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The Correlation between Knowledge, Sleep Patterns, Dietary Pattern, Inhibitors, and Enhancers with Anemia Incidence in Adolescent Girls at Al-Amanah Al-Gontory Islamic Boarding School South Tangerang City

Hubungan Pengetahuan Anemia, Pola Tidur, Pola Makan, Inhibitor*, dan* Enhancer *dengan Kejadian Anemia pada Remaja Putri di Pondok Pesantren Al-Amanah Al-Gontory Kota Tangerang Selatan*

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ABSTRACT

Background: The prevalence of anemia among adolescents in Indonesia in 2018 was approximately 32%. Adolescent girls are ten times more likely to experience anemia than adolescent boys. Anemia can be influenced by knowledge, sleep patterns, dietary pattern, inhibitors, and enhancers.
Objectives: To analyze the relationship between knowledge, sleep patterns, dietary patterns, inhibitors, and enhancers with the incidence of anemia in adolescent girls at Al-Amanah Al-Gontory Islamic Boarding School South Tangerang City.
Methods: This study used a cross-sectional design with 113 samples selected using a stratified random sampling technique. Data analysis used the Chi-Square test and Fisher's Exact.
Results: There was a relationship between sleep patterns (p=0.003), protein intake (p=0.000), iron intake (p=0.000), and inhibitors (p=0.000) and the incidence of anemia and there was no relationship between knowledge (p = 0.156) and enhancer (p = 0.970) with the incidence of anemia.
Conclusions: Anemia can be influenced by a person's sleep patterns. Poor sleep patterns are related to sleep disturbances, lack of sleep, and drowsiness. A person's diet (iron and protein) and frequent consumption of inhibitors can also cause anemia.

INTRODUCTION

Anemia is when hemoglobin in the blood is below the standard value (11.5-12 g/dL), disrupting oxygen transport in the body[1] . In 2013, the prevalence of anemia among adolescents (aged 15-24 years) in Indonesia was around 18.4%[2] . The prevalence in 2018 was around 32%[3] . It represents that 3-4 out of 10 teenagers have anemia problems. In 2018, the number of anemia problems that occurred among adolescent girls in Banten Province under the prevalence of anemia at the national level was around 23%[4] .

Normal hemoglobin levels for female adolescents are >12 g/dl[5] . The problem of anemia occurs because erythrocytes reduce drastically or because the formation process of erythrocytes in the body is too slow[6]. Anemia can be generated by knowledge[7] . A person with good knowledge of anemia will have better food consumption behavior[7] . A study conducted in 2019 explained that there was a relationship between knowledge and the incidence of anemia in young females at SMA Muhammadiyah 4 Depok and SMK Al-Hidayah Cinere[8] .

Anemia is related to the timing and quality of sleep[9]. If sleep doesn't meet the need, oxidative stress will last longer. It will cause the erythrocytes in the body to burst and hemoglobin levels to fall, causing anemia[10]. According to a study conducted in 2018, there was a relationship between sleep patterns and the incidence of anemia in young females at SMA Negeri 2 Binjai[11].

Iron deficiency causes insufficient red blood cell creation in the spinal cord, causing Hb levels to fall and triggering iron anemia[12] . Protein plays a role in the process of storing, absorbing, and distributing iron

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throughout the body[13]. A study conducted in 2019 stated that there was a relationship between iron and protein diets and the incidence of anemia in young females at SMA Muhammadiyah 1 Karanganyar (p-value 0.023)[14].

Consuming iron inhibitors (inhibits absorption) can trigger anemia[15]. In addition, lack of consumption of iron enhancers (increases absorption) can cause anemia[16]. A study conducted in 2019 stated that there was a relationship between inhibitors and anemia in young females at SMA/K Depok[17] . In addition, research conducted in 2022 suggested a relationship between inhibitors and enhancers and anemia in young females at MTs Fadlurrahman[18] .

Research on anemia with female adolescent subjects in Tangerang Selatan is still limited[19] . Therefore, this research was conducted at an Islamic boarding school, Al-Amanah Al-Gontory, in Tangerang Selatan. The author chose the Al-Amanah Al-Gontory Islamic boarding school because it has a management structure that has its sections, including food procurement. The Al-Amanah Al-Gontory school system is a boarding school. Therefore, the school provides sleeping facilities for female students.

