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The effect of anemia free-club model (CBA) application and giving of blood supplementary tablets (TTD) on knowledge, attitudes, and hemoglobin levels in anemic teenage girls of Senior High School

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A B S T R A C T

Introduction: The prevalence of anemia among teenage girls in senior high schools in Lampung Province is still quite high. A more comprehensive coping model is needed to improve this situation, such as applying the CBA (Anemia Free Club) model, which consists of nutrition education and the supervisory role of mothers and teachers. This study aims to analyze the effect of applying the CBA model and administering blood supplementary tablets on knowledge, attitudes and hemoglobin levels in anemic teenage girls of high school students in South Lampung Regency. Methodology: Quasi-experimental research with a non-randomized control group pretest–posttest design. The research was conducted in February-May 2022 using the consecutive sampling technique by dividing into two groups: the intervention group of senior high school and the control group of senior high school. The Anemia Free-club model was applied for anemic teenage girls, and tablet supplementary tablets were given for 6 weeks. The analytical test used was the paired t-test using the SPSS program and was considered to have a significant effect if p<0,05. Results: After implementing the Anemia Free-club model and giving iron supplements, in the intervention group, there was an increase in the nutrition knowledge (up 45.33 points), the nutritional attitude (up 9.8 points) and the Hb level (up 1,06 mg/dL). Conclusion: It showed a significant effect between the application of the CBA model and the administration of blood supplementary tablets on nutritional knowledge, nutritional attitudes, and Hb levels (p <0,05) in the intervention group.

INTRODUCTION

Anemia is a condition when the quantity or level of hemoglobin in the red blood cells is below normal (WHO, 2019a). Young women are frequently diagnosed with anemia as a result of physiological events like menstruation. In addition to these physiological factors, inadequate protein and iron consumption as well as poor dietary choices made in an effort to lose weight are other factors that contribute to anemia in teenage girls (Republic of Indonesia Ministry of Health, 2020). The World Health Organization (WHO) reports that in Indonesia, the prevalence of anemia among non-pregnant women (aged 15 to 49) is 31.2% in 2019. (WHO, 2019b).

According to several studies, anemia is still relatively high, notably among teenage girls in high school or their equivalent in different parts of Lampung Province. Among young women in Metro City, research by students at State Madrasah Aliyah 1 Metro revealed a 40% frequency of anemia (Martini, 2015). Teenage girls in East Lampung Regency have anemia at an 80.9% prevalence, according to a study done by female students at SMA Negeri 1 Purbolinggo (Astuti & Trisna, 2016). Anemia affects 62.8% of adolescent females in Tanggamus District, according to a study done on class XI girls at State Senior High School 1 Talang Padang (Laksmita & Yenie, 2018).

Anemia affects 60.8% of teenage girls in Central Lampung Regency, according to research done at State Vocational High School 1 Terbanggi Besar (Listiana, 2016). A survey of female high school students in Bandar Lampung discovered that teenage girls had a 49.3% frequency of anemia (Zuraida, 2020).

Teenage girls' anemia will have an effect on their present or future health. Teenage girls with anemia currently experience effects like diminished body immunity, fitness, and physical agility, which have an impact on learning attainment and performance productivity (Republic of Indonesia Ministry of Health, 2018). Future expectant teenage girls who are planning to become mothers run the danger of harming both themselves and their unborn children because anemia raises the chance of bleeding both before and after childbirth (Republic of Indonesia Ministry of Health, 2018).

According to estimates, the lack of iron and protein in regular diets is one of the main causes of anemia in Indonesian teenage girls (Republic of Indonesia Ministry of Health, 2020). Based on research that was conducted on a group of teenage girls in Way Kanan Regency, Lampung Province, it was found that the average intake of nine types of nutrients measured in teenagers was all below the nutritional adequacy rate so that the nutritional adequacy level for teenagers did not reach 100%. or nothing was regarded as normal (Indriani et al., 2013). In addition to consumption behavior that is not in accordance with the recommendations for General Messages of Balanced Nutrition, the knowledge and attitude factors of teenage girls can also influence and exacerbate the occurrence of anemia. Research conducted by students at State Middle School Rambah Hilir found that 95.3% of students had anemia and lacked knowledge (Handayani, 2019). Another study related to attitudes was carried out on students at State Senior High School 9 Mataram, it was found that 58.1% of students had mild and moderate anemia had a bad attitude (Jaswadi, 2020)

Innovation is required to change teenage girls' eating habits and nutritional knowledge, and nutrition education is one such innovation. The goal of nutrition education for teenage girls is to develop nutrition knowledge so that dietary aberrations can be avoided (Sefaya et al., 2017). Nutrition education for anemic teenage girls besides being able to raise young women's knowledge about nutrition, notably concerning anemia, it is hoped that it can also change eating patterns so that nutrient intake becomes better (Silalahio et al., 2016).

