The Relationship Between Sociodemographics and Media Access on Knowledge Regarding Anemia Among Young Women in Indonesia

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Abstract

The limited knowledge of young women about anemia and the difficulty in accessing information about anemia are essential problems for young women's health. This study examines the association between sociodemographic factors and media access with anemia knowledge in young women in Indonesia. This study analyzed data from the 2017 Indonesian Health Demographic Survey. This study involved unmarried women of childbearing aged 15–24 years who had heard of anemia. The analysis used multiple logistic regression. The percentage of young Indonesian women with good knowledge of anemia was 70.9%. This study showed that the odds of having good knowledge of anemia increased significantly among young women aged 20–24 years (AOR = 1.341, 95% CI [1.140, 1.579], $p < .001$), living in urban areas (AOR = 1.178, 95% CI [1.015, 1.367], $p < .05$), highly educated (AOR = 2.617, 95% CI [1.647, 4.160], $p < .001$), had the highest economic quintile (AOR = 1.730, 95% CI [1.356, 2.207], $p < .001$), read newspapers/magazines at least once a week (AOR = 1.315, 95% CI [1.089, 1.588], $p < .01$), and had access the Internet almost every day (AOR = 1.204, 95% CI [1.038, 1.397], $p < .05$). Education on anemia among this age group should be encouraged and instituted in the educational curriculum. Newspapers, magazines, and internet media may be practical tools for educating young people about health and nutrition.

Keywords

Anemia; Indonesia; knowledge; media; young women

Introduction

Anemia remains a global public health problem, particularly in low-middle-income countries, including Indonesia. The latest Indonesian National Health Survey (Riskesdas) 2018 reported that the national prevalence of anemia among adolescents aged 15 to 24 was 32% (Health Research and Development Agency, 2019). Adolescent girls are vulnerable to anemia as they require high nutritional intake for growth acceleration, sexual maturation, and future pregnancy (Teji et al., 2016; Tesfaye et al., 2015). The risk of anemia remains high after the growth spurt has passed because of menstruation (World Health Organization, 2011).

Iron deficiency leads to anemia due to the loss of balance between the body's losses of iron due to hemorrhage of the iron intake and stores in the body (Miller, 2013). Overall, iron deficiency is the leading cause of anemia, and menstruation disadvantages reproductive-aged women. Results from the Individual Food Consumption Survey conducted in 2014 showed that the leading staple food for nearly all Indonesians was rice, while red meat was consumed by less than 10% of the population (Health Research and Development Agency, 2014). Therefore, Indonesians are in danger of iron deficiency anemia because rice has little iron, but red meat contains iron and other micronutrients required for red blood cell formation.

In this country, the nutrition-specific intervention to prevent anemia among women of reproductive age is carried out by providing an iron and folic acid (IFA) supplement recommended to be consumed weekly for non-pregnant women. Although around three-quarters (76.2%) of female adolescents in this country have received the IFA tablets, a large majority (80.9%) of them consume the supplement less than the recommendation (Health Research and Development Agency, 2019), and at least a quarter of Indonesian girls admitted that they do not need that supplement. Other common reasons for not taking the IFA tablets were their unpleasant taste and smell and forgetting to consume them (Health Research and Development Agency, 2019). This finding indicates that the awareness of anemia among them is probably low. It also suggests the government not merely distribute the supplements but also accompany the intervention with an educational campaign to promote adherence to IFA tablet consumption and raise knowledge about anemia.

Many factors are associated with anemia, such as appropriate knowledge regarding healthy nutrition among adolescents. A community-based cross-sectional study of 1,323 Ethiopian girls aged 10–19 years revealed that less than half knew about anemia, and approximately one-third knew of the link between anemia and iron-rich dietary consumption (Gebreyesus et al., 2019). Understanding the knowledge role in anemia is vital to strengthening health behavior through attitude and practice changes to prevent anemia (Lally et al., 2010). It is also helpful to capture essential messages to perceive better the necessity, compliance, and side effects of iron supplementation among adolescent girls (Agustina et al., 2020).

