Research Article

Exploring the Relationship Between Nutrition Status, Reproductive Health Knowledge, and Anemia in Adolescent Girls in Depok, Sleman, Yogyakarta

Mustika Cahya Nirmala Dewinta[1]*, Erni Gustina[2]

[1] Program Study of Nutrition, Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

[2] Program Study of Public Health, Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

* Correspondence: mustika.dewinta@gizi.uad.ac.id.

ABSTRACT

Background: The issue of anemia continues to be a significant public health concern requiring attention, particularly due to its increasing prevalence. In Sleman District, it has been observed that the prevalence of anemia among adolescents has significantly risen from 2016 to 2018. This phenomenon underscores the interconnectedness of nutritional status, reproductive health, and anemia, especially among adolescent girls. Adolescents, particularly girls, require sufficient nutritional intake to navigate the challenges associated with their physiological changes, particularly those related to the reproductive system. Nutritional status plays a crucial role in influencing reproductive system disorders, impacting menstrual irregularities, and closely intertwining with the occurrence of anemia among adolescent girls. This paper highlights the relationship between nutrition status, reproductive health knowledge, and anemia in adolescent girls in Depok, Sleman, Yogyakarta

Method: The study employed a cross-sectional method to explore data concerning nutritional status and reproductive health knowledge variables. The study was conducted on 108 female junior high school students aged 10-15 years in 3 schools in the Depok Sleman District. Sampling was done using accidental sampling. Data collection was carried out at the schools by measuring anthropometry (body weight, height, BMI), checking hemoglobin (Hb), and filling out questionnaires on knowledge and dietary patterns.

Results: It was found that there was no significant relationship between nutritional status and anemia status in adolescents (p-value 0.75). Analysis of the relationship between knowledge related to reproductive health and anemia status also revealed no significant relationship (p-value 0.772).

Conclusion: The study concluded that there is no significant relationship between nutrition status, knowledge related to reproductive health, and anemia status in adolescent girls. Although the results of this study did not show a significant relationship, the urgency for adolescents to maintain nutritional status and increase knowledge about anemia prevention remains important in the effort to prevent anemia. A comprehensive anemia prevention program needs to be implemented through collaboration among schools, health authorities, and the community.

Keywords: Adolescence; Anemia; Nutrition; Reproductive Health.

INTRODUCTION

Anemia is defined as a condition where an individual lacks red blood cells or hemoglobin as oxygen carriers in the blood to meet the body's physiological needs.[1] Anemia cases, especially among adolescent girls, women of childbearing age, and pregnant women, remain a public health issue both globally and nationally. Data from the WHO indicates that approximately 32.4 million (38%) pregnant women and 496 million (29%) women of childbearing age between 15-49 years old suffer from anemia.[1] In Indonesia, the prevalence of anemia among women has increased from 11.3% in 2007 to 23.9% in 2013.[2] The latest data obtained from the Sleman Health Office in 2020 indicates that the prevalence of anemia among adolescents in the Depok sub-district is 9.84%. This figure is still higher than the target of 8.50% according to the Strategic Plan of Sleman Regency 2020.[3]

Moreover, the topic of adolescent health has become a significant health issue in the Depok area, which has the highest population density (131,242 people) in Sleman Regency (Sleman Regency Statistics 2022). Additionally, considering the large number of educational institutions ranging from elementary schools to universities in the Depok area, the Depok sub-district is densely populated with adolescents and young adults. Meanwhile, adolescents are particularly vulnerable to health issues, especially anemia.

This issue of anemia warrants attention as per BAPPENAS and UNICEF (2017), achieving zero hunger is one of the parameters of the Sustainable Development Goals (SDGs). One of the indicators for zero hunger is the prevalence of anemia among women of reproductive age not exceeding 12%. However, the prevalence of anemia among adolescent girls aged 15-24 years remains high at 32% based on the Basic Health Research (*RISKESDAS*) data in 2018. Furthermore, data from the Sleman Health Office in 2018 revealed a significant increase in the prevalence of anemia among adolescent girls from 12.6% in 2017 to 22.86% in 2018.[4]

This high prevalence of anemia among adolescents needs to be addressed seriously as it can have negative impacts on the future of adolescents and the next generations. Untreated anemia during adolescence can lead to short-term effects such as reduced immunity, decreased ability to concentrate in learning, and decreased productivity or achievement of adolescents.[5] In the long term, adolescent anemia can lead to complications during pregnancy, increased risk of maternal mortality, risk of premature birth, low birth weight babies (LBW), and growth and developmental disorders in children.[6]

