



## Effectiveness of the Peer Educator Model in Improving Hemoglobin Level among Adolescent Girls in Depok City

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### Abstract

**Background:** Anemia remains a global public health concern due to its high prevalence among adolescent girls and women of reproductive age. According to the 2022 Indonesian Health Survey, the prevalence of anemia among adolescent girls was 23%. Hemoglobin (Hb) testing conducted by the Depok City Health Office revealed that 9,514 (36.34%) students were found to be anemic. **Objective:** This study aimed to determine the effectiveness of the peer educator model in improving hemoglobin levels among adolescent girls in Depok City. **Methods:** This study employed a prospective cohort design with a quantitative quasi-experimental pretest-posttest approach. The study was conducted among 11<sup>th</sup> and 12<sup>th</sup> grade female students at Raflesia IT High School, Depok. A total of 63 participants were included in the study. Hemoglobin levels were measured before and after the intervention, which involved peer education-based health education and mentoring on anemia prevention. **Results:** The peer educator model effectively increased hemoglobin levels among the participants. A significant improvement in mean Hb levels was observed after the intervention ( $p=0.015$ ). **Conclusion:** The peer educator model was proven effective in improving hemoglobin levels among adolescent girls. Training non-anemic students as peer educators is recommended to enhance peer-to-peer support and education in anemia prevention programs.

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## INTRODUCTION

Anemia remains a global public health issue due to its high prevalence among in adolescent girls and women of reproductive age.<sup>1</sup> According to data from the Global Nutrition Report, more than 33% of women and children worldwide affected by anemia.<sup>2</sup> The majority of high-risk

populations are found in developing and low to middle-income countries. In a developing country, approximately 30% of the population aged 15 to 49 has anemia.<sup>3</sup> Approximately 30% of women aged 15-49 years in developing countries are affected by anemia.<sup>3</sup> The prevalence of anemia in South Asian countries among adolescents ranges from 40 to 88% with the highest rate found in South Asian countries reported in Bangladesh (70%), Nepal (67%), and Maldives (62%).<sup>4</sup> According to the 2022 Indonesian Health Survey (SKI), the prevalence of anemia among adolescent girls is 23%.<sup>5</sup> Hb tests conducted by the Depok City Health Office on 7<sup>th</sup> and 10<sup>th</sup> grade students revealed that 9,514 (36.34%) were found to be anemic.<sup>6</sup> Anemia causes a decline in academic performance, productivity in adulthood, and overall quality of life.<sup>7</sup> Chronic anemia increases the risk of stunting among girls in early adolescence. If this happens, we must promptly address anemia as a priority issue. It is because adolescence is a transition from childhood, free of responsibilities, to adulthood, which brings various responsibilities.<sup>3</sup> Therefore, the growth and development of adolescent girls should be comprehensively monitored.

Anemia negatively affects cognitive performance, behavioral characteristics, and physical growth.<sup>3</sup> Anemia status plays a crucial role in the physical capacity and work performance of adolescent girls and adult women.<sup>8</sup> Among adolescents, anemia does not only affect their current health status but also has long-term effects in the future. Adolescent girls, as future mothers, need to receive adequate and consistent iron intake to optimize their productive functions, enabling them to give birth to healthy babies who develop optimally and are protected from the risk of stunting.<sup>9</sup>

Anemia serves as an indicator of a country's level of development, as it correlates with the Human Development Index (HDI), including physical growth and cognitive function and human resource productivity. Therefore, to improve a nation's economic development, effort must be made to address the risk factors contributing to anemia.<sup>10,11</sup> One of the key risk factors for anemia in adolescents is the low interest among adolescent girls in consuming iron supplements (TTD) and food rich in iron, often due to poor dietary habits.<sup>12,13</sup> Therefore, we need effective strategies to lower the prevalence of anemia among adolescent girls in Depok City. Previous studies have implemented interventions such as using the CERIA application, the Peer Educator Model, and educational videos as preventive measures against anemia in adolescent girls. However, the most effective model among these approaches-whether using peer groups, technology applications, or educational videos-has not yet been clearly identified. This study employed an experimental method with a prospective cohort design and compared various intervention methods, aiming to effectively reduce anemia prevalence in Depok City and determine the most effective approach for reducing anemia among adolescent girls.

## METHODS

This study employed a prospective cohort design with a quantitative quasi-experimental research method, using a pretest-post test approach across three different treatment groups. This study aimed to assess the effectiveness of three intervention types in increasing hemoglobin (Hb) levels in adolescent girls with anemia at Raflesia IT High School, Depok City. The research was conducted from July to September 2025.