Researchers chose female students as the research sample because apart from studying academic subjects, female students also studied religious studies more deeply and memorized the Quran, so there was a possibility that their rest time would be less. The prevalence of anemia in female adolescents is higher than in male adolescents due to the menstrual cycle they experience every month[19]. Young females also care more about their body shape which influences their food consumption[20]. The difference between this research and the other research was that there were more variables than in previous research, and the previous researchers mainly chose locations in public schools. This research aims to determine the relationship between knowledge of anemia, sleep patterns, eating patterns, inhibitors, and enhancers with the incidence of anemia in female adolescents at the Al-Amanah Al-Gontory Islamic Boarding School, Tangerang Selatan.

METHODS

The design of this research is observational analytic and uses a cross-sectional research design. Sampling was collected using the Proportionate Stratified Random Sampling technique. The determination of sample size was calculated by the Slovin formula and the minimum sample obtained was 100 respondents from a population of 330 female students. Calculated using the proportional allocation formula, the respondents were 48 respondents from class X and 52 respondents from class XI. The sample for this study was 113 respondents who were active female students aged 15-18 years, not menstruating, and not smoking. The exclusion criteria were the respondents who were active female students who were not willing to take part in the research, had never experienced menstruation, and used a drug, Paracetamol, whose hydroxylation causes erythrocyte hemolysis. Data were collected using respondent characteristics questionnaires, hemoglobin levels measured using the Easy Touch GCHb tool, anemia knowledge questionnaire, Pittsburgh Sleep Quality Index (PSQI)[21], and Semiquantitative Food Frequency Questionnaire (SQ-FFQ) to obtain respondent characteristics data, anemia data, knowledge data, sleep pattern data, diet data, as well as inhibitor and enhancer consumption data. Univariate analysis was carried out to determine the characteristics of respondents (age, class, pocket money, and TTD or blood builder consumption), data on anemia, knowledge, sleep patterns, eating patterns, inhibitors, and enhancers. In addition, bivariate analysis was carried out using the chi-square test and Fisher's exact test to analyze the relationship between knowledge, sleep patterns, eating patterns, inhibitors, and enhancers and the incidence of anemia in young females at the Al-Amanah Al-Gontory Islamic Boarding School, *Tangerang Selatan.*

RESULTS AND DISCUSSION

The univariate data observed were the distribution of respondent characteristics (age, class, pocket money, and TTD or blood builder supplement consumption of respondents), anemia data of respondents, distribution of knowledge level, distribution of PSQI components, distribution of sleep patterns, distribution of eating patterns, and distribution of consumption of inhibitors and enhancers. Data regarding the characteristics of respondents – age, class, daily pocket money, and blood builder supplement (TTD) consumption are in Table 1. The results of the univariate analysis of overall respondent characteristics showed that the majority of respondents aged 16 are 53.1%. This study was in line with research conducted in 2022 which stated that, at most, young females who took part were 16-year-old girls at SMA Negeri 9 Depok, around 77.9%[22]. The majority of respondents came from class 11, 50.4%. Most respondents received a daily allowance of ≥14,000, 58.4%. Most respondents in this study who did not regularly consume TTD (blood builder supplement) were 50.4%.

Table 1. Distribution of Characteristics of Young Women at the Al-Amanah Al-Gontory Islamic Boarding School, South Tangerang City

Characteristic Respondent	Total (n)	Percentage (%)
Age		
15 year	18	15.9
16 year	60	53.1
17 year	31	27.4
18 year	4	3.5
Class		
10	56	49.6
11	57	50.4

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Characteristic Respondent	Total (n)	Percentage (%)
Pocket Money/day		
Low	47	41.6
High	66	58.4
Consume TTD (blood builder supplement)		
Do not consume	56	49.6
Not a routine	57	50.4
Routine	0	0.0
Anemia		
Anemia	31	27.4
Not Anemia	82	72.6

Data regarding the distribution of respondents' anemia categories are in Table 1. The analysis of the distribution of anemia categories showed that respondents who had anemia incidence were 27.4%. Compared with the prevalence of anemia in 2018 in Indonesia, which was 32%, and in Banten Province, which was 23%, all three prevalences were above 20%, which means that anemia was a public health problem[23]. According to a study conducted in 2022, more than 20% of young females experienced anemia around 26.1% [24].

