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# Knowledge, attitude, and practice towards anemia prevention among female students in Indonesia: a mixed method study

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**ABSTRACT**

Based on the Indonesian national health survey in 2018, the prevalence of anemia in young women aged 15-34 was 48.9%. This study aimed to examine the influence of knowledge and attitude on anemia prevention practice and to identify reasons for not practicing anemia prevention among female high school students in Banjarmasin municipality, Indonesia. A mixed method sequential explanatory was applied for this study. The respondents are 350 female high school students from three senior high schools, chosen purposively for a cross-sectional study and followed by focus group discussion with 15 students and in-depth interviews with three teachers and four health workers. The results revealed that 254 (72.6%) female students had poor practice, 147 (42.0%) had poor attitude, and 169 (48.3 %) had poor knowledge related to iron deficiency anemia (IDA) prevention. Female students in the older age group (17-18 years old) (adjusted odds ratio/AOR 1.88, 95% CI 1.12, 3.16), studying at vocational school (AOR 1.85, 95% CI 1.05, 3.27), good knowledge (AOR 2.52, 95% CI 1.49, 4.26) were significant predictors on iron deficiency anemia (IDA) prevention. The qualitative findings found that the reasons for not practicing anemia prevention include poor knowledge about anemia practice prevention, dislike of iron tablets, and ineffective anemia education program due to poor coordination and communication between health workers and teachers. Effective anemia education programs at schools are needed to enhance students' knowledge related to anemia prevention.



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## 1. INTRODUCTION

World Health Organization (WHO) defines adolescents as people between 10 and 19 years of age [1]. Adolescents are at high risk of developing iron-deficiency anemia due to an increased need for accelerated but poor food intake, high infection rates, worm attacks, early marriage, and pregnancy consequences [2]. Iron deficiency anemia (IDA) is one of the most common nutritional disorders globally [3], [4]. Anemia is a condition when the number of red blood cells and the oxygen-carrying capacity are insufficient to meet all the body's physiologic needs [5]. The IDA-related factors include inadequate iron intake, decreased absorption, and blood loss [6]–[9]. IDA has several adverse health consequences, such as decreased physical capacity, work performance, impaired cognitive performance, behavior, and growth [2]. Iron tablet supplementation is one of the treatments for IDA [10]–[12].

According to the Indonesia National Basic Health Survey (RISKESDAS), in 2013, the prevalence of anemia in young women aged 15-34 was 37.1%, which increased to 48.9% in 2018 [13]. The weekly iron tablet

supplementation program is one approach to solving anemia problems. This program provides iron tablets based on WHO recommendations to prevent IDA among adolescent girls and pregnant women [14]. Indonesia's weekly iron tablet supplementation program started in 2016 and is still running. It was implemented in high schools in Indonesia [15], [16]. However, this program faced major challenges, such as female students' non-compliance with the consumption of iron tablets [13].

We selected Banjarmasin municipality due to the feasibility of research during COVID-19 restrictions in 2020. Based on South Kalimantan provincial health office data in 2018, around 884 female high school students had anemic conditions in Banjarmasin municipality. They measured anemia conditions by checking hemoglobin levels. This number was higher compared to other districts in South Kalimantan province. Therefore, the local government has made several programs to solve this problem, such as routine hemoglobin level checks and iron tablets supplementation for female high school students. The provincial health office implemented regular meetings with the principal of schools or school representatives. These school representatives will help as the communication bridge between the provincial health office and schools. These meetings aimed to deliver information about the weekly iron tablet supplementation program at schools and the importance of the program.

There is limited study related to anemia prevention program evaluation in Indonesia, such as users/students' perspectives about the program given and students' knowledge, attitude, and practice (KAP) on IDA prevention. Therefore, this study was intended to fill those literature gaps. This study aimed i) To examine the influence of knowledge and attitude on anemia prevention practice and ii) To identify reasons for not practicing anemia prevention among female high school students in Banjarmasin, Indonesia. It will be beneficial for us to understand more about the KAP on anemia prevention among female high school students and its challenges. In addition, this study will also benefit the provincial health office, schools, and policymakers by showing some snapshots of the current situation of anemia prevention program implementation at schools and how to improve it.