Media, such as television, radio, newspapers/magazines, the Internet, and social media, are the primary sources of information for health knowledge, such as anemia. Good media access can provide accurate and relevant information about disease risks, the benefits of preventive measures, and how to address health problems (Aisah et al., 2022). Delivering information about preventing anemia in adolescent girls through animated videos and social media on Instagram significantly increases adolescent knowledge (Hernianti et al., 2023). However, there is still little information about the most suitable media for delivering information related to anemia among adolescent girls.

For that reason, this study aims to capture information on the anemia knowledge of adolescent girls and analyze its association with socio-demographic factors and access to media. The study's findings can be utilized to create intervention programs and policies to increase adolescent girls' understanding of anemia.

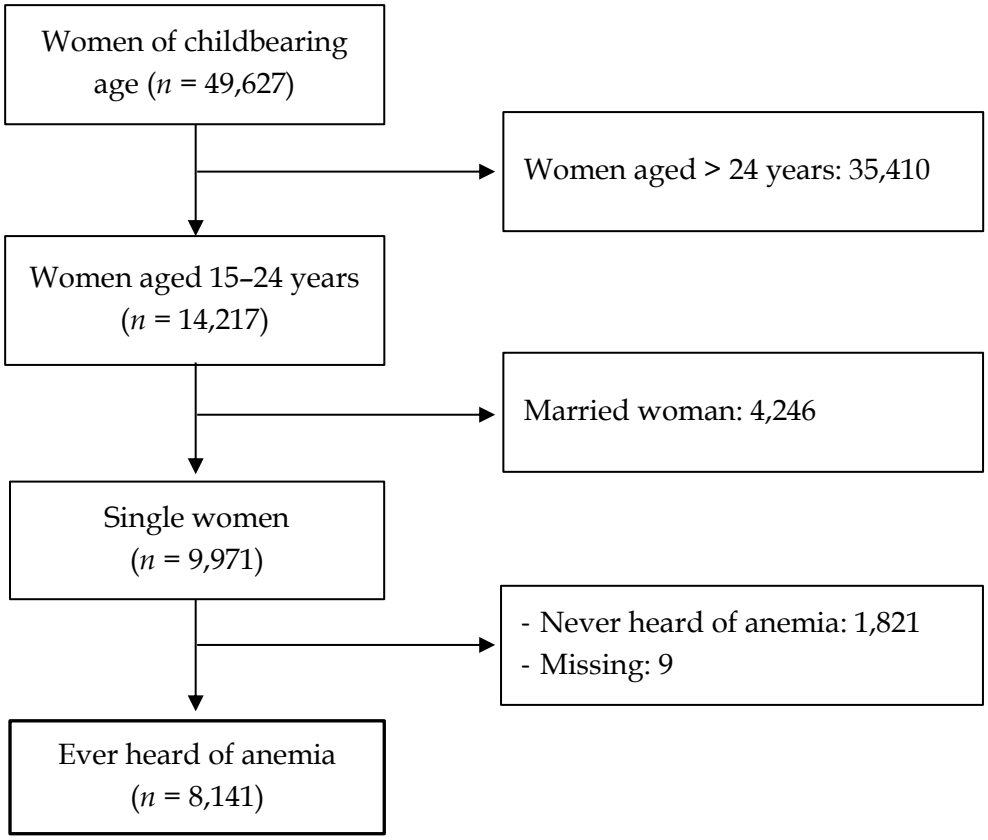
Methodology

Data source

Cross-sectional data was sourced from the Indonesian Demographic Health Survey (IDHS) 2017, a national representative survey conducted every five years using a multistage random sampling design. In the first stage, census blocks in each district were selected by proportional sampling and stratified urban and rural areas from the most recent census sampling frame in 2010. In the second stage, 25 regular households were selected systematically in each of the chosen block censuses.

The IDHS has been designed to collect data on marriage and sexual activity, fertility, family planning, infant and child mortality, maternal health care, child health, infant and young child feeding practices, knowledge about human immunodeficiency virus (HIV), women's empowerment, and father's participation in family health care. Information about learning regarding anemia was only asked from women of childbearing age aged 15–24 years who were not married. Data on women of childbearing age can be found practically in the SDKI-IDIR71FL data. As such, the IDHS data is free for download after a simple registration process on the demographic and health survey website (Statistics Indonesia et al., 2017).

