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The Influence of *Cegah Anemia Remaja* (Care) Educational Video on Knowledge and Perceptions of Anemia Prevention in Female Adolescents

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ABSTRACT

Background: In adolescents aged 15-20 years, anemia is a disease that is susceptible, especially in young women. Early prevention efforts use educational videos motion graphics It has not been widely studied as to how much influence it has on knowledge and perceptions regarding the prevention of anemia in adolescents. This study aims to determine the effect of the Prevent Adolescent Anemia (CARE) educational video on knowledge and perceptions of preventing anemia in adolescents.

Subjects and Method: A quantitative study was conducted on 68 teenage girls who were susceptible to anemia. This research used a quasi-experimental design that was held in February 2024 at Abi-Ummi Boyolali Islamic Boarding School. The dependent variable were adolescent knowledge and perception. The independent variable was Cegah Anemia Remaja (CARE) educational video. The difference in values between the two groups was analyzed using the Wilcoxon matched-pairs signed-ranks test. The influence of the CARE educational video on adolescents' knowledge and perceptions of anemia was examined using multinomial logistic regression.

Results: The prevalence of knowledge of preventing anemia in adolescents is 58.8% sufficient and the majority's perception of preventing anemia in adolescents is good, at 94.1%. The effect of CARE educational videos on knowledge is significant (OR= 5.40; p <0.001) and on perception is also significant (OR= 5.48; p= 0.013).

Conclusion: Health education through the Cegah Anemia Remaja (CARE) Educational Video has an effect on increasing knowledge and perception of anemia prevention in female adolescents.

Keywords: anemia, health education, female adolescent

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BACKGROUND

Adolescence is a period marked by rapid changes, particularly in physical, biological, and emotional aspects (Özdemir et al., 2016). During this stage, the frontal lobe of the brain, which is responsible for decision-

making, planning, emotional regulation, and impulse control, undergoes significant development. This brain maturation enhances cognitive abilities, which in turn influences adolescents' capacity to acquire knowledge through experience and available information (Walsh and Nicholson, 2022)

Optimal growth and development during adolescence can be achieved when supported by adequate intake of essential macro- and micronutrients, such as iron. A deficiency in iron may lead adolescents to experience fatigue due to a lack of oxygen in the body. This insufficient oxygen supply is caused by red blood cells that are unable to transport oxygen effectively, thereby failing to meet the body's physiological needs. This condition is known as anemia (World Health Organization).

Anemia is a condition in which hemoglobin (Hb) levels fall below the normal threshold (Newhall et al., 2020). According to the United Kingdom (UK) Laboratory, anemia is defined as a hemoglobin level that is two standard deviations below the normal range based on age and gender; specifically, Hb levels below 13.0 g/dL in males aged over 15 years, below 12.0 g/dL in non-pregnant females over 15 years, and below 12.0 g/dL in children aged 12–14 years (Newhall et al., 2020). Data from the World Health Organization (WHO) in 2018 showed that the prevalence of anemia among adolescents in developing countries was 27%, compared to 6% in developed countries. As a developing country, Indonesia reported a 2021 anemia prevalence of 27.2% among adolescent girls and 20.35% among adolescent boys (Kementerian Kesehatan Republik Indonesia, 2023).

The high incidence of anemia among Indonesian adolescents is generally attributed to a lack of knowledge about the condition. This is supported by a study conducted by Vira (2022) in Ampel, Boyolali, which found that most adolescents had only moderate knowledge about anemia (47.5%), while 9.5% had poor knowledge (Rinjani et al., 2022). This knowledge gap is largely due to limited access to information from healthcare providers, mass media, electronic media, or family members, leading to widespread misconceptions within the community (Indrawatiningsih et al., 2021).

Inaccurate perceptions about anemia prevention can potentially cause adolescent behavior to prioritize their health status less. This condition needs to be explored to determine the extent of adolescent perceptions about anemia, especially in the Ampel Boyolali area. Based on a preliminary study conducted by researchers in Ampel Boyolali, namely at the Abi-Ummi Islamic Boarding School, the results showed that 7 out of 10 students still had sufficient knowledge and 3 of them had insufficient knowledge about anemia.