## 2. RESEARCH METHOD

This study used a theoretical framework of KAP [17]–[19]. The design of this study was a sequential explanatory mixed-method study. In an explanatory sequential design, the first step was to collect and analyze quantitative data. After that, qualitative data collection was performed to complement quantitative findings or give more information [20], [21]. The study was conducted in three high schools in Banjarmasin municipality, South Kalimantan Province, Indonesia. The data were collected from April to May 2020 among 350 female students (15-18 years old). The sample size in this study was 333 participants. Female students who did not agree to participate and did not have smartphones were excluded from this study. Purposive sampling was used to select three high schools with a high prevalence of anemia in Banjarmasin municipality.

The structured questionnaires covered general characteristics, knowledge, attitude, practice on IDA prevention, and reasons for not practicing anemia prevention. The questionnaires are prepared, adopted, and modified from WHO guidelines on anemia, the Indonesian National Guideline on Anemia, various institutional sources, and literature reviews [9], [22]–[28]. Questionnaire validity and reliability were tested with item-objective congruence (IOC), Cronbach's alpha, and KR20 before the data collection. The index of IOC was conducted before the pilot test. The questions with scores equal to or less than 0.5 were revised or deleted accordingly. The reliability score for attitude was 0.752, and the reliability score for knowledge was 0.717.

A cross-sectional study was conducted through an online survey using Google Forms in line with COVID-19 restrictions. A qualitative descriptive study was conducted by focus group discussion among fifteen female students aged 15-18 who were chosen purposively from quantitative study participants. Furthermore, we conducted in-depth interviews with three teachers and four primary health care officers. We performed the descriptive analysis such as frequency, percentage, mean, and standard deviation, followed by multivariable analysis with binary logistic regression. As the data was not normally distributed, we used a median cutoff point to classify practice, knowledge, and attitude into two levels (poor and good). Multivariable analysis with binary logistic regression was performed to identify significant predictors on the dependent variable, with the calculation of adjusted odds ratio (AOR) and p-value <0.05 considered statistically significant. The data were analyzed using the SPSS version 22 software (SPSS Inc., Chicago IL). For a qualitative study, we used thematic analysis to explore female students' perceptions of anemia prevention programs and reasons for not practicing anemia prevention. The study was approved with written permission from the Ethical Review Board, Faculty of Public Health, University of Muhammadiyah Jakarta: No. 10.005.B/KEPK-FKMUMJ/IV/2020.

## 3. RESULTS AND DISCUSSION

### 3.1. Quantitative findings

Table 1 shows the general characteristics of the participants. More than half of the participants, 50.9%, were between 15-16 years old. More than half of the participants, 56.3%, had parents' income higher than the district minimum wage of 2,500,000 IDR, approx. 171.8 USD. More than half of the participants, 67.4%, were public school students. More than half of the participants' fathers' education, 74.0%, were less than a bachelor's degree. More than half of the participants' mothers' education, 80.6%, was less than a bachelor's. Table 2 shows the score and proportion of practice for anemia prevention. Among 350 participants, about 72.6% had poor anemia prevention practices, followed by good practices around 27.4%. Half of the participants had good knowledge 51.7%, and the rest had poor knowledge 48.3%. Half of the participants had a good attitude (58.0%), followed by a poor attitude (42.0%). Table 3 shows the top three reasons for participants not practicing anemia prevention were 1) feeling nausea after taking the iron tablet (32.9%), 2) do not like the smell and color of iron tablets (21.1%), and 3) do not know the benefit of practicing anemia prevention (18.9%). These reasons were followed by participants who perceived anemia prevention as unimportant (16.0%) and lack of parent support (11.1%).

Table 1. General characteristics of participants (N=350)

| Characteristics | | Frequency (N=350) | Percentage (%) |
|---|---|---|---|
| Age | 15-16 years old | 178 | 50.9 |
| | 17-18 years old | 172 | 49.1 |
| Parents income* | <171.87 USD per month | 153 | 43.7 |
| | ≥171.87 USD per month | 197 | 56.3 |
| Type of school | Public school | 236 | 67.4 |
| | Vocational school | 114 | 32.6 |
| Father education | <Bachelor's degree | 259 | 74.0 |
| | ≥Bachelor's degree | 91 | 26.0 |
| Mother education | <Higher education | 282 | 80.6 |
| | ≥Higher education | 68 | 19.4 |
| Anemia history | Yes | 74 | 21.1 |
| | No; not sure | 276 | 78.9 |
| Family history of anemia | Yes | 70 | 20.0 |
| | No; not sure | 280 | 80.0 |