Figure 1: Selection of the Study Subjects



Subjects

In this study, women who were eligible and met the inclusion-exclusion criteria were enrolled in the analysis. Details of the selection of participants are shown in Figure 1 above. Participants were taken from women of childbearing age 15–24 who were the sample for the 2017 IDHS. The inclusions for this study were (1) women who had never been married and (2) who had heard of anemia. Exclusion criteria include (1) not having complete data and (2) refusing to be interviewed. Based on the inclusion and exclusion criteria, the participants involved in this analysis were 8,141 young women. Field staff training was conducted to ensure that they had the same understanding of the survey's management and each point in the questionnaire, including operational definitions.

Outcome variable

This study used the 2017 IDHS for women of childbearing age and a household questionnaire. The outcome variable was the category of knowledge regarding anemia. The variables comprised three open-ended questions: "What is anemia?" "What causes anemia?" and "How to treat anemia?" Each participant was allowed to give more than one answer. The more the number of correct answers mentioned, the higher the score of knowledge regarding anemia. One point was awarded for each correct answer mentioned and 0 for wrong or unknown answers (Rahman & Sathi, 2020). This knowledge score was then categorized into code 1 as good knowledge (≥ median) and code 0 as poor knowledge (< median) (Kamate et al., 2020).

The correct answer (1 point) to the question "What is anemia?" was low hemoglobin level, iron deficiency, and a deficit in red blood cells. The correct answers to the question "What causes anemia?" were low intake of meat, chicken, fish, and heart; low intake of fruits and vegetables; bleeding; menstruation; malnutrition; infectious diseases; and lack of sleep. The correct answers to the question "how to treat anemia" were: take pills to increase blood pressure; take iron tablets; adequate consumption of meat, fish, and liver; adequate consumption of fruits and vegetables rich in iron; and blood transfusions.

Independent variable

We examined the influence of sociodemographic factors and media access on knowledge of anemia. The sociodemographic factors included *age group*, *residence*, *education level*, *occupation status*, *wealth index*, and *age at first menstruation*. The *age group* was categorized into code 0 for ages 15–19 years and code 1 for ages 20–24. *Residence* was categorized into code 0 for rural and code 1 for urban. *Educational level* was categorized into three: code 0 for primary education (≤ elementary); code 1 for secondary education (junior-senior high school); code 2 for higher education (college). *Occupation status* was categorized into codes: 0 for not working and 1 for working. The *wealth index* consisted of 5 categories: the higher the code, the higher the wealth index, with code 0 for the poorest and code 4 for the richest. *Age at first menstruation* was categorized into three: code 0 for never; code 1 for ages 9–12 years; code 2 for ages 13–21.

Meanwhile, variables regarding media access consisted of *frequency of reading newspapers/magazines offline and online* (code 0 for not at all, code 1 for less than once a week, and code 2 for at least once a week), *frequency of listening to the radio* (code 0 for not at all, code 1 for less than once a week, and code 2 for at least once a week), *frequency of watching television*

(code 0 for not at all, code 1 for less than once a week, and code 2 for at least once a week), and *frequency of using the Internet* (code 0 for not every day, and code 1 for almost every day).

Statistical analysis

Data were analyzed using statistical software (STATA Version 15). The categorization of the outcome variables used the median as the cut-off. A score ≥ median was declared as good knowledge. Bivariate tables were performed using chi-square and binary logistic regression. Variables with p value < .25 were included in multivariable logistic regression analysis to identify factors associated with knowledge of anemia. The strength of the association was measured using the Adjusted Odds Ratio (AOR) with a 95% confidence interval. The p < .05 was assigned to statistical significance—the analysis employed sample weights to represent the proportion of women at the national level. Before interpreting the multivariate results, a goodness of fit test (GoF) was conducted using a Hosmer and Lemeshow test to determine whether the model formed is appropriate. It was said that the model was appropriate if there was no significant difference between the model and its observation value (p > .05).

Ethical statement

All respondents were given informed consent before entering the interview. Respondents' participation was voluntary. A parent or guardian of an adolescent was also provided consent before data collection. Questionnaires for standard IDHS 2017 surveys had been reviewed and approved by the ICF Institutional Review Board (IRB).