The government has made efforts to reduce anemia and meet the iron needs of adolescent girls, who are future mothers, by providing iron supplementation tablets (Tablet Tambah Darah or TTD) to female adolescents aged 12 to 18 years through school-based distribution, as stated in the circular letter from the Director General of Public Health, Ministry of Health, Number HK.0303/V/0595/2016 on the Provision of Iron Supplementation Tablets (TTD).

Anemia prevention strategies for adolescents and women of childbearing age (WCA) also include the introduction of balanced nutrition guidelines, food fortification, and treatment of comorbid conditions (Kemenkes RI, 2018). The goverment's promotive and preventive efforts continue to evolve. Health education for adolescents is a preventive strategy aimed at addressing anemia early on, delivered

through various counseling media. Among these, motion graphic educational videos represent an innovative learning tool that facilitates adolescents' understanding of the material presented.

Counseling for adolescents as an early prevention of anemia is a solution to prevent anemia, which is packaged in various counseling media. Counseling using motion graphic educational video media is a development of learning media that will make it easier for adolescents to better understand the contents of the material explained, where the motion graphic video contains animations such as titles for films, television program openings, bumpers, and graphic elements that appear on television (Elanda et al., 2021).

However, evidence regarding the effectiveness of such digital interventions, particularly in Indonesia's diverse adolescent population, remains limited. There is a need to evaluate whether educational videos such as CARE can significantly improve adolescents' knowledge and perceptions about anemia prevention. Understanding this impact is essential for scaling up digital health education strategies as part of national programs targeting adolescent health. The Cegah Anemia Remaja educational video will be developed using editing software and motion graphic animation techniques, which are intended to help respondents more easily understand the content of the video, thereby improving their knowledge and perception of anemia. Based on the background above, researchers are interested in knowing the effect of the Preventing Adolescent Anemia (CARE) educational video on knowledge and perceptions of anemia prevention in adolescents.

SUBJECTS AND METHOD

1. Study Design

This research employs a quantitative approach with a quasi-experimental design, specifically using a pretest-posttest control group design. This study was conducted in February 2024 at the Abi Ummi Islamic Boarding School, Boyolali, Central Java.

2. Population and Sample

The population of this study were all adolescents at the Abi-Ummi Ampel Boyolali Islamic Boarding School who were at high risk of anemia. The population in this study was 128 people from grades 10, 11, and 12 of the Abi-Ummi Ampel Boyolali Islamic Boarding School.

Finite population was calculated using the Lemeshow formula, which resulted in a sample of 68 people. The sample was selected through purposive sampling. The sample was divided into two groups, namely 34 people in the intervention group and 34 others in the control group.

3. Study Variables

The dependent variable were knowledge and perception. The independent variable was Cegah Anemia Remaja (CARE) educational video.

4. Operational Definition of Variables

The CARE educational video is an educational media that contains material about anemia such as the definition, types, impacts, symptoms, complications, prevention methods, and types of foods that are rich in iron.

Knowledge are all information understood by the adolescents was derived from their answers to a 10-item questionnaire conducted pre- and post-intervention.

Perception is a person's assessment of an object is measured through a questionnaire consisting of 10 statements on a Likert scale from pre- and post-intervention.

History of anemia education is whether the teenager has ever received education about anemia or not.

Physical activity is the total time respondents dedicate to physical activities in their everyday lives.

Nutritional patterns is the respondents' dietary patterns, particularly their weekly intake of fruits and vegetables.

BMI represents a calculated value based on the weight and height of adolescent respondents, serving as an indicator of their nutritional status.

5. Study Instruments

The knowledge questionnaire, consisting of 10 items, was adapted from the study by Hatma et al. (2014), with a reported validity and a Cronbach's alpha of 0.713. The perception questionnaire was developed and tested for validity and reliability, yielding a Cronbach's alpha of 0.610.