Changing the eating behavior of young women is not just done with nutrition education because it will only affect individuals (intrapersonal), specifically information about why and how to eat properly which is converted into the shape of healthy or unhealthy behavior (Zuraida, 2020). According to the idea of Lawrence Green (Green, 1991) behavior was created from three variables, namely predisposing factors, enabling factors and reinforcing factors (Adventus et al., 2019). According to this theory, it is vital to include school or family support as one of the reinforcing and enabling elements when providing nutrition education to anemic teenage girls, as they are predicted to increase knowledge and improve eating habit. Parents provided assistance for research carried out at the Ngemplak Simongan Health Center's working area; in this case, mothers could influence teenage girls' dietary habits to prevent anemia (Setyowati et al., 2017).

Based on the aforementioned characteristics, a more holistic approach to treating anemia in teenage girls that take into account a variety of factors is required in order to enhance the behavior of food intake, especially iron in anemic adolescent girls. The CBA (Anemia Free Club) model is a way to treat anemia that includes moms and instructors in modifying young women's eating habit (food-based), in addition to focusing on changing teenage girls' nutritional understanding through nutrition education (Zuraida, 2020). Overcoming anemia, besides boosting iron intake in this case, improving food intake and providing Blood Supplement Tablets (the Republic of Indonesia Ministry of Health, 2018). Therefore, this study aims to evaluate the impact of implementing the CBA model (Anemia Free Club) and giving blood-supplement tablets to anemic high school students in South Lampung Regency on their knowledge, attitudes, and hemoglobin levels.

METHOD

Research Design and Research Sample

This study is a form of non-randomized control group, pretest-posttest, quasi-experimental research. The grouping of sample members into the intervention group and the control group was not random. Teenage girls from two high schools, Tanjung Sari State Vocational High School (SMK) and ASSALAM Private High School, made up the study's population

The samples were 41 female adolescents at Tanjung Sari State Vocational School as an intervention high school and 42 female adolescents at ASSALAM private high school as a control high school. For these anemic teenage girls, the study was carried out from February to May 2022 using a consecutive sampling technique. The study's inclusion criteria were menstrual teenager girls, the absence of conditions that would have affected the study (such as thalassemia, TB, HIV/AIDS, or chronic malaria), excessive menstruation, pregnancy, or regular use of multivitamins and supplements). This study was approved by the Ethics Commission of the Faculty of Medicine, Universitas Lampung with No: 771/ UN26.18/ PP.05.02.00/2022.

Variables and Variable Measurement

The independent (free) variables are the application of the Anemia free-club model and administration of iron supplements, while the dependent (dependent) variables are knowledge, attitudes and hemoglobin levels of female adolescents. The Anemia free-club model is an intervention model for tackling teenage girls which consist of providing nutrition education and monitoring teachers' and parents' meals. Nutrition education is carried out once a week with an estimated time of 60 minutes using lecture methods, direct demonstrations or other methods related to anemia, nutrition related to anemia or others related to anemia treatment which is carried out for 6 weeks.

The eating habits of teachers and parents are supervised, namely by giving them education on nutrition and anemia so they may encourage teenage girls to take iron supplements and eat more iron. The prescribed blood supplement tablets, which were used daily and once a week throughout the menstrual cycle, comprised 400 mcg of folic acid and 60 mg of ferrous fumarate. The method for supplying blood supplement tablets is based on one of the literature sources, which claims that preventing anemia in young women can be accomplished by giving them one tablet every week and one tablet every day while they are menstruating (Taufiqa et al., 2020)..

Using a questionnaire with 24 questions and a score of zero for each incorrect response and a score of one for each correct response, enumerators directly collected pre- and posttest knowledge regarding anemia and nutrition in the intervention group and control group. The overall score earned by each teenage girl is then calculated by adding the correct answers, dividing the total number of questions by 2, and multiplying the result by 100. Enumerators used a questionnaire with 22 items that included both positive and negative questions to directly collect attitude assessments from the intervention and control groups. There are four answer choices for the attitude statement consisting of strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD) answers. Hemoglobin (Hb) levels in teenage girls were measured by taking blood through a vein and examined using a hematology analyzer which was carried out before and after the implementation of the Anemia free-club model and administration of iron supplements in the intervention school group and control school group.