Results

Knowledge regarding anemia

Among 9,971 unmarried women aged 15–24 years, 81.6% of them were aware of anemia. On what is anemia, less than one-fifth of young women answered correctly, i.e., 5.2% answered low hemoglobin, 8.4% answered iron deficiency, and 15.1% answered deficit in red blood cells. As many as 73% of women responded incorrectly (blood deficit).

On the question of the cause of anemia, unmarried young women answered lack of consumption of vegetables and fruits (36.7%), lack of consumption of meat, fish, and liver (26%); malnutrition (18%), and 20.8% did not know the cause of anemia. On the treatment of anemia question, the majority answered take pills to increase blood (59.4%), increase consumption of iron-rich vegetables and fruits (33.6%), and as many as 22.3% answered to increase the consumption of meat, chicken, fish, and liver (Table 1).

Table 1: Frequency Distribution of Responses to Knowledge Regarding Anemia in Young Women 15–24 Years in Indonesia

Questions	Correct		Incorrect	
	Answer	*n* (%)	Answer	*n* (%)
Ever heard of anemia? (N = 9,971)	Yes	8,141 (81.6)	No/missing	1,830 (18.4)
*Cause of anemia? * (N = 8,141)*	Low hemoglobin	427 (5.2)	Blood deficit	5,941 (73.0)
	Iron deficiency	681 (8.4)	Vitamin deficiency	332 (4.1)
	Deficit in red blood cells	1,228 (15.1)	Low blood pressure	342 (4.2)
			Other	294 (3.6)
			Don't know	899 (11.0)
*Cause of anemia * (N = 8,141)*	Lack of consumption of meat, fish, and liver	2,114 (26.0)	Tired	1,180 (14.5)
	Lack of consumption of vegetables and fruits	2,991 (36.7)	Others	715 (8.8)
	Bleeding	577 (7.1)	Do not know	1,694 (20.8)
	Menstruation	974 (12.0)		
	Malnutrition	1,463 (18.0)		
	Infectious diseases	41 (0.5)		
	Lack of sleep	596 (7.3)		
*Cause of anemia * (N = 8,141)*	Lack of consumption of meat, fish, and liver	2,114 (26.0)	Tired	1,180 (14.5)
	Lack of consumption of vegetables and fruits	2,991 (36.7)	Others	715 (8.8)
	Bleeding	577 (7.1)	Do not know	1,694 (20.8)
	Menstruation	974 (12.0)		
	Malnutrition	1,463 (18.0)		
	Infectious diseases	41 (0.5)		
	Lack of sleep	596 (7.3)		
Treatment of anemia (N = 8,141?)*	Take a pill to increase blood (IFA)	4,831 (59.4)	Break	431 (5.3)
	Take iron tablet	1,356 (16.7)	Going to a health facility	532 (6.5)
	Increase consumption of meat, chicken, fish, and liver	1,816 (22.3)	Drinking water, vitamins, or milk	214 (2.6)
	Increase consumption of iron-rich vegetables and fruits	2,739 (33.6)	Other	240 (3.0)
	Blood transfusion	118 (1.5)	Don't know	635 (7.8)

*Note: * Each subject could answer more than one answer*

Table 2 shows the score from participants' correct answers. The score range was 0–13 (Mean = 2.54; standard deviation (*SD*) = 1.95). The median value of 2 was used as a cut-off in categorizing the score of knowledge regarding anemia. The categorization results showed that 70.9% of young women had good knowledge regarding anemia.

Table 2: Scores of Knowledge Regarding Anemia of the Participants

Knowledge	Value
The range of scores achieved	0–13
Mean ± *SD*	2.54 ± 1.95
Median (cut-off point)	2
Poor knowledge n (%)	2,365 (29.1)
Good knowledge n (%)	5,776 (70.9)

Knowledge regarding anemia based on sample characteristics

Table 3 shows the distribution of the characteristics of young women aged 15–24 years who had heard of anemia. The highest percentage of women were in the group aged 15–19 years (65.7%), lived in urban areas (62.7%), had secondary–junior high school/senior high school education (71%), were not working (65.2%), the status of wealth index were the richest (30%), menarche age was at 13–21 years (63.7%), read newspapers/magazines (60.7%), listened to the radio (52.4%), often watched television (81.5%), and used the Internet almost every day (77%) (Table 3).