6. Data analysis

The data analysis in this study was conducted using IBM SPSS version 26. Univariate analysis was performed to describe the characteristics of respondents, including the frequency distribution and percentage of each variable. Bivariate analysis was carried out using the Wilcoxon signed-rank test to examine the differences in values between the two groups. Furthermore, multivariate analysis was conducted using multiple logistic regression to determine the influence of the Cegah Anemia Remaja (CARE) educational video on adolescents' knowledge and perceptions regarding anemia.

7. Research Ethics

Ethical considerations such as informed consent, anonymity, and confidentiality were thoroughly observed throughout the research process. Ethical approval for the study was granted by the Research Ethics Committee of Dr. Moewardi Hospital, Surakarta, Indonesia, under approval number 123/I/HREC/2024.

RESULTS

1. Sample Characteristics

A total of 64 students participated in this study, equally distributed between the intervention and control groups. The findings reveal that all adolescents in this research, drawn from Abi Ummi Ampel Boyolali Islamic Boarding School, were female students, with the majority (42.6%, n=29) currently enrolled in grade 10 of senior high school.

The majority of adolescents have physical activity <30 minutes, which is 70.6% (48 people). The majority of adolescents have a nutritional pattern of consuming vegetables and fruits every day, 82.4% (56 people). All adolescents in the intervention group have a normal BMI, which is 100% (68 people).

Table 1. Sample Characteristics Descriptions

Sample Characteristics	Frequency	Percentage
Education Level		
10th Grade	29	42.6
11th Grade	24	35.3
12th Grade	15	22.1
History of Health Education on Anemia		
Never	34	50
Ever	34	50
Physical Activity		
<30 minutes	48	70.6

Sample Characteristics	Frequency	Percentage
>30 minutes	20	29.4
Nutitional Pattern		
Once every two weeks	12	17.6
Once a week	0	0
Everyday	56	82.4
BMI		
Abnormal	0	0
Normal	68	100

2. Bivariate Analysis

Difference in Knowledge Score Before and After the CARE Educational Video Intervention

Bivariate analysis was conducted to assess the differences in knowledge before and after the intervention in both the intervention and control groups. This analysis employed the Wilcoxon matched-pairs signed-rank test. On average, respondents demonstrated sufficient knowledge prior to the intervention and improved to a good level of knowledge following the intervention.

Table 2. Difference in Knowledge Scores Before and After the CARE Edu¬cational Video Intervention (an analysis by wilcoxon matched-signed)

Knowledge toward anemia prevention	Mean	Min	Max	N	SD	p
Intervention Group						
Pretest	0.94	0	2	34	0.65	<0.001
Posttest	1.85	1	2	34	0.36	
Control Group						
Pretest	0.65	0	2	34	0.65	0.072
Posttest	0.91	0	2	34	0.71	

The difference in significance value between pretest-posttest was <0.001, which means that statistically there was a significant difference between knowledge before and after being given education through the CARE educational video. Meanwhile, in the control group, before the intervention, the average respondent had sufficient knowledge. After the intervention in the form of a time gap, the respondents had very sufficient knowledge. The difference in significance value between pretest-posttest was 0.072, which means that statistically there was no significant difference between knowledge before and after being given a time gap of one week.

Difference in Perception Score Before and After the CARE Educational Video Intervention

The difference in perception scores before and after the CARE educational video intervention is presented in Table 3. In both the intervention and control groups, perception scores improved significantly after the intervention. In the intervention group, the average respondent's perception increased from close to "positive" to very close to "positive," with a p-value of 0.013, indicating a statistically significant difference.

Table 3. Difference in Perception Scores Before and After the CARE Educational Video Intervention (an analysis by wilcoxon matched-signed rank)

Perception toward anemia prevention	Mean	Min.	Max.	N	SD	p
Intervention Group						
Pretest	2.71	2	4	34	0.58	0.013
Posttest	2.97	2	4	34	0.52	
Control Group						
Pretest	2.38	1	3	34	0.55	<0.001
Posttest	2.74	2	3	34	0.45	

Similarly, the control group also experienced a significant improvement in perception after a one-week time gap, with a p-value of <0.001. However, the posttest mean perception score in the intervention group was higher than that of the control group. This indicates a difference in perception between the two groups after the intervention. While the intervention group's average perception reached a level very close to "positive," the control group's average remained at a level close to "positive."

