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The Effect of Anemia Free Club Interventions to Improve Adolescent Dietary Intakes in Bandar Lampung City, Indonesia

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Abstract

BACKGROUND: Many adolescent girls had a lack of nutrients in daily food consumption. This condition will cause one of the health problems is anemia.

AIM: This study was performed to determine the effect of anemia free club interventions to improve adolescent dietary intakes in Bandar Lampung City, Indonesia.

METHODS: A quasi-experimental study was conducted to assess the effect of anemia free club interventions and dietary iron intakes among adolescent school girls. The study was conducted at Bandar Lampung City, Indonesia. The sample size included 102 participants of senior high school girls in Bandar Lampung City, consisting of 55 participants for intervention group and 47 participants for control group. Nutrition education based anemia free club sessions for 12 weeks as the intervention group, while the control group did not. The sampling technique is proportional random sampling. Data collected consisted of dietary iron intakes (food recall), nutritional status (body mass index/age), and anemia (cyanmethemoglobin). A paired sample t-test analysis was done to check the association between each independent variable with the group variable (intervention and control). The analysis was done with a 95% confidence interval. $p < 0.05$ was set as the cutoff value for statistical significance. Data were collected and analyzed by Statistical Package for the Social Sciences version 20.0 program.

RESULTS: This study found the effect of anemia free club interventions on increasing calories, iron, protein, fat, animal protein, vegetable protein, vegetable, and fruit intakes before and after the intervention ($p < 0.05$). However, there was no effect of anemia free club interventions on increasing carbohydrate intake in grams and portions before and after the intervention ($p > 0.05$).

CONCLUSION: This analysis confirmed an effect of anemia free club interventions to increasing calories, iron, protein, fat, animal protein, vegetable protein, vegetable, and fruit intakes among adolescent school girls.

Introduction

One of the global nutritional problems among female adolescents aged 15–19 years is nutritional anemia [1]. The prevalence of anemia based on the World Health Organization was 29.4%. In South East Asians, the prevalence of anemia it was 41.9%. Indonesia is one of the Southeast Asia countries that had nutritional anemia. Anemia prevalence is 22.7% or an estimated 7.5 million cases of iron deficiency anemia [2]. An estimated 25.9% anemia prevalence known at Lampung Province that's one of the provinces in Indonesia had higher anemia prevalence than the national prevalence [3].

Many adolescent girls had a lack of nutrients in daily food consumption. Iron deficiency is considered the most common cause of anemia globally, but some other malnutrition (including folate, iron, and vitamin of B12 and A), acute and chronic inflammation, and parasitic infections can cause anemia. Malnutrition life cycle, if it is not prevented, will result in more severe consequences [4], [5].

Adolescent girls are one group that is an occurrence of anemia. Since, at that time, adolescent girls have menstruation and also have a low level of knowledge about anemia. When adolescent girls have menstruation which is the first time, they need it more iron to replace the loss due to menstruation. The amount of iron loss during one menstrual cycle (around 28 days) approximately 0.56 mg/day. This amount is added by a basal loss of 0.8 mg/day, so the number of total iron loss of 1.36 mg/day [6].

Adolescent girls, in general, have characteristics of unhealthy eating habits. Among others, the habit of not eating breakfast, lazy drinking of water, and unhealthy diet because want to slim (ignoring sources of protein, carbohydrates, vitamins, and minerals), snacking habits low-nutrition foods, and fast foods. So that adolescent girls are unable to fulfill the diversity of food substances needed by their bodies for the process of hemoglobin (Hb) synthesis formation.

If this happens for a long time, Hb levels will continue to decrease and cause anemia [7].

The alternative solution for the reduction of iron deficiency anemia among adolescent school girls is anemia free club. This intervention has three major components that affect adolescent school girls are peer-group, teacher, and mother (tripartite paradigm). There is no model for treating anemia in adolescent school girls who use the tripartite paradigm and by maximizing the role of mothers as supervisors at home eating and teachers as facilitators.