The population consisted of 11<sup>th</sup> and 12<sup>th</sup>-grade female students from Raflesia IT High School, Depok, with a total of 63 participants selected through purposive sampling to ensure relevance to the research objectives. The 63 participants were divided into three treatment groups. Each consisting of 21 students:

Group 1: Received the Peer Educator Model. Two adolescents of the same age were trained as peer educators before the intervention. They attended an educational session to be peer educators and were given a guidebook containing educational materials. Peer educators received material on how to educate during 8 meetings in the two months before the intervention was carried out on respondents. After that, counseling sessions were held 4 times over two months, each lasting about one hour. The sessions took place in the classroom during extracurricular hours under teacher supervision. Session 1: Definition and Symptoms of Anemia (Week 4 July 2025), Session 2: Causes of Anemia (Week 2 August 2025), Session 3: Impact of Anemia (Week 4 August 2025), and Session 4: How to Prevent Anemia (Week 2 September 2025).

Group 2: Received a model of the CERIA (Creative Education with Animation for Reproductive Health) application from the Ministry of Health. The CERIA application can be downloaded directly from Google Play Store on smartphones. After downloading, researchers gathered respondents in a room and explained about accessing and using the application as an anemia prevention measure. For two months, participants were asked to use the application as an additional educational tool and as a reminder to take iron supplements.

Group 3 received an intervention in the form of an educational animated video produced by a video maker (After Effects), in line with the latest technology trends. The educational content was divided into several scenes: Scene 1: What is Anemia and Its Impacts, Scene 2: Symptoms of Anemia, Scene 3: Tips for Preventing Anemia, Scene 4: Benefits for Young Women to be Free from Anemia. Scenes were provided every 2 weeks also through a WhatsApp group so that researchers could see which members had watched the videos sent from each scene. This study passed the ethical review at the Health Research Ethics Committee of University Muhammadiyah Prof. DR Hamka with the approval number: KEPK-NK/02/07/2025/0334.

## RESULTS

The result of the Hb level test in student of SMA IT Raflesia in Tugu Village, Cimanggis, Depok, showed significant differences between the three treatment groups: the peer educator group, The CERIA application group from the Ministry of Health, and the educational video group.

**Table 1.** The Difference of Hb Level Examination in Students of SMA IT Raflesia Depok Across Three Treatment Groups in Effort to Prevent Anemia in Depok City.

Variable	Mean	SD	Correlation	P value
<b>Peer Educator group</b>				
Pre-intervention Hb level	12.024	0.773	1.081	0.054
Post-intervention Hb level	13.076	0.798		
<b>CERIA application Group (Ministry of Health)</b>				
Pre-intervention Hb level	12.195	1.146	0.684	0.001
Post-intervention Hb level	12.271	1.419		
<b>Educational Video Group</b>				
Pre-intervention Hb level	12.327	0.846	0.142	0.529
Post-intervention Hb level	12.359	1.027		

Based on the table above, in the peer educator group, the average Hb level before the intervention was lower than after the intervention indicating an increase in the average Hb level after education, The standard deviation (SD) for Hb before the intervention was higher than Hb after the interventions that showed more variation in Hb levels before the intervention compared to the Hb value after the intervention that was moderate (1.081). It showed a positive relationship between Hb levels before and after the intervention. The p-value for the correlation was 0.054, slightly greater than 0.05 that means that this correlation can still be said to be statistically significant at the 0.05 significance level. In other words, there was a correlation between Hb levels before and after the intervention.

According to the CERIA application group from the Ministry of Health, the average Hb level before the intervention was slightly lower compared to after the intervention with an increase of 0.0762. However, a higher standard deviation was observed for the post-intervention Hb values compared to the pre-intervention values showed more variation in the data after the intervention. The correlation value was 0.684 indicating a moderate relationship between the pre-and post-intervention of Hb levels. This correlation was significant (p value = 0.001), meaning there was a strong enough relationship between the two variables (Hb before and after the intervention), suggesting that the change in Hb levels is related to the intervention provided.

In the educational video group, there was also difference in the average Hb level before the intervention, with the result being slightly lower compared to after the interventions. The variation or standard deviation for Hb values after interventions was slightly higher before the intervention, indicating more variation in the data after the intervention. Additionally, the correlation between pre-and post- intervention Hb level; was very low (0.142) and not significant (p-value = 0.529). It means

that there was no strong or significant relationship between the Hb values before and after the interventions. In other words, the change in Hb level after the intervention did not show a significant correlation with the pre-intervention values.