*Currency rate 1 USD =15,095.00 IDR (4th February 2023)

Table 2. Score and proportion of practice, knowledge, and attitude level on anemia prevention (N=350)

| Practice, knowledge, and attitude level (N=350) | Frequencies (%) |
|---|---|
| Poor practice (Score 0-12) | 254 (72.6) |
| Good practice (Score 13-22) | 96 (27.4) |
| Poor knowledge (Score 0-12) | 169 (48.3) |
| Good knowledge (Score 13-22) | 181 (51.7) |
| Poor attitude (Score 19-30) | 147 (42.0) |
| Good attitude (Score 31-44) | 203 (58.0) |

Table 3. Frequencies and distribution of reasons for not practicing anemia prevention (N=350)

| No | Reasons for not practicing anemia prevention | Frequencies (%) |
|---|---|---|
| 1 | Feeling nausea after taking an iron tablet | 115 (32.9) |
| 2 | I do not like the smell and color of iron tablets | 74 (21.1) |
| 3 | I do not know the benefit of practicing anemia prevention | 66 (18.9) |
| 4 | Anemia prevention is not important | 56 (16.0) |
| 5 | Lack of parental support | 39 (11.1) |

Table 4 shows factors predicting the practice of anemia prevention among participants (N=350) adjusted for age, type of school, and mother's education. Among five predictors, the study's findings indicated that three predictors showed statistically significant with the practice of anemia prevention after holding other variables constant. The older age group of female students (17-18 years old) was 1.88 times more likely to practice anemia prevention than the younger age group of female students (15-16 years old) (AOR 1.88, 95% CI 1.12, 3.16, p=0.016). Female students at vocational schools were 1.85 times more likely to practice anemia prevention than female students at public schools (AOR 1.85, 95% CI 1.05, 3.27, p=0.035). Finally, female students with good knowledge were 2.52 times more likely to practice anemia prevention than female students with poor knowledge (AOR 2.52, 95% CI 1.49, 4.26, p=0.001).

Table 4. Binary logistic regression predicting practice of anemia prevention (N=350)

| Variables | | Practice of IDA prevention 95% CI | | | |
|---|---|---|---|---|---|
| | | AOR[b] | Lower | Upper | p-value[b] |
| Knowledge | Good | 2.52 | 1.49 | 4.26 | 0.001* |
| | Poor[Ref] | 1 | | | |
| Attitude | Good | 1.56 | 0.92 | 2.63 | 0.097 |
| | Poor[Ref] | 1 | | | |
| Age | 17–18-years old | 1.88 | 1.12 | 3.16 | 0.016* |
| | 15–16 years old[Ref] | 1 | | | |
| Household income | >2,500,000 IDR | 1.16 | 0.68 | 1.99 | 0.702 |
| | ≤2,500,000 IDR[Ref] | 1 | | | |
| Type of school | Vocational school | 1.85 | 1.05 | 3.27 | 0.035* |
| | Public school[Ref] | 1 | | | |
| Father education | Bachelor's degree | 0.88 | 0.47 | 1.66 | 0.695 |
| | Lower than Bachelor's degree[Ref] | 1 | | | |
| Mother education | Bachelor's degree | 1.67 | 0.85 | 3.30 | 0.139 |
| | Lower than Bachelor's degree[Ref] | 1 | | | |
| Anemia history | Yes | 1.23 | 0.65 | 2.32 | 0.524 |
| | No[Ref] | 1 | | | |
| Family history of anemia | Yes | 1.09 | 0.57 | 2.07 | 0.797 |
| | No[Ref] | 1 | | | |

[b]AOR *Significant p-value <0.05

### 3.2. Qualitative findings

The qualitative study involved fifteen female students aged 15-18 who participated in a quantitative study. We also recruited four primary health care officers and three teachers for in-depth interviews. The focus group discussion findings were constructed into two big themes: i) The lack of students' knowledge due to insufficient education and information about anemia prevention; and ii) Female students' perception and practice of iron tablet consumption. Furthermore, in-depth interview results were constructed into one big theme: Description of anemia prevention program implementation at schools.