3. Multivariate analysis

After conducting the prerequisite tests, it was found that an external factor influencing the results was the history of anemia education. To determine the effect of the CARE educational video on knowledge and perception, a multivariate analysis was performed using multiple logistic regression to calculate the odds ratio.

Table 4. Logistic Regression Analysis of The Effect of CARE Video on Knowledge and Perception of Anemia Prevention among Adolescents

Variable	Sufficient Knowledge			Good Knowledge			Positif Perception			Very Positif Perception		
	aOR	95% CI	p	aOR	95% CI	p	aOR	95% CI	P	aOR	95% CI	p
Educational Video	6.08	1.61-2.30	0.001	5.05	5.05-5.06	0.001	0.39	0.10-1.50	0.175	3.61	3.61-3.62	0.001
History of Anemia Education	2.41	0.46-12.47	0.292	1.34	0.22-8.15	0.749	2.71	0.73-10.05	0.134	3.52	0.32-38.36	0.302

The results of the multiple logistic regression analysis on the influence of the CARE educational video on adolescents' knowledge and perception of anemia pre-vention are presented in Table 4.

Knowledge was categorized into two levels: sufficient and good. Based on the Adjusted Odds Ratios (AORs) obtained after including both the educational video intervention and the history of prior anemia education in the model, adolescents who received the video intervention were found to be 6 times more likely to have sufficient knowledge and 5 times more likely to have good knowledge compared to those who did not receive the video.

Perception was also divided into two categories: positive and very positive. The AORs indicated that adolescents who received the video intervention were 0.3 times less likely to have a merely positive perception, but were 3.6 times more likely to have a very positive perception compared to those who did not receive the intervention, after adjusting for prior exposure to anemia education.

DISCUSSION

Respondent Characteristics

Respondent characteristics based on age where the majority of adolescents at the Abi Ummi Ampel Boyolali Islamic Boarding School were studying in grade 10 of high school was 42.6% (29 people). This education is closely related to knowledge where according to research by Damayanti et al. (2021) regarding the relationship between education level and community knowledge level, the result of a sig value of <0.001 where the higher the level of education, the higher the knowledge they have (Damayanti et al., 2021). Therefore, people with higher education can provide a more rational response to the information received.

In the physical activity variable, they have a majority of adolescents with physical activity <30 minutes, which is 70.6% (48 people). People who have less physical activity tend to be at greater risk of anemia. This is in line with research by (Walsh and Nicholson, 2022) which states that hemoglobin levels in the blood are greatly influenced by human physical activity. Routine exercise will have an impact on increasing Hb levels due to the increased need for tissue or cells for O2.

In addition to exercise, nutritional patterns also play an important role in preventing anemia in adolescents. The results show that the majority of adolescents have a nutritional pattern of consuming vegetables and fruits every day was 82.4% (56 people). This is in line with the research of Hartati et al. (2021) where the results of the study showed that adolescents with sufficient consumption of vegetables and fruits will have an impact on sufficient fiber intake so that iron metabolism can run to prevent anemia.

A good pattern of vegetable and fruit consumption balanced with sufficient physical activity will affect a person's nutritional status. Measurement of nutritional status can be done by determining the Body Mass Index (BMI) where the results of this study showed that all respondent had a normal BMI category, with 100% (68 people) falling within this range. Adolescents with normal BMI mostly do not suffer from anemia because adolescent girls have consumed foods rich in iron so that the body's needs can be met (Enggardany et al., 2021). However, BMI can also not have a significant effect on the incidence of anemia due to various other factors that influence anemia, including adolescent health status, cycle, duration of menstruation, and food consumption, as well as the environment (Estri and Cahyaningtyas, 2021).