Table 2. Distribution of knowledge levels of anemia, sleep patterns, protein and iron adequacy levels of adolescent girls at the Al-Amanah Al-Gontory Islamic Boarding School, South Tangerang City

Variable	Total (n)	Percentage (%)
Anemia Knowledge		
Low	57	50.4
High	56	49.6
Sleep Pattern		
Poor	95	84.1
Good	18	15.9
Protein Adequacy		
Not Enough	49	43.4
Enough	64	56.6
Iron Adequacy		
Not Enough	58	51.3
Enough	55	48.7
Consume Iron Inhibitor		
Seldom	82	72.6
Often	31	27.4
Consume Iron Enhancers		
Seldom	58	51.3
Often	55	48.7

Based on the results obtained about the respondents' knowledge, the most wrong answers were in the animal-based dishes absorption question, the Fe enhancer question, and the question of normal red blood cell levels. Data regarding the distribution of respondents' level of knowledge is in Table 2. Respondents who had less knowledge were 50.4%. The minimum and maximum knowledge scores of the female students were 30 and 100, respectively. The standard deviation of the knowledge level was 14.15, where this value was smaller than the mean (62.04), which meant that the knowledge value data was less varied. According to a study conducted in 2022, the percentage of the knowledge level of young females, the majority of whom were less, was around 69.4%[18]. Respondents who had less knowledge were because they had not received counseling and lacked information about anemia[18]. Based on a statement from the respondent administrator from the Al-Amanah Al-Gontory Islamic Boarding School, the female students had received counseling about anemia from the local health center. However, they have not received anemia counseling for a long time since the pandemic outbreak.

Table 3. Distribution of PSQI components for young women at the Al-Amanah Al-Gontory Islamic Boarding School, South Tangerang City

Component PSQI	Total (n)	Percentage (%)
Subjective Sleep Quality		
Very Good	5	4.4
Pretty Good	79	69.9
Pretty Bad	28	24.8
Very Bad	1	0.9

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Component PSQI	Total (n)	Percentage (%)
Sleep Latency		
Very Good	63	55.8
Pretty Good	24	21.2
Pretty Bad	12	10.6
Very Bad	14	12.4
Sleep Duration		
Very Good	2	1.8
Pretty Good	23	20.4
Pretty Bad	16	14.2
Very Bad	72	63.7
Sleep Efficiency		
Very Good	108	95.6
Pretty Good	5	4.4
Pretty Bad	0	0.0
Very Bad	0	0.0
Sleep Disorders		
No distractions	4	3.5
Minor disturbance	99	87.6
Moderate disturbance	10	8.8
Severe disturbance	0	0.0
Use of Sleeping Pills		
Never	112	99.1
1 time/week	0	0.0
2 time/week	0	0.0
≥3 time/week	1	0.9
Daily Activity Dysfunction		
None	9	8.0
Occasionally	37	32.7
Frequently	61	54.0
Always	6	5.3

Data regarding the distribution of respondents' sleep pattern questionnaire components is in Table 3. The components most frequently experienced by female students were sleep disorders with a score of 1-9 (87.6%), sleep duration <5 hours (63.7%), and daily activity dysfunction in the frequent category (54.0%). Based on sleep pattern interviews, nearly all respondents experienced poor sleep patterns due to sleep disorders. Besides, the average number of respondents sleeping hours was <5 hours/day, which means it was insufficient for their needs. Sufficient sleep for individuals aged 12-18 years old was 8 to 9 hours per day[25]. Data regarding the distribution of respondents' sleep patterns is in Table 2. The majority of respondents had poor sleep patterns, 84.1%. The minimum and maximum sleep pattern values obtained by female students were 1 and 21 respectively. The standard deviation value of sleep patterns was 3.96 which was smaller than the mean (11.50), which meant that the sleep pattern value data was less varied. According to a study conducted in 2022, the majority of young females who had poor sleep quality was around 56.5%[24].

Data regarding the distribution of respondents' eating patterns is in Table 2. The majority of respondents had a sufficient level of protein adequacy of 56.6%. The minimum and maximum values for female students' protein adequacy levels were 45.59 grams and 79.70 grams respectively. The standard deviation value for the level of protein adequacy was 5.78, which was smaller than the mean (63.95), which meant that the data on protein intake values was less varied. According to a study conducted in 2022, the majority of young females who had adequate protein intake were around 52.2%[24]. They got sufficient protein needs from several foods with a high protein content[24] Most respondents' iron adequacy level was less, 51.3%. The minimum and maximum values for female students' iron intake patterns were 5.36 mg and 15.82 mg. The standard deviation value for iron intake patterns was 3.54, where this value was smaller than the mean (9.86), which meant that the data on iron intake values was less varied. According to a study conducted in 2022, the majority of female adolescents' iron intake was deficient, around 65.2%[24]. The majority of respondents consume foods, such as rice with a frequency of > once a day (1 rice spoon), tofu with a frequency of 1-2 times a week (1 piece), and tempeh with a frequency of 1-2 times a week (1 piece).