#### 3.2.1. The lack of students' knowledge: insufficient education and information about anemia prevention

This study found a lack of knowledge related to anemia prevention among female students. Female students did not have sufficient knowledge about certain details, such as: i) anemia symptoms; ii) anemia causes; iii) the benefit of preventing anemia; iv) how to prevent anemia; v) myths about anemia; vi) the benefit of iron tablets; and vii) how to consume and the dosage of iron tablets. This insufficient knowledge was one factor in students' lack of awareness of anemia prevention practices. Some participants admitted that they did not completely understand the benefits of consuming iron tablets. Furthermore, they also realized that they have poor awareness of anemia prevention.

> "*I only know the sign of anemia, something like dizziness maybe... And I was not sure if I was anemic or not?*" (Informant 2, 16 years old)
> "*Sis, I have heard that anemia can cause death. Is it true? So, I know that anemia is dangerous.*" (Informant 4, 16 years old)

Although it could be a preventable problem, most adolescents indulge in unhealthy dietary habits and are unaware of IDA and how to prevent it [29]. Therefore, educating people about the preventive behaviors and lifestyle changes associated with anemia is crucial [30], [31]. Knowledge is an essential domain for someone's actions. The behavior will be lasting if the acceptance of new behavior is based on knowledge, awareness, and a positive attitude [32]. This study revealed that insufficient knowledge among female students is linked to an insufficient anemia education program. The insufficient anemia education program in this paper refers to the short duration of anemia education program and ineffective techniques in delivering anemia education program; for example, not attractive presentation, boring, and complex terms of health-related. Poor knowledge is a risk factor for developing malnutrition [33]. This study's findings are consistent with previous studies from some countries, such as Jordan [31], Saudi Arabia [34], Malaysia [5], [35], [36], India [37], [38], Iran [39], Pakistan [40].

> "*I am not sure last time what kind of information about anemia was already given, about the sign of anemia, something like dizziness? I did not pay attention when the health worker came into my school; I just heard that they mentioned anemia, but I did not understand. Feel so bored.*" (Informant 7 and 9, 16-17 years old)

### 3.2.2. Female students' perception and practice of iron tablet consumption

This study revealed that several factors influence the consumption of iron tablets among female students: i) they do not know the results of hemoglobin level checks; ii) they do not have adequate knowledge about the benefits of iron tablet consumption; and iii) they do not know the side effects of iron tablets consumption. Lack of understanding led to the perception that iron tablets are only consumed if they have anemia symptoms. As long as they do not feel anemia symptoms such as dizziness, they are perceived as not affected by anemia, so consuming iron tablets is unnecessary. Conversely, those who had the intention to take iron tablets do not have adequate information related to the doses for iron tablet consumption and the side effects of iron tablet consumption. Therefore, an effective anemia education program that provides comprehensive information is needed to achieve successful iron tablet consumption and coverage at schools. This finding was consistent with previous studies [26], [30], [41]–[48].

> "*I have done the hemoglobin test. But we did not receive the results, so we were unsure whether anemia affected us.*" (Informant 11, 17 years old)
> "*Back when I was menstruating, I took iron tablets because I felt dizzy. I took about 3-4 tablets. It had an effect; I did not feel dizzy anymore after taking tablets, but then my stool was black. I told my parents and my parents said that the iron was in excess, so I stopped taking it. Now, I am afraid to take those iron tablets; I am afraid my stool would black again.*" (Informant 14, 16 years old)

### 3.2.3. Description of anemia prevention program implementation at schools

The South Kalimantan provincial health office-initiated anemia prevention program in high schools at Banjarmasin municipality in 2018. However, in 2019, the anemia prevention program only ran once, followed by a weekly iron tablet supplementation program. In 2020, this program was not implemented due to COVID-19 pandemic. Based on an in-depth interview with the health district officer, there were two indicators to identify the success of the implementation of the anemia program at schools. First, it increased students' hemoglobin levels after weekly iron tablet supplementation intervention, and second, it decreased the proportion of anemic students after the intervention. Figure 1 is provided as a comprehensive snapshot of this program implementation. The anemia prevention programs conducted in South Kalimantan Province were divided into three phases: i) the education program related to anemia; ii) hemoglobin level checks; and iii) the weekly iron supplementation program. In this paper, the authors developed the process implementation of anemia prevention programs in high schools in Banjarmasin municipality, Indonesia, as seen in Figure 1. This figure summarizes in-depth interview results with teachers and health workers.