**Table 2.** Statistical Test Results of Hb Level Examination on Students of SMA IT Raflesia Depok with Three Treatment Groups in an Effort to Prevent Anemia in Depok City

Variable	Paired Differences			<i>t</i>	<i>P value</i>
	Mean	95% CI			
Peer Educator group	-1.052	-1.544 – (-0.560)		-4.461	0.001*
CERIA application Group (Ministry of Health)	-0.076	-0.554 – (0.416)		-0.333	0.743
Educational Video Group	-0.032	-0.579 – (0.515)		-0.121	0.905

Based on the analysis using the paired t-test, the average difference between pre and post-Hb values is -1.052 showed a change in the average Hb level after the intervention in the peer educator group. The confidence interval showed that with a 95% confidence level, the average Hb difference falls within the range of -1.544 to -0.560 that did not include zero, strengthening the finding that there is a significant difference. The t-statistic of -4.461 indicates that this difference was considerable and negative, supporting the existence of a difference between pre and post- Hb values. The p values of 0.001 that was less than 0.05 suggests that the null hypothesis can be rejected, meaning there was a statistically significant difference between pre-and post Hb values in the peer educator group.

Meanwhile, in the CERIA group, there was also a difference in the average Hb value between pre and post, with a mean value of -0.076. The t-statistic result of -0.333 showed that this difference was small and does not support the hypothesis of a significant difference between Hb values before and after treatment and the p-value of 0.743 that was much greater than 0.05 that means it fails to reject the null hypothesis. In other words, there was no significant difference between Hb values before and after treatment.

In the educational video group, the average difference in Hb values before and after treatment was -0.032 showed a slight decrease, but this difference was not significant. The t-statistic result of -0.121 showed that this difference was very small and did not support the hypothesis that there is a significant difference between Hb before and after treatment. The p-value of 0.905 was greater than 0.05, so we fail to reject the null hypothesis. This means that there was no significant difference between the Hb values before and after treatment in this group.

## DISCUSSION

Based on the results of paired t-test results, the peer educator model was the only treatment that showed a p-value of less than 0.05, which means there was a difference in the increase in Hb

levels of female students at SMA IT Raflesia Depok before and after the intervention. In this study, there was an increase in the average hemoglobin level of 0.833 from the previous average Hb level of 11,324 to 12,157. According to the results of various studies that have been conducted, one effective method strategy among adolescents was through the peer-group education method.<sup>14</sup> Peer groups had an important role for individuals in relation to attitudes, speech, interests, appearance and behavior. Teenagers often imitate role models or trends that exist among their peers. Peer groups were places for teenagers to obtain information that they cannot get from their family or school environment. Peer groups can direct individuals towards good behavior and provide input or suggestions for correcting any deficiencies they have.<sup>15,16</sup>

The results of previous research showed a significant effect of weekly iron tablet supplementation combined with health promotion from cadres or student ambassadors who provide peer education to their peers can improve knowledge, attitudes and skills in preventing anemia.<sup>16-18</sup> Other research shows the effect of peer education on increasing Hb levels in anemic adolescents by 2.3 g/dL. Several articles showed that peer group interventions have been shown to improve knowledge, attitudes, skills, intentions, and behaviors to prevent anemia in adolescents. This suggests that peer groups are an effective strategy for reducing anemia in adolescents.<sup>19</sup> An article showed that peer group interventions also increased nutritional intake such as calories, protein, iron, and fruit and vegetable intake.<sup>20</sup>

There was no significant increase in Hemoglobin observed among participants application using the CERIA application developed by the Ministry of Health. The CERIA application is a means of electronically recording and reporting data on iron supplement (IBT) consumption in adolescent girls. Its function includes providing information to adolescent girls about IBT and anemia, as well as reminding them to take their IBT weekly. The results of this study were not in line with the results of various previous studies that showed that the use of the CERIA application that was associated with increased Hb levels in adolescent girls.<sup>21,22</sup> However, the results of another study in Bangladesh showed that the use of mHealth interventions let to increase in attitudes and knowledge toward anemia prevention in adolescent girls, but was ineffective in reducing the prevalence of anemia in adolescent girls.<sup>23</sup>

Another anemia prevention intervention used in this study was an educational animated video. However, based on the data analysis result, this intervention was not significantly associated with Hemoglobin (Hb) levels in adolescent girls. Aisah's (2022) research found that the use of educational videos increased adolescent girls' knowledge and awareness of anemia prevention.<sup>24</sup> However, this intervention did not show significant correlation with an increase in Hb levels.. Educational videos provided to young women were in the form of attractive animations with high-quality sound. The results of this study were not in line with the results of Dwistika's research (2024) that showed the

effect of providing education with educational videos on an average increase in hemoglobin levels of 2.87 points.<sup>25</sup>

## CONCLUSION

The most effective model for anemia prevention among female students at Raflesia IT High School, Depok City was the peer educator model. This model was the only one significantly associated with an increase in mean Hb levels in female students at Raflesia IT High School in Depok City ( $p=0.015$ ). Meanwhile, the CERIA application model and educational animation videos did not show a significant relationship with the increase in Hb levels in students at Raflesia IT High School, Depok City.

## RECOMMENDATION

There is a need for training programs for peer educators among adolescent girls who are not anemic. Collaboration between community health centers and schools is essential in developing anemia-free adolescent friends as health cadres to support effective anemia prevention efforts.

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#### Declarations

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