Data Collecting Technique

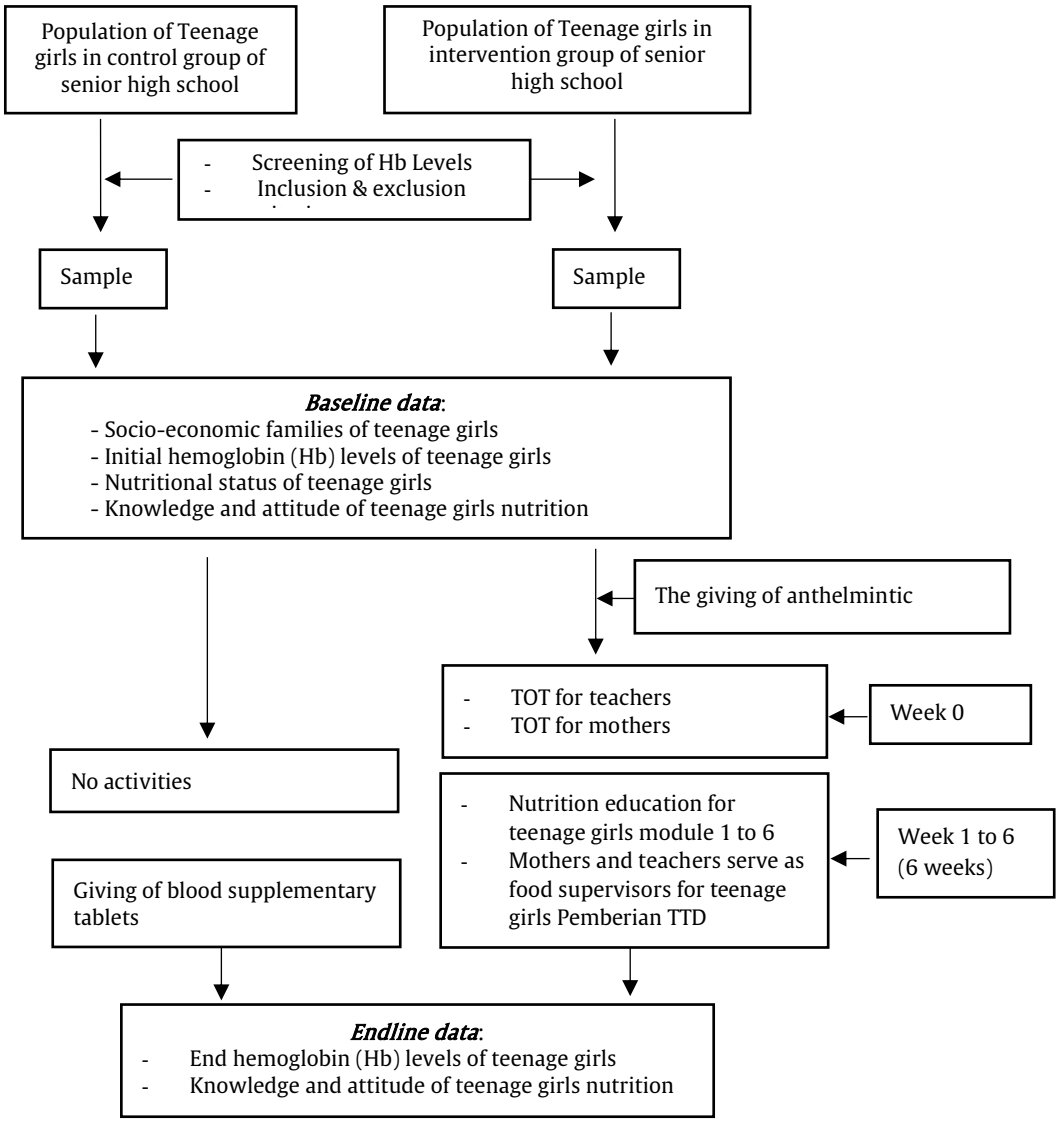

Figure 1 Data Collecting Technique

Data Analysis

Univariate and bivariate data analysis are used to test the variables under study. The univariate analysis described the general features, dietary needs, and familial characteristics of anemic adolescent girls. The dependent variable and independent variable are both described by this univariate analysis utilizing frequency distribution tables that provide the mean, minimum, and maximum starting and final data after the intervention.

It was a numerical comparison analysis of pairs of twice-repeated measurements that was employed in the bivariate analysis. Before and after the Anemia Free-club Model intervention and the delivery of iron supplements, measurements of nutritional knowledge, nutritional attitudes, and Hb levels in anemic young women were made. If the data distribution is normal, the paired t test is performed to test the hypothesis; if it is not, the Wilcoxon test is used. The SPSS program was used to gather and analyze the data. A

significant effect was defined as one with a p-value of 0.05 or lower.