The frequency distribution of knowledge regarding anemia in young women 15–24 years based on characteristics and media access is shown in Table 3. Factors related to knowledge regarding anemia in young women were age, residence, education level, wealth index, menarche age, frequency of reading newspapers/magazines, frequency of watching television, and frequency of using the Internet. Young women who had good knowledge about anemia mainly were aged 20–24 years (77.2%) and lived in urban areas (74%). The higher the level of education, wealth index, frequency of reading newspapers, and frequency of internet use, the higher the percentage of young women who had good knowledge about anemia.

Table 3: Frequency Distribution of Knowledge Regarding Anemia among Young Women 15–24 Years Based on Characteristics of Demography and Media Access

Variable		Overall (*N* = 8,141)	Knowledge regarding anemia		*p* *
			Poor (*N* = 2,365)	Good (*N* = 5,776)	
		n (%)	n (%)	n (%)	
Age group (year)	15–19	5,350 (65.7)	1,729 (32.3)	3,620 (67.7)	< .001
	20–24	2,791 (34.3)	636 (22.8)	2,156 (77.2)	
Residence	Rural	3,040 (37.3)	1,040 (34.2)	2,001 (65.8)	< .001
	Urban	5,100 (62.7)	1,325 (26.0)	3,775 (74.0)	
Educational level	Primary	115 (1.4)	59 (51.2)	56 (48.8)	< .001
	Secondary	5,780 (71.0)	1,851 (32.0)	3,929 (68.0)	
	Higher	2,246 (27.6)	455 (20.3)	1,791 (79.7)	
Occupation status	Not working	5,305 (65.2)	1,572 (29.6)	3,733 (70.4)	.175
	Working	2,836 (34.8)	793 (28.0)	2,043 (72.0)	
Wealth index	Poorest	814 (10.0)	336 (41.3)	478 (58.7)	< .001
	Poorer	1,368 (16.8)	479 (35.0)	889 (65.0)	
	Middle	1,619 (19.9)	508 (31.4)	1,111 (68.6)	
	Richer	1,895 (23.3)	507 (26.7)	1,388 (73.3)	
	Richest	2,445 (30.0)	535 (21.9)	1,910 (78.1)	

Variable		Overall (*N* = 8,141) *n* (%)	Knowledge regarding anemia		*p* *
			Poor (*N* = 2,365) n (%)	Good (*N* = 5,776) n (%)	
Age at first menstruation (year)	Never	22 (0.3)	10 (47.8)	11 (52.2)	.068
	9–12	2,931 (36.0)	809 (27.6)	2,122 (72.4)	
	13–21	5,188 (63.7)	1,546 (29.8)	3,643 (70.2)	
Reading newspaper/ magazine	Not at all	3,199 (39.3)	1,003 (31.4)	2,196 (68.6)	< .001
	Less than once a week	3,622 (44.5)	1,068 (29.5)	2,554 (70.5)	
	At least once a week	1,320 (16.2)	294 (22.3)	1,026 (77.7)	
Listening to radio	Not at all	3,875 (47.6)	1,146 (29.6)	2,729 (70.4)	.651
	Less than once a week	2,920 (35.9)	842 (28.9)	2,077 (71.1)	
	At least once a week	1,346 (16.5)	377 (28.0)	970 (72.0)	
Watching television	Not at all	161 (2.0)	42 (26.0)	119 (74.0)	.002
	Less than once a week	1,345 (16.5)	331 (24.7)	1,014 (75.3)	
	At least once a week	6,635 (81.5)	1,992 (30.0)	4,643 (70.0)	
Using the Internet last month	Not every day	1,872 (23.0)	703 (37.6)	1,169 (62.4)	< .001
	Almost every day	6,269 (77.0)	1,662 (26.5)	4,607 (73.5)	

*Note: * Statistical test with binary logistic regression, significant level p < .10*

Most of the young women who had good knowledge regarding anemia were in the age group of 20–24 years (77.2%), lived in urban areas (74%), were highly educated (79.7%), had wealth index status of the richest (78.1%), menarche age was at 9–12 years (72.4%), had a frequency of reading newspapers at least once a week (77.7%), had a frequency of watching television less than once a week (75.3%), and had a frequency of using the Internet every day (73.5%).