The status of anemia in adolescents is influenced by various determinants. Some determinants of anemia among adolescent girls include malnutrition, imbalanced nutrient intake, and suboptimal reproductive health. Iron, protein, vitamin C, Vitamin B12, folic acid deficiencies, and menstrual cycle disturbances are some factors known to affect adolescent anemia.[7]

Regarding the reproductive health of adolescent girls, knowledge about menstrual patterns and the required nutritional intake during menstruation are known to be factors that can influence the risk of anemia among adolescent girls.[8] Adolescent girls need to have a good understanding of normal menstrual patterns, including the causes and effects of abnormal menstrual patterns. One of the impacts of abnormal menstrual patterns is the increased risk of anemia among adolescents.[9]

Given the urgency of the issue of anemia among adolescent girls and the complexity of determinants influencing this issue, various strategies are being implemented to address anemia among adolescents. One of them is through the provision of iron supplementation tablets (TTD), adolescent integrated health posts (*posyandu remaja*), and other health education platforms for adolescents. Some areas that need to be studied regarding adolescents are the balance of adolescent nutrition, healthy life skills, adolescent reproductive health, nutrition, physical activity, and counseling on other health issues.[10]

Based on this background, the researchers conducted this study to identify the relationship between adolescent nutritional status and adolescents' knowledge about reproductive health on the status of anemia among adolescent girls. Hopefully, the results of this study will contribute to enriching information about determinants influencing adolescent anemia status, thus enabling the planning of more effective educational approaches to reduce and prevent cases of anemia among adolescents.

METHOD

The research subjects consisted of 108 female junior high school students aged 10-14 years in 3 schools in the Depok Sleman District. The minimum sample size was calculated using the Slovin formula, resulting in a minimum sample size of 100 individuals. Sample selection was done accidental sampling until the minimum required sample size was met.

The research was conducted using a cross-sectional method to gather data related to variables such as nutritional status, reproductive health knowledge, and anemia status among adolescent girls. Nutritional status was assessed using the BMI indicator based on weight and height. Weight was measured using a digital scale, and height was measured with a microtoise. Knowledge about reproductive health, specifically about prevention of anemia during menstruation, was evaluated using a validated questionnaire derived from the research by Mularsih (2017).[11] Hemoglobin levels were assessed through peripheral blood testing using the Quick Cek device by professional medical personnel from UAD Hospital. The research has obtained ethical approval from the UAD Ethics Committee with reference number 012309208.

This study involves female adolescents aged 10-15 years, so parental/guardian consent is required. Since it would be impractical to approach each parent/guardian individually for permission, ethical approval was represented by the teachers or class guardians at the school.

Therefore, the research team first explained the purpose and procedures of the study through an information sheet to the school authorities, including the designated teachers or guardians responsible for the students. The selection of potential respondents was carried out by requesting recommendations from the teachers to ensure that the respondents met the criteria set by the research team. Respondents were included in the study only after the teacher granted permission by signing the informed consent form.

Data analysis was conducted in stages, namely 1) measuring the basic characteristics of research participants, 2) analyzing each data variable descriptively, and 3) performing simple bivariate tests Pearson Chi Square to examine the relationship between independent

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variables and dependent variables (nutritional status to anemia, and reproductive health knowledge to anemia).

RESULTS

The data obtained from this research implementation include age, height, weight, BMI-for-age Z-score, level of knowledge, and Hb levels. Age, height, and weight data were processed to calculate the BMI-for-age Z-score as an indicator of nutritional status in adolescents. The total number of research subjects in this study was 108 adolescent girls, with an average age of 13.38 years. The respondents from the three schools are 10th-grade junior high school students.

Nutritional status is categorized according to Minister of Health Regulation No. 2 of 2020 on Child Anthropometric Standards, with categories including severe undernutrition (<-3 SD), moderate undernutrition (-3 SD to <-2 SD), balanced nutrition (-2 SD to +1 SD), overweight (>+1 SD to +2 SD), and obese (>+3 SD). The level of adolescent knowledge about reproductive health was analyzed based on the total questionnaire score, categorized as inadequate knowledge (<60%), sufficient (61-74%), and good (≥75%). Hb levels were used as an indicator of anemia status in adolescents. Adolescents were considered anemic if Hb levels were <12.0 mg/dL, and non-anemic if Hb levels were ≥12 mg/dL.

Descriptively, it was found that 63.9% of adolescents had good knowledge about reproductive health. The nutritional status of adolescents in this study showed that 6.5% of adolescents had moderate to severe malnutrition, while overnutrition to obesity was 12% and 13.9%, respectively. Meanwhile, based on Hb levels, it was found that 13% of adolescent girls in this study experienced anemia (Table 1).