RESULTS AND DISCUSSION

Anemic Free-club Implementation Model Research Results

Teenage girls' mothers met the requirements to take part in this study if they came to two sessions with researchers, heard about the program, gave their informed consent, and received instruction on how to measure serving sizes of food. Meetings with mothers are held numerous times, both on weekdays (Monday-Friday) and holidays, to accommodate moms who cannot attend during the week because some women work and find it difficult to leave their jobs (Saturday and Sunday).

Some of the mothers in the intervention and control group of senior high schools had the following education.

Table 1. Characteristic of Teenage girls' mothers (n=83)

No	Variable	Intervention		Control	
		n	%	n	%
1	Education Level:				
	Unfinished School	2	4.9	4	9.5
	Elementary School	16	39.0	16	38.1
	Middle School	12	29.3	11	26.2
	High School	11	26.8	11	26.2
2	Mother's occupation				
	Farmer	2	4.9	1	2.4
	Trader	2	4.9	2	4.8
	Farm workers	3	7.3	3	7.1
	Non-farm workers	1	2.4	35	83.3
	Housewife	33	80.5	1	2.4

Anemic Free-club Model Implementation Step

The implementation stage of the Anemic Free-club Model is the stage where the teenage girls' module is implemented for anemic teenage girls in the intervention group of senior high school. The teenage girls' module is implemented after the teacher and the teenage girls' mothers receive the TOT and understand their respective tasks. The nutrition education module for teenage girls was carried out for 6 weeks at the intervention group of senior high school. Whereas in the control group of senior high schools, the intervention was given in the form of nutrition counseling in the middle of the program. The control high school was also given the same nutrition education module as the intervention high school which was given at the end of the program. A total of 41 teenage girls participating in the program were in the intervention high school and 42 in the control group of senior high school.

The average duration of menstruation for teenage girls in the intervention and control group of senior high schools was 7 days.

Table 2. Characteristics of Menstrual Period for Teenage girls

Respondent Characteristic	Intervention	Control
Duration of menstruation (days)	7.00 (5.00-10.00)	7.0 5.00-8.00)

Family Socio-Ecodemographic Characteristics

The characteristics of religion and ethnicity in both the control and intervention group of senior high schools were similar, that is, they were dominated by the Islamic religion and dominated by the Javanese and Lampung ethnic groups. For parental education, most of the education of fathers and mothers in the intervention high school was elementary and junior high school, in contrast to the control high school, which was mostly elementary school. Father's occupation was dominated by non-farm workers in the intervention group of high school, while the control group of senior high school was dominated by farmers. Most of the teenage girls' mothers were housewives in the intervention group, in contrast to the control group where most of the teenage girls' mothers were non-farm workers. Most of the family income in the intervention high school was in the category below the Regencies Minimum Wage (< Rp. 2,650,000), while in the control high school most were in the category above the Regencies Minimum Wage (> Rp. 2,650,000). The sociodemographic characteristics of the family are listed in Table 3.

Table 3. Sociodemographic Characteristics of Teenage Girls' Families (n=83)

Socioecodemographic Characteristics	Intervention		Control	
	n	%	N	%
Religion				
Islam	38	92.7	42	100.0
Christian Protestant	1	2.4		
Hindu	1	2.4		
Buddha	1	2.4		
Ethnic				
Lampungnese	3	7.3	1	2.4
Java	33	80.5	39	92.9
Sundanese	1	2.4	1	2.4
Palembangnese	1	2.4	1	2.4
Balinese	1	2.4		
Others	2	4.9		
Fathers' Education				
Unfinished School	2	4.9	6	14.3
Elementary School	12	29.3	14	33.3
Middle School	15	36.6	8	19.0
Senior High School	12	29.3	12	28.6
Bachelor's degree			2	4.8
Mothers' Education				
Unfinished School	2	4.9	4	9.5
Elementary School	16	39.0	16	38.1
Middle School	12	29.3	11	26.2
Senior High School	11	26.8	11	26.2
Fathers' Occupation				
Farmer	7	17.1	17	40.5
Trader	6	14.6	4	9.5
Farm Wokers	8	19.5	7	16.7
Non-farm workers	13	31.7	9	21.4
Service	1	2.4	1	2.4
Contract Worker	1	2.4	4	9.5
Others	5	12.2	17	40.5
Mothers' Occupation				
Farmer	2	4.9	1	2.4
Trader	2	4.9	2	4.8
Farm Wokers	3	7.3	3	7.1
Non-farm workers	1	2.4	35	83.3
Housewives	33	80.5	1	2.4
Lainnya			1	2.4
Family Income				
Under Minimum Wage (< Rp. 2.650.000)	25	61.0	12	28.6
Above Minimum Wage (≥ Rp.2.650.000)	16	39.0	30	71.4

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Characteristics of the Nutritional Status of Teenage Girls

Teenage girls with underweight nutritional status made up 28.6% of the senior high school control group, which is more than the 16.7% in the intervention group. The intervention group of senior high school (76.2%) had more teenage girls with normal nutritional status than the control group of senior high school (66.7%). Teenage girls with anemia and the same nutritional condition in the intervention and control groups were fat (4.8%).