Multivariate analysis

The results of the multivariate analysis showed that the determinants of knowledge regarding anemia among young women 15–24 years were age, residence, education level, wealth index, frequency of reading newspapers/magazines, and frequency of using the Internet. Factor of education level had the highest association with knowledge regarding anemia (Table 4).

Table 4: Determinants of Knowledge Regarding Anemia among Young Women 15–24 Years

Variable		AOR	95% CI	*p value* *
Age group (year)	15–19	Ref	1	
	20–24	1.341	1.140, 1.579	< .001
Residence	Rural	Ref	1	
	Urban	1.178	1.015, 1.367	.031
Educational level	No education/primary	Ref	1	
	Secondary	1.976	1.275, 3.061	.002
	Higher	2.617	1.647, 4.160	< .001
Occupation status	Not working	Ref	1	
	Working	0.903	0.789, 1.034	.140
Wealth index	Poorest	Ref	1	
	Poorer	1.181	0.948, 1.471	.138
	Middle	1.287	1.028, 1.611	.028
	Richer	1.486	1.175, 1.878	.001
	Richest	1.730	1.356, 2.207	< .001
Age at first menstruation (year)	Never	Ref	1	

Variable		AOR	95% CI	*p value* *
	9–12	1.491	0.516, 4.310	.461
	13–21	1.369	0.476, 3.940	.559
Reading newspaper/ magazine	Not at all	Ref	1	
	Less than once a week	1.035	0.907, 1.180	.613
	At least once a week	1.315	1.089, 1.588	.005
Watching television	Not at all	Ref	1	
	Less than once a week	0.913	0.579, 1.439	.695
	At least once a week	0.725	0.471, 1.116	.144
Using the Internet last month	Not every day	Ref	1	
	Almost every day	1.204	1.038, 1.397	.014
Goodness-of-fit				.570

*Note: * Statistical test with multiple logistic regression p < .05 and Hosmer Lemeshow test for goodness of fit models p > .05; AOR = adjusted odds ratio*

Table 4 shows that the significance value of the Hosmer and Lemeshow test on the model was $p = .570$, indicating that the model obtained was acceptable and the test results on the model were acceptable. Table 4 shows that the young women in the age group of 20–24 years had a 1.3 times higher chance of good knowledge than women aged 15–19 years (AOR = 1.341, 95% CI [1.140, 1.579], $p < .001$). Women in urban areas had a 1.2 times higher chance of good knowledge than women in rural areas (AOR = 1.178, 95% CI [1.015, 1.367], $p < .05$). Highly educated women had 3 times higher chances of good knowledge than women who do not attend school (AOR = 2.617, 95% CI [1.647, 4.160], $p < .001$). Women with a better wealth index (the richest) had twice the chance of good knowledge than the poorest women (aOR = 1.730, 95% CI [1.356, 2.207], $p < .001$). Women who read newspapers/magazines at least once a week had a 1.3 times higher chance of good knowledge than women who never read newspapers (AOR = 1.315, 95% CI [1.089, 1.588], $p < .01$). Women who frequently used the Internet had 1.2 times higher chances of good knowledge than women who rarely accessed the Internet (AOR = 1.204, 95% CI [1.038, 1.397], $p < .05$).

Discussion

This study found that over 80% of participants were aware of anemia. This was higher than another study in Ghana that showed that only 37.2% of respondents were aware of anemia (Wiafe et al., 2021). Of those who had heard of anemia, 70% had good knowledge, regardless of using the median as a cut-off. Unfortunately, knowledge about the definition of anemia was still lacking, as well as the causes of anemia. This remains a challenge of iron supplementation in Indonesia (Sungkar et al., 2022). However, more than half of the respondents knew the function of iron supplementation as a treatment for anemia. One of the reasons for this was the existence of a government program, iron supplementation for young women since 2014. This program has been more massive as a part of the National Strategy to Accelerate Stunting Prevention 2018–2014.

Significant findings in this study were that in addition to demographic factors (more mature age, urban living, higher education, and higher wealth index), the habit of reading magazines or newspapers once a week and the use of the Internet every day can increase adolescent girls' knowledge related to anemia. These findings might help health promotion approaches by giving relevant information on anemia in adolescent girls. Good literacy and appropriate media and internet technologies can offer simple and quick access to information.