Table 1. Characteristics of subject

Variable		N	%
Age (years)	11	2	1.85
	12	10	9.26
	13	56	51.85
	14	32	29.63
	15	8	7.41
	Total	108	100
Knowledge	Inadequate	16	14.8
	Sufficient	23	21.3
	Good	69	63.9
	Total	108	100
Nutrition status	Severe undernutrition	2	1.9
	Undernutrition	5	4.6
	Balanced nutrition	73	67.6
	Overweight	13	12.0
	Obese	15	13.9
	Total	108	100
Anemia status	Non-anemic	94	87
	Anemic	14	13
	Total	108	100

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Data analysis was conducted using SPSS software to test the relationship between nutritional status, level of knowledge, and anemia status among adolescent girls. Based on the analysis results, it was found that there was no significant relationship between nutritional status and anemia status in adolescents (p-value 0.75). Analysis of the relationship between knowledge related to reproductive health and anemia status also revealed no significant relationship (p-value 0.772).

Table 2. Relationship between nutrition status and anemia status

| Nutrition status (BMI/age) | Anemia status | | | | p-value |
| | Anemic | | Non-anemic | | |
	N	%	N	%	
Severe undernutrition	0	0	2	100	
Undernutrition	0	0	5	100	
Balanced nutrition	11	15,3	62	84,7	0.750
Overweight	2	15,4	11	84,6	
Obese	1	6,7	14	93,3	

Table 3. Relationship between knowledge related to reproductive health and anemia status

| Knowledge | Anemia status | | | | p-value |
| | Anemic | | Non-anemic | | |
	N	%	N	%	
Inadequate	2	50	2	50	
Sufficient	4	44,4	5	55,6	0.772
Good	8	11,4	62	88,6	

DISCUSSION

The results of this study indicate that there is no relationship between the level of knowledge about reproductive health and the incidence of anemia in adolescent girls. There are several reasons that may explain why there is no significant relationship between the variables in this study. The first possibility is that the characteristics of the respondents tend to be homogeneous, particularly in terms of age, which may lead to similar eating patterns and activities, resulting in insufficient variation. Secondly, the respondents belong to the early adolescent group, whose eating patterns are still more strongly influenced by family dietary habits rather than individual knowledge, resulting in better intake levels. Thirdly, it is known that the majority of respondents in this study have good nutritional status. Most respondents also have normal hemoglobin levels or are not anemic, including those in the group with excess nutritional status.

This finding is consistent with previous research conducted at SMK Bangsa Kota Bogor, which found that the majority of respondents who experienced anemia had good knowledge levels about anemia and its prevention.[12] In other words, there is no association between knowledge and the occurrence of anemia. Moreover, a study conducted in several districts in Indonesia revealed that the level of knowledge does not always guarantee someone to be free from anemia.[13] This research discusses a systematic review on the relationship between knowledge about anemia and its prevention, as well as dietary intake and consumption of iron supplementation tablets. The knowledge variable in this study focuses on adolescents'

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understanding of menstruation, the relationship between menstruation and the risk of anemia, as well as behaviors related to anemia prevention. Other factors need to be considered, such as the dietary habits of adolescent girls both at home, in school environments, and in recreational settings, which may lack adequate nutritional intake. Additionally, the desire to have a slim body often leads them to restrict the consumption of foods essential for meeting hemoglobin needs. Therefore, many adolescents still experience anemia despite having good knowledge and understanding of the condition and the importance of adequate nutrition.[14]

Furthermore, the lack of association between the level of knowledge among adolescent girls and the incidence of anemia may be attributed to the tendency of adolescent girls to follow their parents' dietary patterns in planning their daily meals. This results in both adolescent girls with poor knowledge and those with good knowledge not influencing the selection of foods that can prevent nutritional anemia.[13]

In theory, knowledge is influenced by various factors, including age, occupation, education level, environment, and culture. The lack of understanding among female students about anemia is one factor that leads to less supportive behaviors in efforts to prevent anemia during menstruation. This lack of knowledge may be due to the students' misunderstanding or receiving incomplete information. An individual's knowledge influences their behavior, such as in the prevention of anemia during menstruation. Therefore, increasing knowledge about anemia is essential to encourage supportive behaviors in preventing anemia during menstruation.[15]

The first important aspect of reproductive health knowledge to understand is menstrual patterns. A normal menstrual pattern is a cycle that lasts 21-35 days, with a menstruation duration ranging from 2-8 days and a blood volume ranging from 20-80 mL/day. An abnormal menstrual pattern occurs when the cycle, duration, and volume of menstrual blood are less or more than those described above.[9] Previous research has revealed that adolescent girls with abnormal menstrual patterns are more susceptible to anemia compared to those with normal menstrual patterns.[16–18]

Abnormal menstrual patterns, especially when menstruation lasts >7 days with short menstrual cycles <21 days, are more likely to cause anemia because adolescents lose more blood during this period.[19] Therefore, it is important for adolescent girls to have a good understanding of what constitutes a normal menstrual pattern. This enables adolescent girls to identify whether their own menstrual pattern is normal or not, so they can recognize what needs to be improved to address the situation.