Table 4. Characteristics of the Nutritional Status of Teenage Girls (n=83)

Characteristics of the Nutritional Status	Intervention		Control	
	n	%	n	%
Nutritional Status (BMI)				
Thin	7	16.7	12	28.6
Normal	32	76,2	28	66.7
Fat	2	4,8	2	4.8
CED Status				
CED	30	71.4	37	88.1
Normal	11	26.2	5	11.9
Degree of Anemia				
Moderate Anemia (Hb: 8.0 - 10.0 gr/dL)	3	7.1	5	11.9
Mild Anemia (Hb: 10.1 - 11.9 gr/dL)	38	90.5	37	88.1

In senior high school, the frequency of teenage girls with CED nutritional status was 88.1% greater in the control group than it was in the intervention group (71.4%). Teenage girls in the control group had higher rates of Hb: 8.0–10.0 gr/dL (11.9%) than those in the intervention group (7.1%). Table 4 provides information about the nutritional status of teenage girls.

Intervention School Teenage Girls Adherence to the Program

Application of nutrition education in a high school intervention group using the Anemia Free-club model. Due to the Covid-19 pandemic and the implementation of Level 3 Community Activity Restrictions in South Lampung Regency at the time, the original implementation schedule called for holding the sessions every Wednesday from 10 to 11 a.m. As a result, the nutrition education programs had to be modified because learning activities for senior high school students were also restricted. Due to the fact that not all of the high school students involved in the intervention were present at the time it was conducted, another option–online material delivery–was offered. In order to ensure that all nutrition education content was communicated and understood by teenage girls, researchers construct Google Classroom online classes or *WhatsApp* groups to disseminate information. The main points discussed at the last nutrition education meeting will be covered again the following week so that research participants who couldn't attend may still get the information. Table 5 showed the number of teenage girls who attended the intervention school.

Table 5.
Presence of Intervention Group of High School Teenage Girls in Nutrition Education (n=41)

Week	Total of face to face people (n)	Percentage of face-to-face people (%)	Total of people online (n)	Percentage of people online (%)
1	25	60,98	16	39,02
2	33	80,49	8	19,51
3	23	56,09	18	43,91
4	19	46,34	22	53,66
5	19	46,34	22	53,66
6	28	68,29	13	31,71

Table 6 Intervention Group of High School Teenage Girls Activeness in Uploading Food Photos for each Group

Group	Number of teenage girls who uploaded photos (n)	Total teenage girls per group (n)	The percentage of activity in uploading photos in each group (%)
1	3	10	30
2	5	10	50
3	3	10	30
4	7	11	63,64
Average			43,41

In addition to providing materials for six weeks, the interventions also involved monitoring the dietary habits of moms and teachers who had previously received TOT. The young child is watched over by her mother at home to make sure she eats nutritional foods high in iron to treat her anemia. The the teenage girls' mother also keeps an eye on her at-home intake of blood supplementary tablets.

If the research subject consumes an blood supplementary tabblet while attending class, the teacher's job is to monitor such use. Additionally, the teacher is in charge of managing 10–11 people who remind young women to eat nutrient- and iron-rich meals through a *WhatsApp* group that has been set up. To make sure that teenage girls are eating a balanced diet, the teacher actively requests daily uploads of images of breakfast, lunch, and supper from research participants. The activity of young women uploading food images can be seen in Table 6 as the teacher keeps an eye on their eating habits.

Knowing that teenage girls taking blood supplementary tablets are provided a control card signed by their teacher or parents in both the intervention and control groups of high schools was important. At the end of the intervention, it was discovered that young women consumed blood supplementary tablets on a weekly and daily basis, if menstruation occurred, in accordance with the guidelines

established at the start of the study, resulting in a 100% consumption rate.

Nutrition Knowledge and Attitude Scores for Teenage Girls

Before the intervention, there was no difference in the average score of teenage girls' nutrition knowledge between the intervention group and the control group (35.26 vs 48.71). After the intervention, the knowledge score increased by 44.33 points (p=0.000) in the intervention group, while the control group only increased the knowledge score by 14.78 points (p=0.000).