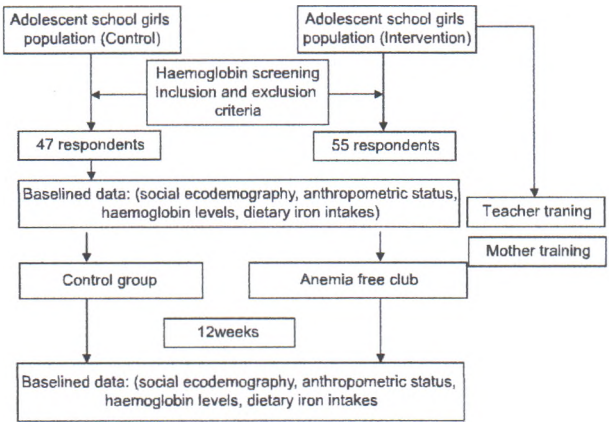

Figure 1: Research procedure

Methods

Study design and research sample

A quasi-experimental study was conducted to assess the effect of anemia free club interventions and dietary iron intakes among adolescent school girls. The study was conducted at Bandar Lampung City, Indonesia. The sample size included 102 participants of senior high school girls in Bandar Lampung City, consisting of 55 participants for intervention group and 47 participants for control group. Nutrition education based anemia free club sessions for 12 weeks as the intervention group, while the control group did not. The sampling technique is proportional random sampling. Inclusion criteria: (a) Menarche, (b) not pregnant, (c) no history of chronic diseases or infections or blood disorders (tuberculosis, malaria, thalassemia, leukemia, and aplastic anemia), (d) not alcohol and/or drugs and smoking consumption, and (e) not taking a similar multivitamin-mineral supplement.

Operational definitions

The variables of this study included that the independent variable was nutrition education based anemia free club and the dependent variable was dietary iron intakes among adolescent school girls.

Research procedure

This research procedure is shown in Figure 1.

Data collection technique

Data were collected using a pre-tested structured questionnaire. The questionnaire had sociodemographic characteristics, anthropometric status, Hb levels, and dietary iron intakes by food-frequency. Those school adolescent girls who were absent at the time of data collection were followed and recontacted for the next add 1–2 days to include in this study. Three diploma nutrition were recruited and trained for data collection. Informed consent was prepared to protect respondents and researchers when carrying out research. This study was approved by the Ethics Commission of the Faculty of Medicine, Universitas Lampung with No: 4489A/UN26.8/DL/2017. The intervention group attended nutrition education-based anemia free club sessions for 12 weeks. This model develops the teacher's role in how to provide information regarding the importance of efforts to prevent iron deficiency anemia and monitor adolescent health. Mothers are given information on how to prepare good food containing iron and prepare it based on serving sizes, compile menus according to nutritional needs, and assess nutritional status by anthropometric methods (body mass index/age). During the 12 weeks of the implementation phase of this model, the teacher was selected and the female adolescent mothers played their respective roles. The teacher as a facilitator and the mother as a companion eat rheumatism at home. Adolescent girls will get nutrition education related to efforts to prevent iron deficiency anemia. Before and after the intervention program, dietary iron intakes were filled out for both groups.

Data analysis

Data were checked, cleaned, coded, and entered using Statistical Package for the Social Sciences version 20.0 statistical software for analysis. Descriptive statistics such as frequencies, proportions, and standard deviation were done to describe data. A paired sample t-test analysis was done to check the association between each independent variable with the group variable (intervention and control). The analysis was done with a 95% confidence interval. $p < 0.05$ was set as the cutoff value for statistical significance.

Results

Characteristic of respondents is shown in Table 1.

