



Health education to prevent anemia among adolescents in Samarinda, Indonesia

Ratih Wirapuspita Wisnuwardani, Shelia Wulandari, Annisa Dwi Kartika

Faculty of Public Health, Universitas Mulawarman, Samarinda, Indonesia
Jl. Kuaro, Gn. Kelua, Samarinda, 75119, Indonesia

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ABSTRACT

Health cadres play a vital role as community educators and frontline workers in the stunting handling. Iron deficiency anemia disrupts the concentration of adolescent girls; reduce their academic achievement, productivity, and physical strength and increases the risk of infection. The nutrition education program about anemia is needed to increase nutritional awareness among students. This community service aim was to evaluate the effectiveness of nutrition education among female students of High School in Samarinda, East Kalimantan, Indonesia. There were two interventions: health education using video among 128 students in in high school and health education using leaflet among 11 students in the boarding school. A pretest/posttest was conducted to evaluate the knowledge about anemia. Independent sample t-test was used to compare difference between the before and after interventions. Health educations of using video or leaflet increased students' anemia knowledge. A school health program could improve student' anemia knowledge. It is very important for school to have collaboration with primary health center, university and other institutions for the health education program. Including nutrition education program to the curriculum of high school is important to prevent malnutrition among female adolescents.

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1. INTRODUCTION

Adolescents (aged 10 to 19 years) is a critical age period since health during adolescence might affect the risk of adult non-communicable diseases. Therefore, health intervention among adolescents can have a positive effect. Nutrition education is the essential program to prevent the malnutrition (Schembri et al., 2016). The knowledge about proper nutrition and balanced diet during adolescence is very important to prevent malnutrition as adolescence is a critical period that can affect adult's chronic disease (Biro & Wien, 2010). Therefore, dietary intake during adolescence may indicate adult lifestyle and health (Wisnuwardani et al., 2018). Inadequate diet during adolescence can lead to malnutrition such as anemia.

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Iron deficiency is the most prevalent nutrition deficiency in the world that contribute to at least half of global burden anemia. Iron deficiency is the most major cause of anemia (McLean et al., 2009). The major causes of iron deficiency include inadequate dietary iron intake (due to the consumption of a diet with a low overall or bioavailable iron content); increased losses of iron due to chronic blood loss (in women, due to menstruation and exacerbated in cases of heavier menstrual bleeding, and by intestinal hookworm infection in individuals living in endemic settings and increasing iron requirements (e.g; during growth or pregnancy) (Low et al., 2016).

Anemia decreases the concentration of female adolescents, productivity, their educational success and increase the risk of infection (Abu-Baker et al., 2021). Approximately, one out of six people affected anemia are adolescents (WHO, 2018). In Indonesia, anemia among adolescents is a moderate public health problem as 23% female adolescents (13-18 years olds) are anemia (Indonesia Ministry of Health, 2013). The prevalence of anemia among Indonesian adolescents increases in 2018 (32%) (Indonesian Ministry of Health, 2018). Iron supplementations are a commonly used to prevent anemia. However, the lowest province of iron suppelementation coverage among female adolescents in Indonesia is East Kalimantan (7.8%) (Indonesian Ministry of Health, 2018). Primary health centre (Puskesmas) Wonorejo is one of primary health centre in East Kalimantan has 20% anemia among female adolescents. Other primary health centre in East Kalimantan, Puskesmas Samarinda Kota also has a problem about non-compliance in consuming iron supplement tables in female high school students. Some of schools don't have nutrition program to educate the students about balanced diet.

Nutrition education reduces the prevalence of anemia in European, North American, Asian and Autralian countries (Sunuwar et al., 2019). In addition, nutrition program in schools was suggested as an appropriate intervention to increase nutritional awareness (Xu et al., 2020). Therefore, this community service used a nutrition education program as intervention to increase the nutritional knowledge among female high school students in Puskesmas Wonorejo and Puskesmas Samarinda Kota, East Kalimantan, Indonesia.

2. METHODS

Location

There were two locations of community services, Boaring School in the coverage of Puskesmas Wonorejo and high school in the coverage of Puskesmas Samarinda Kota. Both of cities were in Samarinda, East Kalimantan (Figure 1).



Figure 1. The activity location was 5-8 km from Faculty of Public Health, Universitas Mulawarman

Tools and Materials

Preparation stage

This activity was begun with problem identification. Discussion with the health officers in Puskesmas Wonorejo and Puskesmas Samarinda Kota, East Kalimantan and using the secondary data were the first step to do in this community service.

After that, we chose the priority issue, determining the cause of the problem and problem solution with the teachers, health officers, high school students and community. Detail of the preparation stage was discussed below:

Problems identification

Based on observation and secondary data, there were 4 problems in Puskesmas Wonorejo and Puskesmas Samarinda Kota: (1) The prevalence of anemia among adolescents was high, ex. 20% in Puskesmas Wonorejo in 2022; (2) Low consumption of iron supplementation among adolescents; (3) Inadequate knowledge and skill of posyandu's cadres about antropometri measurement (d) there were other malnutrition in children, such as underweight and wasting.