Before the intervention, there was no difference in the average score of teenage girls' nutritional attitudes between the intervention group and the control group (62.67 vs 62.20). After the intervention, there was an increase in attitude scores in both treatment groups. However, the increase in the average attitude score in the intervention group was greater than in the control group (9.8 vs 8.36).

Table 7 Test Results for Differences in Knowledge and Attitude Scores Between Groups when Before and After Intervention

Variable	Score	Intervention	Control	P-value
Knowledge	*Pretest*	35.26	48.71	0.000
	Posttest	80.59	63.49	0.000
Attitude	*Pretest*	62.67	62.20	0.755
	Posttest	72.47	70.56	0.411

Table 8 Pre-PostTest Difference Test Results Knowledge and Attitude Scores Between Treatment Groups

Variable	Intervention				Control			
	Pre	Post	Difference	P-value	Pre	Post	Difference	P-value
KNOWLEDGE								
Average	35.26	80.59	45.33	0.000	48.71	63.49	14.78	0.000
Lowest	16.00	58.00			16.00	33.00		
Highest	75.00	95.00			75.00	91.00		
ATTITUDE								
Average	62.67	72.47	9.8	0.000	62.20	70.56	8.36	0.000
Lowest	46.00	59.00			46.00	56.00		
Highest	79.00	86.00			84.00	87.00		

Table 9 Test Results for Differences in Hb Levels (g/dL) Between Treatment Groups Before and After Intervention

Variable	Score	Intervention	Control	P-value
Hb Levels (g/dL)	*Pretest*	11.02	11.01	0.986
	Posttest	12.08	11.75	0.051

Table 10 Pre-PostTest Difference Test Results for Hb Levels (g/dL) between Treatment Groups

Variable	Intervention				Control			
	Pre	Post	Difference	p-value	Pre	Post	Difference	p-value
Average	11.02	12.08	1.06	0.000	11.01	11.75	0.74	0.000
Lowest	8.20	10.00			8.60	7.00		
Highest	11.90	13.00			11.90	18.00		

Teenage Girls Hemoglobin (Hb) Levels

Before the intervention, there was a significant difference in the average Hb level between the intervention group and the control group (p=0.986), whereas the Hb level in the intervention group and the control group (11.02g/dL vs 11.01g/dL). After 6 weeks of intervention, both treatment groups experienced an average increase in Hb levels, but the average increase in Hb levels was much greater in the intervention group than in the control group (12.08 g/dL vs 11.75 g/dL).

DISCUSSION

Based on Table 4, it can be seen that there are still quite a high number of anemic teenage girls who experience CED in both interventions (71.4%) and control groups (88.1%). If the nutritional conditions above are not corrected in the long term, they will have a negative impact on teenage girls. The future impact that will occur on teenage girls if they later become pregnant women will have a risk of anemia. This is in line with research conducted on pregnant women who had their pregnancies checked at the Cepiring Public Health Center, Kendal Regency, which showed that CED status was related as a cause and effect to the incidence of anemia in pregnant women (OR 39,000 with CI 95% 3,465 – 438,977) (Sandhi and Wijayanti, 2021).

The CBA model (Anemia Free Club) is a model for tackling anemia in teenage girls which was developed to change eating behavior (food based) by involving a tripartite paradigm (Zuraida, 2020). The tripartite paradigm in the Anemia Free-club model includes nutrition education for teenagers, mothers and teachers which is carried out in schools and focuses on changing the eating behavior of teenage girls, not

just knowledge (Zuraida, 2020). The school environment is one of the external factors that can influence the formation of students' personality attitudes (Yana and Jayanti, 2015). The main task of the teacher is to organize and manage the learning of 29 students, which includes implementing control over the management of learning activities and management of student behavior (including maintaining discipline) (Darmawan, 2018). Teachers as educators are expected to provide direct knowledge to their students, especially young women, about the importance of preventing and treating anemia as early as possible (Fadila and Kurniawati, 2019). The application of the Anemia Free-club model previously carried out in 2020 turned out to be effective in improving iron intake eating behavior and improving blood hemoglobin levels of teenage girls in Bandar Lampung City.