Table 1 known the mean of adolescent girl's age in high school in the intervention group was

Table 1: Characteristic of respondents

Characteristic	Intervention	Control
Age (years), mean (min-max)		
Menstrual period (days), mean (min-max)	15.1 (13.9–16.3)	15.3 (14.1–17.0)
Religion, f (%)	6.5 (3.0–12.0)	6.4 (3.0–11.0)
Islam	54 (98.18)	43 (91.49)
Christian	1 (1.82)	1 (2.13)
Hinduism	0	3 (6.38)
Ethnicity, f (%)		
Javanese	25 (45.45)	22 (46.81)
Lampung	17 (30.91)	14 (29.79)
Palembang	6 (10.91)	2 (4.26)
Sundanese	3 (5.45)	3 (6.38)
Batak	1 (1.82)	2 (4.26)
Bali	0	3 (6.38)
Others	3 (5.45)	1 (2.13
Father's education, f (%)		
Elementary	0	1 (2.13)
Senior high school	19 (34.55)	24 (51.06)
Undergraduate school	27 (49.09)	15 (31.91)
Graduate school	8 (14.55)	5 (10.64)
Doctoral	0	1 (2.13)
Mother's education, f (%)		
Elementary	1 (1.82)	1 (2.13)
Junior high school	1 (1.82)	1 (2.13)
Senior high school	19 (34.55)	21 (44.68)
Undergraduate school	26 (47.27)	19 (40.43)
Graduate school	6 (10.91)	5 (10.64)
Father's occupation, f (%)		
Civil servant	15 (27.27)	15 (31.91)
Laborer	1 (1.82)	1 (2.13)
Farmer	0	1 (2.13)
Service officer	1 (1.82)	1 (2.13)
Trader	2 (3.64)	6 (12.77)
Entrepreneur	30 (54.55)	21 (44.68)
Others	4 (7.27)	2 (4.26)
Mother's occupation, f (%)		
Civil servant	14 (25.45)	12 (25.53)
Housewife	27 (49.09)	26 (55.32)
Trader	2 (3.64)	3 (6.38)
Service officer	4 (7.27)	0
Others	7 (12.73)	6 (12.77)
Family income, f (%) [3]		
Low income	0	1 (2.13)
Middle income	55 (100.00)	46 (97.87)

15.1 years with a mean of the menstrual period was 6.5 days. While the mean of adolescent girl's age in high school in the control group is 15.3 years, and the mean of the menstrual period was 6.4 days. The characteristics of religion and ethnicity in both control and intervention are similar to those dominated by Islam and are dominated by Javanese and Lampung ethnicity. For parental education, most of the father's and mother's education in the intervention group is graduate school, in contrast to the control group is high school. The father's occupation is dominated by entrepreneurs and civil servants both in two groups. Most of the respondent's mothers were housewives in both two groups. Most family income in the intervention group is in the middle-income category (>5 million–10 million rupiah), while in the control group is mostly low (0–5 million rupiah).

Nutritional status of respondents is shown in Table 2.

Table 2: Nutritional status

Nutritional status	Intervention	Control
Nutritional status (body mass index), f (%) [3]		
Underweight	22 (40.00)	17 (36.17)
Normal	23 (41.82)	25 (53.19)
Overweight	8 (14.55)	1 (2.13)
Obese 1	1 (1.82)	4 (8.51)
Obese 2	1 (1.82)	0
Chronic energy deficiency, f (%) [3]		
Chronic energy deficiency	34 (61.82)	29 (61.70)
Normal	21 (38.18)	18 (38.30)
Anemia level, f (%) [3]		
Moderate (Hb: 8.0–10.0 g/dl)	14 (25.45)	4 (8.51)
Low (Hb: 10.1–119 g/dl)	41 (74.55)	43 (91.49)

Table 2 known less than half of respondents in the intervention and control group had nutritional status based on body mass index with classified underweight and normal. Adolescents, girls with chronic energy deficiency both in the intervention and control group, were similar to 61.82% and 61.70%. Anemia level respondents with moderate were 25.45% in the intervention group and 8.52 in the control group.

Dietary intakes among adolescent school girls between intervention and control group before and after the intervention (Table 3). Mean score difference of knowledge and attitude between intervention and control group (Table 4).