Knowledge factors related to adolescent reproductive health that are associated with anemia are inseparable from adolescent understanding of the nutritional needs that need to be met during adolescence, including when adolescent girls experience menstruation every month. Previous study revealed that in groups of adolescent girls with inadequate intake of protein, iron, and vitamin C, the prevalence of anemia was higher compared to groups with sufficient intake.[17]

This study also revealed that there is no significant relationship between nutritional status and the incidence of anemia in adolescent girls. Similar results were reported by a study at SMAN 8 Kendari, which found no association between nutritional status and the occurrence of

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anemia.[20] Consistent with these findings is the research in South Galesong, Takalar, which examined nutritional status and anemia in adolescent girls, and found no relationship between nutritional status and anemia.[21]

These findings may occur because nutritional status in the form of BMI-for-age is predominantly influenced by macronutrient intake such as carbohydrates, proteins, and fats. Meanwhile, anemia is caused by deficiencies in micronutrients such as iron, folic acid, vitamin B6, and vitamin B12. Therefore, it can be understood that good nutritional status based on the proportion of weight and height is not a guarantee that micronutrient needs are met.[21] This reinforces the foundation that every adolescent girl needs to understand the appropriate strategies for preventing anemia. This is supported by research conducted by Pareek et al. (2022) which indicates that an inadequate intake of dietary iron, along with a concurrent inadequate intake of dietary micronutrients, appears to be the primary factors responsible for anemia and iron deficiency in adolescent girls.[22]

Fundamentally, adolescent eating behavior is greatly influenced by peer influence and the body image they hold. A negative body image leads adolescent girls to feel dissatisfied with their body shape, leading them to adopt unhealthy eating patterns, ultimately impacting their nutritional status.[23] Ironically, most adolescents who claim to reduce their food intake to achieve their desired weight adopt unhealthy eating patterns such as consuming fast food and insufficiently consuming high-fiber foods.[24]

Anemia, particularly iron-deficiency anemia, is a significant public health issue affecting adolescent girls worldwide. Various stakeholders play crucial roles in its prevention, including schools, healthcare providers, parents, and community organizations. Schools, healthcare providers, parents, community organizations, and government policies all play critical roles to work collaboratively in addressing anemia issues in adolescents. Schools serve as a primary setting for health education and intervention programs. They can implement nutritional programs, provide meals, and educate students about healthy eating habits.[25]

One of the best practices of the school feeding program is in the Philippines, by the Department of Education (DepEd) – the School-Based Feeding Program (SBFP). This program aims to provide meals for severely malnourished schoolchildren from kindergarten to Grade 6 for a duration of 100–120 days, utilizing standardized recipes that include malunggay in a 20-day rotating menu. Additionally, the DepEd established a categorization system for foods and beverages sold in schools. Healthy items that should always be available in school canteens are labeled Green, while unhealthy options that should not be present are marked Red. Items that fall in between and may be sold once or twice a week are categorized as Yellow. The objective is to encourage healthy eating habits and help children steer clear of empty calorie foods. Evaluation results showed that mean scores related to knowledge, attitudes, and behaviors of schoolchildren in the intervention groups significantly increased by the end of the program. It reflects that the combination of school lunch provision and nutrition education was effective in enhancing the knowledge, attitudes, behaviors, and nutritional status of the students.[26]

Limitation of this study is the age variation among respondents in this study is limited due to the restriction of students allowed by the school to participate only from grade 10. As a result, the variation in nutritional status and knowledge levels tends to be consistent.

CONCLUSION

The study concluded that there is no significant relationship between nutrition status, knowledge related to reproductive health, and anemia status in adolescent girls. Further research is encouraged to explore deeper understanding regarding to determinants of anemia among adolescents. Even though this study's results did not indicate a significant relationship, it is still crucial for adolescents to sustain their nutritional status and enhance their understanding of anemia prevention in order to effectively combat anemia. Even though this study's results did not indicate a significant relationship, it is still crucial for adolescents to sustain their nutritional status and enhance their understanding of anemia prevention to effectively combat anemia.

Declarations

Authors' contribution

MD contributed to the data collection, analysis, and manuscript. EG contributed to the research design and manuscript.

Funding statement

Conflict of interest

There is no conflict of interest in this research.

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