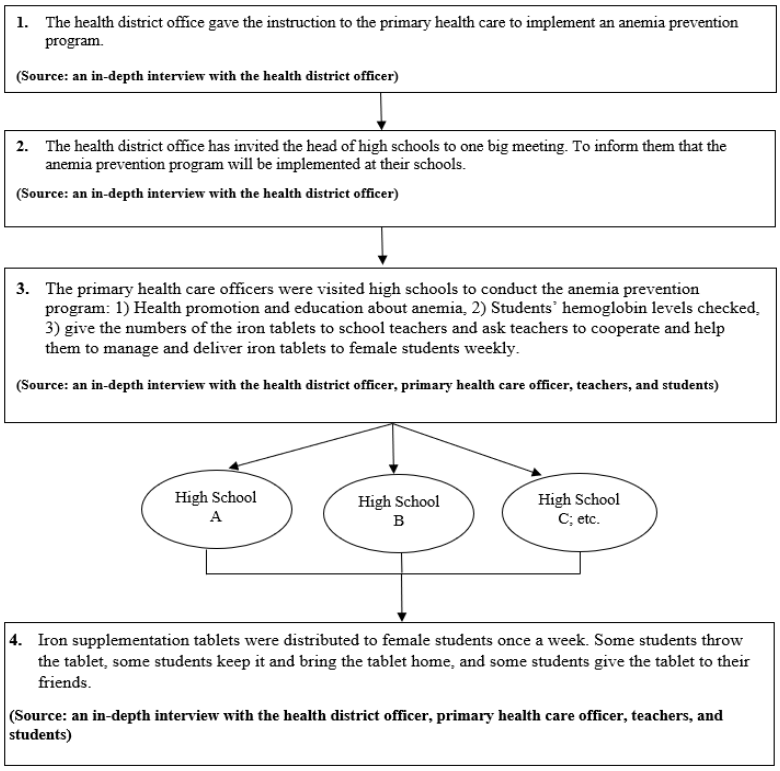


Figure 1. The flowchart of anemia prevention program implementation in Banjarmasin, Indonesia

The anemia prevention program in Indonesia needs to be evaluated. Giving iron tablets without being accompanied by pertinent information about the importance of anemia prevention practices made students feel unconvinced. The female students had some expectations related to the program improvement, such as: i) they wanted to get more information about iron tablets; and ii) what benefits and side effects would be obtained if they consumed these tablets. The results revealed that there are significant challenges in the distribution of iron tablets to students. The iron tablets supplementation program is unsuccessful because some students throw iron tablets into the garbage, some students keep iron tablets and bring them home, and some students give their iron tablets to their friends.

Poor attitudes and practices regarding iron tablet consumption are linked to the lack of awareness of anemia prevention among female students. Therefore, health promotion and nutritional education in a continuous manner are necessary. This finding was consistent with previous experimental studies [26], [30], [41]–[48]. Nutrition educational intervention is one of the cost-effective and sustainable programs that can be incorporated into the school curriculum to enhance the program's horizon. The effective nutritional educational intervention of school children in their life-shaping years progresses their knowledge, widens their positive attitude, and helps sustain healthy practices [41], [43], [49]–[52].

We suggested some recommendations for program implementers. First, it is essential to understand participants' characteristics and perspectives before conducting an intervention program. Second, the urge for communication skills training for health workers in primary health care. Third, good collaboration practices between health workers and school teachers are needed to improve the quality of anemia prevention programs. Fourth, we recommend a regular continuous anemia education program, for example, twice a semester. In addition, future research may study interactive anemia education program activities to enhance students' participation and enthusiasm toward the anemia prevention program.

## 4. CONCLUSION

This study revealed that inadequate knowledge contributed to poor anemia prevention practices among female students. In addition, the limited duration and irregular anemia education program also affected students' knowledge and awareness of anemia prevention practice. Therefore, the anemia prevention program in Indonesia needs to be evaluated and improved.

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