Based on Table 7 and Table 8, it can be seen that the average score of nutritional knowledge of teenage girls in the intervention high school experienced a significant increase after the application of the Anemia Free-club model was carried out when compared to the control high school with different values each (45.33 vs 14.78). Based on the results of this study, it was shown that the application of the Anemia Free-club Model in the form of nutrition education could increase the average score of nutritional knowledge in anemic adolescent girls, especially in the intervention group of high school. The results of this study are in line with the results of a study on anemic students at State Middle School 21 Medan which stated that there was an increase in the mean score from prior knowledge from 62.39 points to 72.31 points after intervention in the form of nutrition education (Silalahio et al., 2016). Based on Table 8, the bivariate analysis test in the form of a paired t-test on the knowledge variable found that there was a significant difference in nutrition knowledge before and after the intervention group of high school with a value of p = 0.000 (p <0.05). The results of this analysis test stated that the application of the Anemia Free-club model could have a significant effect on changes in the nutritional knowledge of anemic teenage girls. The results of this study have similarities with research conducted on female students at State Middle School 31 Semarang City which states that providing nutrition education regarding anemia affects the knowledge of these students (p = 0.000) (Putra et al., 2019). The results of this study were strengthened by the results of research on anemic students at State Middle School 21 Medan which stated that there was a significant correlation between nutrition education conducted on anemic students and their knowledge (p <0.05) (Silalahi et al., 2016). The results of this study were also reinforced by the results of a similar study in the application of the previous Anemia Free-club model which was conducted on high school students in Bandar Lampung City which stated that there was a significant difference in the intervention group on changes in knowledge (p <0.001) but there was no significant correlation in the control group on changes in knowledge. (p=0.107) (Zuraida et al., 2020a).

Based on Table 7 and Table 8, it can be seen that the average score of the nutritional attitude of the teenage girls in the intervention high school experienced a greater increase after the application of the Anemia Free-club model when compared to the control group of high school with different values each (9.8 vs 8.36). Based on Table 8, the bivariate analysis test in the form of a paired t-test on the attitude variable found that there were significant differences in nutritional attitudes before and after the intervention was given by implementing the Anemia Free-club model in the intervention group of senior high school with a value of p<0.000 (p<0.05). Based on the results of this study, it showed that the application of the Anemia Free-club Model in the form of nutrition education can improve nutritional attitudes in anemic young women. The results of this study have similarities with research conducted on high school teenage girls in Bandar Lampung with the Anemia Free Club (CBA) model of nutrition education which states that there is a significant correlation between high school teenage girls who are given interventions to change attitudes (p=0.019) (Zuraida et al ., 2020b). The results of this study were strengthened by the results of research on anemic teenage girls at State Middle School 31 Semarang City, it was found that before being given nutrition education, 51.9% of students had an unsupportive attitude, after being given nutrition education, 77.8% of students had a supportive attitude and there significant correlation between nutrition education carried out on anemic female students and changes in attitude (p = 0.000) (Putra et al., 2019).

Based on Table 9 and Table 10, it can be seen that the average Hb level of teenage girls in the intervention high school experienced a greater increase after the application of the Anemia Free-club model when compared to the control group of high school with different values each (1.06 vs 0.74). Based on the results of this analysis, it showed that the application of the Anemia Free-club model in the form of nutrition education, and the role of mothers and teachers can increase Hb levels in anemic teenage girls. Nutrition education has an effect on increasing the nutritional knowledge and attitudes of teenage girls so that it will improve intake behavior. The roles of teachers and mothers, which are an integral part of the tripartite paradigm, are aimed at monitoring the eating and consumption of blood supplementary tablets in anemic teenage girls.

The mother's role in regulating eating can take the form of providing high-iron foods and watching over anemic teenage girls' meals at home. In order to encourage the consumption of high iron intake and to keep an eye on the food of anemic young women at school, the teacher's role in regulating the eating of anemic teenage girl takes the interactive communication in peer groups. The condition of teenage girls with anemia will be directly improved by increasing iron intake, or Hb levels in anemic young women will rise. The results of the research related to the role of the mother by increasing food intake have in common with research conducted on teenage girls in the Working Area of the Ngemplak Simongan Public Health Center showing the results of the chi-square test obtained a p-value of 0.026 which means there is a significant correlation between maternal support and eating behavior in preventing anemia in teenage girls (Setyowati et al., 2017). The results of the research related to the teacher's role in increasing food intake have in common with research conducted on students at State Elementary School 2 Merjosari, State Elementary School 3 Merjosari and State Elementary School 5 Merjosari regarding the role of nutrition education for teachers in increasing the intake of vegetables and fruit for school children showing that there are significant differences. significant student fruit intake, both in terms of portion and frequency of meals (p<0.05) and there was a significant difference in the number of student nutrients (vitamin A, vitamin C, vitamin B1, and calcium) (p<0.05) (Silalahi et al. ., 2018).