Figure 2. Discussion with health officer and teachers

Priority issues

Using Urgency, Seriousness, Growth (USG) method, the high prevalence of anemia among adolescents was chosen as the priority issues. The choosing the priority issues was discussed with nutritionists of Puskesmas Wonorejo and Puskesmas Samarinda Kota.

Determining the cause of the problem

Using the fishbone method, there are 5 main of the causes of high prevalence of anemia (Figure 2): (1) Few human resources in Puskesmas so lack of anemia socialization; (2) Uneven distribution of iron supplementation due to few human resources; (3) Lack of media information about anemia; (4) Lack of healthy life style programs at schools; and (5) Low socio-economic characteristics of students.

There were some of problem solution alternatives to solve low knowledge of anemia: (1) Nutrition education program to socialize the healthy lifestyle and balanced nutrients among high school students; (2) Coordination and advocacy to the head of schools for healthy lifestyle programs at schools; (3) Healthy menu at school restaurants. CARL (capability, accessibility, readiness leverage) method was used to choose the problem solving priority. The socialization of healthy lifestyle and balanced nutrients among high school students was chosen as the program.

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Figure 3. Presentation material in the health education

3. RESULTS AND DISCUSSION

The program was Anemia Education Program among female high school students (Figure 5). The material of program were: (1) the definition of anemia. The material were the difference anemia and low blood pressure and the definition of anemia; (2) Anemia symptoms. The speaker discussed "Is weakness and fatigue a symptom of anemia?" in the program; (3) Cause of anemia. Micronutrient deficiency and infections was discussed by speaker as the main cause of anemia; (4) Iron supplementation. The speaker presented the importance of iron supplement consumption, especially during menstruation among female adolescents; (5) Healthy eating behaviors. Balaced nutrition was discussed by speaker with the picture of "ISI PIRINGKU"; and (6) Prevention of anemia. Healthy behaviors and supplementation were discussed by speaker to prevent anemia.



Figure 4. Anemia Education Programs with leaflet in Islamic boarding school (11 students) and with video in SMK 7 Samarinda

The aim of program was to improve knowledge of healthy life style, balanced diet and anemia among female high school students in the coverage area of Puskesmas Wonorejo and Puskesmas Samarinda Kota. This program was held to prevent anemia among adolescents. Anemia education programs was conducted in Islamic boarding school in the coverage area of Puskesmas Wonorejo (14 December 2022) and SMKN 7 in the coverage of Puskesmas Samarinda Kota (1 December 2022). There were several activity during anemia education programs in both Puskesmas: (1) Participants answered pre test; (2) Anemia education programs were used video in high school and leaflet in islamic boarding school; (3) Discussion for answer and question sessions. Participants asked wome questions to speaker; and (4) Participants answered post test Material. The speakers designed video and leaflet to present in anemia education programs. For video, LCD was used in the intervention. The presentation with ppt (power point) was used also in both Puskesmas, to discuss about the *isi piringku* or eating behaviours, and iron supplementation. The importance of consumption protein, iron, zink, asam folat and vitamin C to prevent anemia were explained to the high school students. Insufficient consumption of nutrients and infection were the main cause in anemia. Therefore, other healthy behaviors such as physical activity, and hygiene (washing hand) were explained in the anemia education programs.

The evaluation of nutrition education program used the active participation of female high school students and also analyse the different knowledge before and after intervention. All participants were active in the nutrition education programs. Based on the answer of participants, most of them knew anemia (86%), although they never attend nutrition education programs or other sosialization about anemia (60%).

Before and after nutrition education programs, there were pre test and post test. Data entry was analyzed by software package IBM SPSS version 23 (IBM, New-York, USA) and the level of significance was set at two-side $p < 0.05$. Frequencies, percentage, mean (standard deviation) were calculated under descriptive statistics. No normal distribution was found, alhtought log transformation was applied to fit normality. The difference between knowledge of before and after intervention was tested using Wilcoxon test.

Increasing knowledge about anemia was found in both anemia education programs in both schools (table 1). Using leaflet in small group and using video in big group participants increased the knowledge of participants. After post test, all participants consumed iron supplementation together (Figure 6).

Table 1. Increasing knowledge after nutrition education programs

Media	Anemia Education Program				P-value*
	Before intervention		After intervention		
	Median	Range (min, max)	Median	Range (min, max)	
Using leaflet**	75	50 (35, 85)	80	20 (80, 100)	0.005
Using video***	5	5 (3, 8)	6	4 (4, 8)	<0.001

*Data was tested by wilcoxon test

**the highest score was 100

***the highest score was 8, and the lowest was 4

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Figure 6. The consumption of iron supplementation in anemia education program

The distribution of knowledge participants (before and after nutrition education programs) was described in Table 2.