A communication theory called the "mere-exposure effect" suggests that repeated exposure to a stimulus, such as information, can increase liking and familiarity with that stimulus. This theory proposes that the more we are exposed to a particular message or communication, the more likely we are to remember it and develop a positive attitude towards it. Therefore, repeated information can potentially increase knowledge and influence our perception of that information (Bornstein, 1989).

Sociodemographic factors

Sociodemographics are factors that could influence a person's beliefs and behavior. In the health belief model theory, sociodemographics is one of the modifying factors that will influence a person's beliefs as the basis for their behavior. Modifying factors in the Health Belief Model include age, gender, ethnicity, personality, socioeconomics, and knowledge (Glanz et al., 2008). This study found that childbearing age, education, and wealth status were associated with knowledge of anemia.

The age of women determines their knowledge level. Regarding anemia knowledge, the older women of childbearing age, the more they seek information about anemia. Aged 20-24 is the marriage age and having kids for most women. They are usually concerned with the changes in their body due to pregnancy. It encourages them to seek information about pregnancy care, including anemia prevention during pregnancy. Therefore, they may be more aware and informed about food sources of iron, hemoglobin assessment, and iron tablet consumption. Knowledge of pregnant women about food sources of iron is closely related to the incidence of anemia (Abujilban et al., 2019).

On the other hand, at 15–19 years old, they still do not consider anemia-related matters important. Several studies have described that adolescents' knowledge of anemia is mostly low (Aisah et al., 2022). In addition, there is still a gap in knowledge of the etiology of anemia (van Zutphen et al., 2021). The link between knowledge of anemia in elementary school-age children and anemia also occurs in developing countries such as Thailand (Kaewpawong et al., 2022). It is possible because they are still teenagers, so they still do not care about changes or problems in the body related to anemia.

There were significant differences in knowledge about anemia among young women in urban and rural areas. Young women who live in urban areas have 1.2 times the chance to know about anemia compared to those who live in rural areas. The potential causes of disparities between urban and rural areas may be related to socioeconomic factors, education, and access to knowledge, attitude, and practice sources of information such as community health educators, mass media, and scientific publications. The previous analysis reported that young women aged 20–24 had a higher percentage of knowledge in urban areas. That percentage increased with education (Afifah et al., 2020). Other research in the United States also revealed that people living in rural areas tend to use search engines less than people living in urban areas and have less access to health information from various sources, including blogs, publications, and health workers. Rural residents with limited health literacy have lower access to mass media and scientific literature (Chen et al., 2019).

Our analysis showed that the level of educational attainment might influence the knowledge about anemia among Indonesian women aged 15–24. Previous studies have found an association between the educational and occupational status of women with nutritional knowledge. A study in Ethiopia reported that pregnant women who attended college were

4.5 times more likely to be knowledgeable about nutrition than those who did not (Gezimu et al., 2022). However, we found no difference in anemia knowledge between working and non-working women.

Household wealth is an alternative measure widely used in low and middle-income countries, defined broadly by asset ownership and housing quality. Wealth represents a more permanent economic status at the household level than income or expenditure because it considers available resources and long-term economic status (González et al., 2010). This study found that wealth status has a substantial association with women's awareness of anemia, which is consistent with the findings of numerous other studies that show that the wealth index has a relationship with knowledge and the incidence of anemia (Abate et al., 2021; Asif et al., 2022). This is possible because those with higher wealth status will be able to access more and better education and sources of information. The wealth index also affects adolescents; the lowest wealth index experiences a higher incidence of anemia than the highest (Shaka & Wondimagegne, 2018).

Regarding menstrual age, adolescent girls who attained menarche earlier had better anemia knowledge than their counterparts. However, this association was no longer significant in the multivariate analysis. A study in Myanmar school girls aged 11–18 revealed that menarche motivates adolescent girls to find more information or advice from their mothers, sisters, friends, or teachers (Swe et al., 2022). The earlier the onset of menarche, the more they receive information, which may lead to a better knowledge of anemia. This study also showed that some mothers of schoolgirls stated that the girls should not receive menstruation information before menarche because it would scare them or because the mothers did not feel comfortable discussing it with their children (Swe et al., 2022).