Data regarding the distribution of respondents' Fe inhibitor consumption is in Table 2. The majority of respondents, 72.6%, rarely consumed Fe inhibitors. According to a study conducted in 2019, the majority of young females who consumed Fe inhibitors more frequently was around 51.2%[17]. The frequent intake of inhibitors was because young females consume iron-inhibiting food[26]. The majority of respondents consume foods that inhibit iron absorption, such as tea with a frequency of 1-2 times a week (1 glass), cassava leaves with a frequency of 1-2 times a week (1 tablespoon), and

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mustard greens with a frequency of 1-2 times a week (1 tablespoon).

Data regarding the distribution of respondents' enhancer consumption is in Table 2. The majority of respondents who rarely consumed Fe enhancers were around 51.3%. According to a study conducted in 2019, the majority of young females, 54.7%[8], consumed Fe enhancers less frequently. The majority of respondents consumed foods that increase iron absorption, such as oranges with a frequency of once a day (1 fruit), bananas with a frequency of 1-2 times a week (1 fruit), and vitamin C supplements with a frequency of once a week (1 tablet).

Individual level of knowledge can be a factor in the incidence of anemia[7]. An individual's knowledge about anemia can be applied in daily life. The individual's knowledge can prevent the incidence of anemia so that there is a reduction in the incidence of anemia[38]. The following are the results of an analysis of the relationship between the knowledge of anemia and the incidence of anemia among female students at the Al-Amanah Al-Gontory Islamic Boarding School.

Table 4. Analysis of the relationship between level of knowledge, sleep patterns, intake and the incidence of anemia

	Anemia				Total		P-value	*OR*
	Anemia		Not Anemia					
	n	%	n	%	N	%		
Anemia Knowledge								
Low	19	33.3	38	66.7	57	100	0.156	1.8
High	12	21.4	44	78.6	56	100		
Sleep Pattern								
Poor	31	32.6	64	67.4	95	100	0.003*	20.5
Good	0	0.0	18	100.0	18	100		
Protein Adequacy								
Not Enough	30	61.2	19	38.8	49	100	0.000**	99.47
Enough	1	1.6	63	98.4	64	100		
Iron Adequacy								
Not Enough	26	44.8	32	55.2	58	100	0.000**	8.13
Enough	5	9.1	50	90.9	55	100		
Consume Iron Inhibitor								
Seldom	22	71.0	9	29.0	31	100	0.000**	0.1
Often	9	11.0	73	89.0	82	100		
Consume Iron enhancers								
Seldom	16	27.6	42	72.4	58	100	0.970	1.0
Often	15	27.3	40	72.7	55	100		

*fisher's exact test, significant <0.05 ; ** chi-square test, significant <0.05

Data regarding the level of knowledge based on the incidence of anemia of respondents and the results of the chi-square test on the relationship between knowledge level and the incidence of anemia are in Table 4. Most high-knowledge respondents (78.6%) did not have anemia, and low-knowledge respondents (33.3%) had anemia. During the preliminary study, one of the people in charge stated that the female students at the Al-Amanah Al-Gontory Islamic Boarding School had received counseling regarding anemia but not further counseling since the pandemic. Counseling about anemia young females receive will influence their level of knowledge. An individual's knowledge level will affect the behavior[15].

There were still respondents who had high knowledge but still experience anemia (21.4%). If the knowledge that an individual has is improperly applied, it will not affect the incidence of anemia[7]. The respondents who gained less knowledge, 66.7%, did not experience anemia. However, this does not rule out the possibility that the respondents with poor knowledge could have anemia[7].

The results of the bivariate test using the chi-square test showed a p-value of 0.156 (>0.05), so it can be implied that there was no relationship between knowledge and the incidence of anemia in female students at the Al-Amanah Al-Gontory Islamic Boarding School. Even though there was no relationship, female students at the Al-Amanah Al-Gontory Islamic Boarding School, 57 respondents, still had a majority of low levels of knowledge. It was in line with some previous studies. The study conducted in 2015 suggested no relationship between the knowledge and the incidence of anemia in respondents in 3 high schools in Yogyakarta (p-value 0.037)[7]. Then, the study conducted in 2020 stated that there was no relationship between anemia knowledge and the incidence of anemia in young females in Cariu Village, Tangerang (p-value 1.000)[27].