The giving of blood supplementary tablets in research is intended to complement the prevention and control of anemia in teenage girls in addition to the application of the Anemia Free-club model. The Indonesian government has established a program policy for administering iron tablets to teenage girls and women reproductive age with a preventive dose by giving one blood supplement tablet every week for 52

(fifty two) weeks (Republic of Indonesia Ministry of Health, 2020). Administration of blood supplementary tablets in research refers to one scientific source that the mechanism for administering blood supplementary tablets can be given 1 tablet every week and 1 tablet every day during menstruation (Taufiqa et al., 2020). The application of the Anemia Free-club model and administration of blood supplementary is intended to increase Hb levels in anemic teenage girls so that they can change their anemia status. The results of the study are in line with the link between nutrition education as an Anemia Free-club model and the giving of iron supplements on increasing hemoglobin levels, namely in research conducted on female students of public high schools in Mamuju, which stated that students who received the intervention had an average increase in Hb levels of 0,93 g/dL (p value<0,001) (Ahmady et al., 2016).

Giving blood supplementary tablets needs to involve the role of teachers and mothers in terms of monitoring their consumption. Monitoring the consumption of iron tablets by mothers and teachers will increase the adherence of anemic teenage girls to the consumption of iron supplements given. These results can be seen from the good control card in the intervention group of senior high school, it was found that iron supplement consumption was reached at 100%. The results of this study have similarities with research conducted on female students in Depok City, showing that the role of parents was closely related to adherence to taking iron folate tablets for female students (Apriningsih et al, 2019). The results of this study were strengthened by the results of research conducted on Middle School students in Bogor City which showed that the teacher's role was a determining factor in female students' drinking iron supplements adherence (Nuradhiani et al., 2017).

Based on Table 10, the bivariate analysis test in the form of a paired t-test on the Hb level variable found that there was a significant difference in Hb levels before and after being given the Anemia Free-club model intervention and administration of high blood pressure in the intervention group of senior high school with a p-value = 0,000 (p <0,05). The results of this analysis showed that the application of the Anemia Free-club model and administration of blood supplementary tablets increased hemoglobin (Hb) levels in anemic teenage girls. The results of this study are in line with the results of a study on female high school students in Bandar Lampung from the results of the Chi-Square test showing a statistically significant effect of implementing the Anemia Free-club Model nutrition education on increasing blood hemoglobin levels of teenage girls in the intervention group (p = 0,004) (Zuraida et al., 2020a). However, the results of this study are not in line with a study conducted on anemic students aged 16-17 in secondary schools from 4 schools in Tenah Merah Malaysia showing that no significant difference in hemoglobin levels was noted between the 4 groups either the control or the control group. the intervention group was given nutrition education or and given iron tablets to students who were anemic (p = 0.06) (Yusoff et al, 2012).

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and discussion, it can be concluded that the level of nutritional knowledge of anemic teenage girls in senior high schools in Tanjung Sari District, South Lampung Regency before the intervention of the CBA model, the average score of nutritional knowledge of adolescent girls at the intervention school was 35.26 and after the intervention, the average score was obtained and the average of school knowledge was 80.59 (or an increase of 45.33 points). The nutritional attitude level of anemic teenage girls in high schools of Tanjung Sari District, South Lampung Regency before the intervention of the CBA model, the average score of the nutritional attitude of teenage girls at the intervention school was 62.67. After the intervention, the average attitude score became 72.47 (or an increase of 9.8 points). The Hb level of anemic adolescent girls at high school in Tanjung Sari District, South Lampung Regency before the CBA model intervention, the average Hb score for the intervention school girls was 11.02. After the intervention, the average Hb score was 12.08 (or an increase of 1.06 points).

The researcher's advice for policymakers such as Public Health Centre is to carry out routine screening in collaboration with the School Health Unit and follow up on the program so that it can be applied in schools by actively involving the role of schools. For schools to support the provision of TOT for teachers who will play a role as companions for anemic young women at school. In addition, the formation of peer counselors for teenage girls is an alternative to being a motivator or supporting factor for intake behavior for anemic young women. For other researchers, they can make other innovations or other interventions in the approach to preventing and overcoming anemia in teenage girls.

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Availability of Data and Materials

The datasets supporting the conclusions of the study are included in the article. Any additional data will be available on request. The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Conflict of Interest Statement

Authors declared there is no conflict of interest.

Authors' Contributions

RZ: conceptualized, managed the dataset, analyze the data, performed the analysis, and wrote the script, S: synthesized the analysis, interpreted findings and assisted in writing, reviewing, and editing, DIA: assisted to interpret and outline the findings with wirting, supervised the work, reviewing, and editing, BAP: assisted in writing, designed the figures, WG and CA: data collection, reviewing, and editing, Z: reviewing, and editing. All authors read and approved the final manuscript.

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