Media access

This study has shown the results of a significant positive relationship between reading newspapers/magazines and knowledge about anemia. This is consistent with the findings of other research on the subject. The level of nutritional knowledge among women can raise awareness about the risk of anemia and its effects on health. Reading newspapers can help them gain knowledge (Roy et al., 2021). Newspapers have confidence in the information of the mass media (Thurman, 2014). As many as 35% of respondents in Scaveldi et al. (2021) considered newspapers or specialized websites as a source of nutritional information. Exposure to mass media about health knowledge is a process that might influence how people act regarding their health. The Precaution Adoption Process Model (PAPM), one of the health behavior theories, attempts to explain how a person decides on an action, especially a decision about health risk (Glanz et al., 2008). Media access or receiving messages through the media is in the initial stage of health decision-making. There are seven stages in PAPM theory, which are unaware, unengaged, undecided, decided not to act, decided to act, acting, and maintaining (Glanz et al., 2008).

Information from the media plays a role when a person is unaware of being unengaged and undecided about the hazards and precautions that lead to action. As an example, related to this study, people who access media containing information about anemia will tend to be more aware of the risks and dangers that may arise if they suffer from anemia. This can change their perception from "unaware" or "unengaged" to the next stage of "undecided" or "decided to act." On the other hand, those who have never accessed information about anemia through the media will tend not to care or not know about the risks and dangers of suffering

from anemia. This keeps them at the "unaware" or "unengaged" level. A significant association between reading newspaper frequency and anemia incidence in this study described how media exposures affect diet (Agustina et al., 2020). The frequency of newspaper exposure to household diets influences the incidence of anemia. People who access media might learn about the benefits of iron-rich food and the signs and symptoms of anemia, which might improve their precautions and finally decide to change their diet. Nisar et al. (2013) discovered that households without media awareness had a 1.56% higher chance of having severe anemia, 1.21% being moderate and 0.98% mildly anemic than others with a level of awareness of accessing mass media.

Health education for young women has effectively increased knowledge and attitudes toward preventing anemia. Based on this research, health education about anemia in young women can improve knowledge and a good mood in preventing anemia (Kusuma & Kartini, 2021). Good knowledge of anemia through health education campaigns can inspire the adoption of anemia prevention strategies among young women (Benfo et al., 2023). As in the PAPM, after a person is aware, engaged, and decided (Stages 1–4), they need others' support, recommendation, social support, time, effort, and resources to act and maintain their behavior (Stages 5 & 6).

There were significant differences in knowledge about anemia among young women using the Internet almost daily. Our analysis showed that women who frequently used the Internet have 1.2 times higher chances of good knowledge than women who rarely accessed the Internet. Other research in the United States also found that internet use has stronger associations with health knowledge for people exhibiting high internet engagement than those showing low internet engagement (Baker et al., 2003). Another survey conducted at Northwestern University found a clear association between health-related internet use and health change. Frequent health-related internet use may promote improved or maintained health, suggesting that this online activity might also support healthy living (Hunsaker et al., 2021).

Despite statistical significance in multivariate analysis, the frequency of watching television was negatively associated with anemia knowledge. This result contradicts previous work that showed television as an essential health information source for young African-American teens (Lariscy et al., 2010). The disparities in findings might be attributed to variations in research design and demographic variables. The current survey did not examine the most popular television show among adolescent girls.

Study limitations

Due to the study's reliance on secondary data from the Indonesian Health Demographic Survey (IDHS), we could not assess the severity level of anemia in the population. No biomedical sampling was conducted at IDHS; consequently, anemia status could not be determined.

Conclusion

This study's findings have significantly contributed to our understanding of Indonesian young women's knowledge of anemia and its related factors. This study discovered that most

women aged 15–24 years had heard of anemia and had good knowledge of the causes and ways to treat anemia. However, a quarter of women had poor knowledge. Sociodemographic factors related to good knowledge were age 20–24 years, living in urban areas, being highly educated, and having the highest socioeconomic level. Therefore, it is suggested that education on anemia among this age group should be encouraged and instituted in the educational curriculum. In addition, reading newspapers/magazines at least once a week and using the Internet daily were media that influenced knowledge about anemia. These media may play a vital role in educating youths about health and nutrition. More focused health education is needed to avoid anemia in young women.

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