Sleep time and quality are related to the incidence of anemia[9]. Data regarding sleep patterns based on the incidence of anemia in respondents and the chi-square test result of the relationship between sleep patterns and the incidence of anemia are in Table 4. The majority of respondents with poor sleep patterns (32.6%) experienced anemia, while all respondents with good sleep patterns (100.0%) did not experience anemia. A study conducted in 2020 stated that respondents who had poor sleep patterns but did not experience anemia were due to other influencing factors – consumption of TTD (blood builder supplement), vitamin C, animal protein, and diet[28].

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The results of the bivariate test using Fisher's exact test showed a p-value of 0.003 (<0.05), so it can be concluded that there was a significant relationship between sleep patterns and the incidence of anemia in female students at the Al-Amanah Al-Gontory Islamic Boarding School. Based on the results of interviews in this study, respondents had poor sleep patterns because they experienced sleep disorders, sleep time of < 5 hours, and dysfunctional activities during the day (drowsiness). The result was in line with a study conducted in 2018 that showed the relationship between sleep patterns and the incidence of anemia in young females at SMA Negeri 2 Binjai (p-value 0.000)[11]. and research conducted in 2020 that showed the relationship between sleep quality and the incidence of anemia in young females at SMA Negeri 14 Bekasi (p-value 0.049)[28]. If someone has poor sleep quality, it will hinder the production of the melatonin hormone[29]. In addition, oxidative stress will occur longer, causing more rapid damage to erythrocytes and a decrease in hemoglobin[30]. The Odds Ratio value for sleep patterns was 20.5, meaning that female adolescents with poor sleep patterns were at 20.5 times the risk of experiencing anemia compared to female adolescents with good sleep patterns.

An individual's eating activity to meet daily food needs is eating patterns[6]. Data regarding the level of protein adequacy based on the incidence of anemia in respondents and the chi-square test results of the relationship between the level of protein adequacy and the incidence of anemia is in Table 4. The majority of respondents who had a low level of protein adequacy (61.2%) experienced anemia, while the majority of respondents who had sufficient protein (98.4%) did not experience anemia. Adequate protein consumption, including dietary behavior, has been carried out by female students at the Al-Amanah Al-Gontory Islamic Boarding School, so they have not experienced anemia. Protein transports iron in the blood that, later, is used in the process of hemoglobin forming[31]. If there is a lack of protein, the process does not work well, so hemoglobin levels fall and iron anemia occurs[31].

The results of the bivariate test using the chi-square test showed that the p-value for the level of protein adequacy showed a p-value of 0.000 (<0.05), so it can be concluded that there was a significant relationship between protein intake and the incidence of anemia in female students at the Al-Islam Islamic Boarding School. Al-Gontory Trust. According to a study conducted in 2022, the result showed that there was a relationship between protein intake and the incidence of anemia in respondents at SMA Negeri 2 Tambun Selatan (p-value 0.004)[24]. In addition, the result of a study conducted in 2016 showed that there was a relationship between protein intake and the incidence of anemia in respondents at MTs Ciwandan (p-value 0,000)[31]. The Odds Ratio value for protein intake was 99.47, meaning that young females with less protein intake were 99.47 times more likely to experience anemia than those having sufficient protein intake. According to a study conducted in 2016, respondents who had less protein intake tended to be 1.7 times more at risk of developing anemia[32].

Data regarding iron intake patterns based on the incidence of anemia in respondents and the results of the chi-square test, the relationship between the level of iron adequacy and the incidence of anemia is in Table 4. The majority of respondents who had a sufficient level of iron adequacy (90.9%) did not experience anemia. The foods that respondents often consume are rice, tofu, and tempeh. The amount of iron excreted is approximately 42 mg per menstrual cycle[33]. The iron needs of adolescents 16 to 18 years old are around 15 mg[34]. If the iron level does not meet the iron needs, it will disrupt the production process of red blood cells in the spinal cord, causing hemoglobin levels to decrease and triggering iron anemia[35].