Table 3 known that there were differences in calorie, iron, protein, fat, animal protein, vegetable, and fruit intake after intervention in both groups ($p < 0.05$). However, there were no differences in carbohydrate intake in grams and portions and vegetable protein after intervention in both groups ($p > 0.05$).

Table 4 known the effect of anemia free club interventions on increasing calories, iron, protein, fat, animal protein, vegetable protein, vegetable, and fruit intakes before and after the intervention ($p < 0.05$). However, there was no effect of anemia free club interventions on increasing carbohydrate intake in grams and portions before and after the intervention ($p > 0.05$).

Discussion

The results of this study revealed the effect of anemia free club interventions on increasing calories,

Table 3: Dietary intakes among adolescent school girls between intervention and control group before and after the intervention

Daily intakes	Intervention	Control	p-value
Calories (kcal)			
Pre-test	1724.00	1764.60	0.657
Post-test	2037.00	1698.70	<0.001*
Iron (mg)			
Pre-test	10.46	10.34	0.886
Post-test	19.74	15.58	<0.001*
Carbohydrate (g)			
Pre-test	207.27	219.16	0.371
Post-test	210.46	199.76	0.400
Protein (g)			
Pre-test	49.39	45.39	0.232
Post-test	57.30	41.17	<0.001*
Fat (g)			
Pre-test	74.90	78.49	0.547
Post-test	107.34	77.27	<0.001*
Carbohydrate (portion)			
Pre-test	4.43	4.42	0.973
Post-test	4.15	4.06	0.744
Animal protein (portion)			
Pre-test	2.19	1.94	0.316
Post-test	3.75	2.12	<0.001*
Vegetable protein (portion)			
Pre-test	0.87	1.18	0.133
Post-test	1.48	1.12	0.053
Vegetable (portion)			
Pre-test	0.43	0.47	0.664
Post-test	1.39	0.52	<0.001*
Fruits (Porsi)			
Pre-test	1.50	1.01	0.063
Post-test	1.97	0.91	<0.001*

*Significant, p<0.001, **Significant, p<0.05.

Table 4: Mean score difference of knowledge and attitude between intervention and control group

Variables	Intervention				Control			
	Pre	Post	Δ	p-value	Pre	Post	Δ	p-value
Calories (kcal)								
Mean	1724.00	2037.00	313.02	<0.001	1764.60	1698.70	−65.89	0.340
Min	754.29	1234.45			1008.19	839.08		
Max	3288.37	2981.39			3038.48	3219.41		
Iron (mg)								
Mean	10.46	19.74	9.28	<0.001	10.34	15.58	5.24	<0.001
Min	4.46	13.90			3.30	5.04		
Max	21.30	24.67			23.21	30.23		
Carbohydrate (g)								
Mean	207.27	210.46	3.19	0.641	219.16	199.76	−19.40	0.129
Min	38.36	139.28			96.13	0.00		
Max	363.78	311.28			424.44	489.91		
Protein (g)								
Mean	49.39	57.30	7.91	0.003	45.39	41.17	−4.21	0.148
Min	20.77	4.99			19.69	0.00		
Max	120.05	83.87			80.81	72.86		
Fat (g)								
Mean	74.90	107.34	32.44	<0.001	78.49	77.27	−1.22	0.834
Min	37.04	41.52			27.07	0.00		
Max	221.03	156.50			182.74	187.40		
Carbohydrate (portion)								
Rata-rata	4.43	4.15	−0.28	0.100	4.42	4.06	−0.36	0.194
Terendah	0.59	1.77			0.96	0.63		
Tertinggi	7.64	6.43			9.48	9.57		
Animal protein (portion)								
Mean	2.19	3.75	1.55	<0.001	1.94	2.12	0.18	0.383
Min	0.38	2.29			0.54	0.51		
Max	8.87	6.14			5.01	4.54		
Vegetable protein (portion)								
Mean	0.87	1.48	0.61	<0.001	1.18	1.12	−0.06	0.745
Min	0.00	0.32			0.05	0.00		
Max	4.04	4.00			5.36	5.00		
Vegetable (portion)								
Mean	0.43	1.39	0.96	<0.001	0.47	0.52	0.06	0.469
Min	0.01	0.44			0.00	0.00		
Max	2.34	4.24			2.02	2.69		
Fruit (portion)								
Mean	1.50	1.97	0.47	0.025	1.01	0.91	−0.10	0.376
Min	0.00	0.32			0.00	0.00		
Max	7.26	4.55			3.02	2.84		