Difference in Knowledge Score Before and After the CARE Educational Video Intervention

There is a significant difference between knowledge of anemia prevention before and after being given the CARE educational video intervention. The success of health education through the CARE animated video in the intervention group is in line with the cognitive theory of multimedia where there is a selection of words, images, organizing words, images and connecting the two through basic knowledge that is owned and visualized so that it can be stored as prior knowledge (Damayanti, 2013). Information processing theory makes an important contribution to learning design by providing a foundation for prior knowledge, how to design learning objectives, and the concept of feedback. Prior knowledge has an influence in forming new knowledge and skills Munira and Viwattanakulvanid (2024).

The increase in respondents' knowledge through health education is in line with the results of research by Hutasoit et al., (2022) which stated that there was a

significant change in the average knowledge value before and after being given health education using animated videos on preventing anemia.

Difference in Perception Score Before and After the CARE Educational Video Intervention

The difference in knowledge score was seen through bivariate analysis, namely the Wilcoxon signed rank test. The results of the analysis showed a significance value of the pretest-posttest results of the intervention group of 0.013 so that it can be concluded that there is a significant difference between the perception of anemia prevention before and after being given the CARE educational video intervention. This is in line with the study of the influence of education through videos on adolescent girls which shows that education in the form of videos can increase adolescent knowledge where the intensity of attention and perception of an object greatly influences the knowledge possessed due to the sensing carried out (Madestria et al., 2021).

In addition, there is a difference between the perception of anemia prevention in the control group. Both classes showed significant changes in both the intervention class or the class given the educational video and the control class or the class that was only given a time gap. This can be influenced by external factors such as age and education. The level of education can influence a person's rational and irrational mindset in making decisions. A person with low education tends to have high inconsistency in perceptions that are easily influenced compared to someone with a higher educational background (Muhlisin et al., 2018).

Limited knowledge can also influence one's perception or awareness regarding anemia. This is supported by a study from (Munira and Viwattanakulvanid, 2024), which examined knowledge, perception, and practices related to iron tablet consumption. The study found that many female students still had low levels of knowledge about anemia. For instance, some believed that if they did not experience physical symptoms such as dizziness, they were not anemic and therefore did not need to take iron tablets. Additionally, while some had the intention to consume iron supplements, they lacked awareness about potential side effects, indicating insufficient knowledge about iron tablets.

These findings suggest that poor knowledge does not necessarily prevent someone from having a favorable perception. This may be because perception can still shape an individual's readiness to adopt behavioral changes or participate in preventive programs (Ferrer and Klein, 2015). Therefore, to determine the influence of external factors on perception, a multivariate analysis was carried out using multinomial logistic regression.

The Influence of the *Cegah Anemia Remaja* (CARE) Educational Video on Knowledge and Perception of Anemia Prevention in Female Adolescents

The influence of the CARE educational video on knowledge and perception was analyzed using multiple logistic regression. After adjusting for the history of anemia education, respondents who received the educational video were found to be 6 times more likely to have sufficient knowledge and 5 times more likely to have good knowledge, compared to those who did not receive the intervention. Previous research primarily investigated whether educational videos affect knowledge, which aligns with the findings of Madestria et al. (2021), who reported that educational videos significantly influence the knowledge of adolescent girls along with their perceptions

regarding iron supplementation intake. Their study found that respondents who received the educational video were 0.4 times less likely to have a positive perception, but were 3.6 times more likely to have a very positive perception compared to those who did not receive the intervention.

Dwiana and Pramintarto Eko (2019) using the Wilcoxon signed-rank test, also reported differences in adolescent knowledge following exposure to a motion graphic educational video about anemia. However, the study did not quantify the extent of the video's influence. In addition, research by Abu-Baker et al., (2021) on nutrition education and perception of iron supplementation showed that health education influenced perception using a paired-sample t-test analysis, although the study had not yet applied multivariate analysis.

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This study is self-funded.

CONFLICT OF INTEREST

There was no conflict of interest in this study.

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