Table 2. The distribution of knowledge among high school students.

Knowledge of Anemia	True Answer (%)	
	Before Intervention	After Intervention
The definition of anemia	6.3	46.1
Anemia symptoms	50.9	59.4
Cause of anemia	90.6	89.8
Iron supplementation	77	94.5
Healthy eating behaviors	75	81.3
Prevention of anemia	85.9	96.1

All knowledge increased after nutrition education program, except the cause of anemia. The cause of anemia questions had several questions, such as inadequate dietary iron intake (due to the consumption of a diet with a low overall or bioavailable iron content); increased losses of iron due to chronic blood loss (in women, due to menstruation and exacerbated in cases of heavier menstrual bleeding, and by intestinal hookworm infection in individuals living in endemic settings and increasing iron requirements.



Figure 7. Discussion the evaluation program with students

Discussion

This community service program activities by conducting anemia education program have relevance with the urgency of anemia in female adolescents. The routine anemia education programs with leaflet, video and ppt is very importance to increase the knowledge of anemia prevention. Adherence to consumption of iron supplementation among female adolescents will increase as in the of the anemia education program, the female students should consumpt iron supplementation.

Increasing knowledge was found in both anemia education programs in both media (video and leaflet). Anemia education programs in Islamic boarding school and high school were not significant difference, as both of anemia education programs increased the knowledge among female students. In line with community service among adolescent females in Islamic boarding school Purwokerto that increasing reproductive health literacy was found after peer education (Nafisah et al., 2023).

This is also in line with a randomized control study in India that a significant improvement of knowledge was found after intervention (Sharma & Rani, 2016). One of review study also found that nutrition education programs that are delivered face to face and use active learning strategies are positively associated with improvements in nutrition knowledge (Mitchell et al., 2018). Integaration of a nutrition curriculum in the school should be mandatory as it can improve the knowledge of students (Cuerda et al., 2020).

All knowledge increased in this community service except the knowledge of the cause of anemia. There were several questions about the cause of anemia, and the presentation duration was too short to discuss all about anemia. Therefore, the nutrition education program should be the routine agenda in every school, so the speaker can present detail about anemia. The cause of anemia can be discussed in several nutrition education program, so the students will be understand about this. If the students know the causes of anemia, then they will be able to prevent anemia.

The program of Weekly Iron Folic Acid supplementation/WIFAS to adolescent girls is an effective strategy in preventing anemia. However, in Indonesia it is known that only 1.4% adhere to taking WIFAS. Therefore, after nutrition education program, all participants consumed iron supplementation. Similarly with the community health service in Pondok Pesantren Salafiyah Syafi'iyah Sukorejo, Situbondo, that the education of adherence to iron supplementation was given among female high school students as only a half of female students consumed WIFAS (Nurhasanah et al., 2022).

The increasing of iron demand during adolescence is needed priority attention, as young women are a target for the best intervention (Deivita et al., 2021). Early detection of anemia is better to prevent anemia. Although anemia nutrition program can improve the knowledge, daily iron supplementation is needed also. Daily iron supplementation may increase Hb levels and reduce the risk of anemia and iron deficiency anemia (da Silva Lopes et al., 2021). Therefore, anemia nutrition educations, such as socialization of anemia and daily iron supplementation are important in high schools to prevent anemia. Anemia is a major health problem, especially among females in less developed countries (Safiri et al., 2021). However, anemia education programs in Indonesia should focus more on the pathogenetic complexity arising from personal behavior, sociocultural factors, dietary and health patterns, local community and ecology (Nadiyah et al., 2020).

4. CONCLUSION AND RECOMMEDATIONS

This community service program is carried out in partnership with Puskesmas Wonorejo, Puskesmas Samarinda Kota and Faculty of Public Health, Universitas Mulawarman. The implementation of program is divided into 3 stages: preparation (problems identification, priority issues, determining

the cause of the problem, and problem solution), implementation and evaluation. The anemia education program was chosen in this community service program. Increasing knowledge was found after the intervention. The nutrition education programs in high schools, such as socialization of anemia can improve the knowledge among female high school students.

Regularly anemia education programs at high schools are important to prevent anemia among female students. Therefore, the nutrition education programs should be scheduled regularly at high schools. This program can support also the Indonesia government that female adolescents should consume WIFAS, as after the intervention, students will consume WIFAS together. The nutrition education programs can be held with the collaboration between health officers, university and other institutions. Including the anemia education programs to curriculum in high school is important also, so the programs are sustainable. However, teachers should follow some workshops about anemia. The nutrition workshops might have collaboration with education ministry, health ministry and university. The knowledge of cause of anemia was not increasing in this community health service. Therefore, the next community service program should focus to the cause of anemia. The long socialization will be boring for students, so the short and routine nutrition education program will be suitable.

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