*Significant, p<0.001, **significant, p<0.05.

iron, protein, fat, animal protein, vegetable protein, vegetable and fruit intakes before and after the intervention. However, there was no effect of anemia free club interventions on increasing carbohydrate intake in grams and portions before and after the intervention.

The previous study found that the nutritional education approach given to students through empowering teachers in schools could change the dietary intake of students [8]. Another study revealed that appropriate nutrition education interventions can change nutrition and good lifestyle behaviors [9]. The study also stated that nutritional interventions in the form of nutrition education and healthy eating promotion and proper healthy lifestyles can increase the consumption of vegetables and fruits after they know and understand the benefits.

Food serves to maintain the health of the body through the benefits of nutrients contained in it. Quality of arrangement good food and the amount of food that should be eaten will affect optimal body health [7]. Energy is a source of erythrocyte formation, while Hb is part of erythrocytes so that when energy intake is lacking will cause a decrease in erythrocyte formation and result in decreased Hb levels [10]. Sources of animal protein are a source of heme iron. Heme is easier to absorb than non-heme. Low energy intake can worsen the incidence of anemia. Conversely, a lot of fiber intake contributes to anemia in adolescents. Fiber is inside vegetables and cereals contain high phytic acid as an iron inhibitor in the diet, then affect Hb levels [8], [11], [12].

Adolescent girls have many activities, such as school from morning to afternoon, followed by extracurricular activities until the afternoon, not to mention if there are additional lessons or activities. All these activities make them not have time to eat, let alone think about the composition and nutritional content of the food that enters the body, as a result of adolescents often feel exhausted, weak, and powerless. However, the condition of fatigue can also be caused anemia or lack of blood [11].

Adolescent girls with heavy menstrual bleeding are at high risk for anemia. Heavy menstruation in adolescents not only has a negative effect on the quality of life-related to health and school attendance but also health implications such as iron anemia deficiency [6], [11].

Many factors influence anemia in adolescents such as nutrient intake, activity, menstrual patterns, knowledge, and attitude for anemia. Iron deficiency anemia has an impact on adolescent girls, including fatigue, decreased endurance against infectious diseases, and decreased physical fitness. Adolescents girls are prone to anemia because in addition to occurring menarche and menstrual irregularities [13]. The wrong diet and the influence of association because you want to slim down and diet tight, causing the weight to drop. Consuming foods with balanced nutrition will provide enough energy; on the contrary, it will result in decreased brain ability, and decreased enthusiasm for adolescents in learning. Fear of rising body weight and irregular eating habits causes adolescent anemia [14], [15].

Overall, nutrition education for students in schools related to anemia programs through teacher empowerment has good potential to change healthy lifestyles with balanced nutrition in adolescent school girls in Indonesia. Therefore, it is strongly recommended that the learning and delivery of material about anemia and nutrition in high school need to contain the right message and update according to the knowledge needs for repatriates and bring the increasing dietary iron intakes to prevent anemia.

Conclusion

This analysis confirmed the effect of anemia free club interventions on increasing calories, iron, protein, fat, animal protein, vegetable protein, vegetable, and fruit intakes before and after the intervention. The results of this study recommend the need to reduce iron deficiency anemia by implementing anemia free club interventions that treating anemia in adolescent school girls by maximizing the role of mothers as supervisors at home eating and teachers as facilitators.

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