The results of the bivariate test using the chi-square test for iron intake showed a p-value of 0.000 (<0.05), so it can be concluded that there was a significant relationship between the level of iron adequacy and the incidence of anemia in female students at the Al-Amanah Al-Gontory Islamic Boarding School. Iron adequacy was still lacking at the Al-Amanah Al-Gontory Islamic Boarding School due to the respondent's lack of iron consumption behavior. According to a study conducted in 2022, the result showed that there was a relationship between iron intake and the incidence of anemia in young females at SMA Negeri 2 Tambun Selatan (p-value 0.035)[24]. The Odds Ratio value for iron intake was 8.13, which meant that young females with less iron intake were at 8.13 times the risk of experiencing anemia compared to those with sufficient iron intake. According to a study conducted in 2016, respondents who had less iron intake tended to be 1.7 times more at risk of developing anemia[32].

Consumption of inhibitors that inhibit Fe absorption can cause anemia[15]. Data regarding categories of inhibitor consumption based on the incidence of anemia in respondents and the results of the chi-square test of the relationship between inhibitor consumption and the incidence of anemia are in Table 4. The majority of respondents who often consumed inhibitors experienced anemia, 71.0%, while the majority of respondents who rarely consumed inhibitors did not experience anemia, 89.0%. It was related to consuming foods that inhibit iron absorption most frequently consumed by respondents – tea, cassava leaves, and mustard greens. Inhibitors that bind with iron build complex compounds that are insoluble in water, so they can inhibit iron absorption and cause iron deficiency anemia[36].

The results of the bivariate test using the chi-square test showed a p-value of 0.000 (<0.05), so it can be concluded that there was a significant relationship between consumption of Fe inhibitors and the incidence of anemia in female students at the Al-Amanah Al-Gontory Islamic Boarding School. Respondents who frequently consumed inhibitor foods tended to experience anemia. The study conducted at the Al-Mizan Muhammadiyah Lamongan Islamic Boarding School in 2022 showed a relationship between inhibitors and the incidence of anemia in female students (p-value 0.012)[37]. The prevalence of female students who do not experience anemia will also increase if female students consume inhibitors less frequently[37]. The study conducted in 2019 showed that there was a relationship between inhibitors and the incidence of anemia in

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respondents at SMA Muhammadiyah 4 Depok and SMK Al-Hidayah Cinere (p-value 0.009)[8]. The Odds Ratio value for inhibitor consumption was 0.1, which meant that female adolescents who frequently consumed inhibitors were at 0.1 times the risk of experiencing anemia compared to female adolescents who consumed inhibitors infrequently. According to a study conducted in 2019, respondents who frequently took inhibitors tended to be 2.5 times more at risk of developing anemia[8].

Lack of consumption of enhancers (substances that increase Fe absorption) can cause anemia[16]The following are the results of an analysis of the relationship between enhancer consumption and the incidence of female student anemia at the Al-Amanah Al-Gontory Islamic Boarding School. Data regarding enhancer consumption categories based on the incidence of anemia in respondents and the results of the Chi-square test of the relationship between enhancer consumption and the incidence of anemia are in Table 4. The majority of respondents who frequently consumed enhancers, 72.7%, did not experience anemia. It was related to not all respondents consuming foods that increase iron absorption, such as oranges, bananas, and vitamin C supplements. Consuming enhancers supports the absorption of non-heme iron, maintains low intestinal pH, and is a monomeric chelator that will form iron-ascorbate chelate that eases the absorption process[36]. The insufficient consumption of enhancers will disrupt the process and can cause anemia.

The results of the bivariate test using the Chi-square test showed a p-value of 0.970 (>0.05), so it can be concluded that there was no relationship between enhancer consumption and the incidence of anemia in female students at the Al-Amanah Al-Gontory Islamic Boarding School. The number of respondents who consumed and did not consume enhancers was not much different. A study conducted in the Al-Mizan Muhammadiyah Lamongan Islamic Boarding School in 2022 showed that there was no relationship between enhancers and the incidence of anemia in respondents (p-value 0.339)[37]. Based on this research, the food menu of Islamic boarding schools only consisted of rice and side dishes, and no fruit was provided[37]. A study conducted in 2019 showed that there was no relationship between enhancers and the incidence of anemia in respondents at SMA Muhammadiyah 4 Depok and SMK Al-Hidayah Cinere (p-value 0.511)[8].

CONCLUSIONS

Anemia can be influenced by a person's sleep patterns. Poor sleep patterns are related to sleep disturbances, lack of sleep, and drowsiness. A person's diet (iron and protein) and frequent consumption of inhibitors can also cause anemia. The research still has limitations because it did not observe other factors related to anemia such as the menstrual cycle, morbidity factors such as worms and infections, frequency of taking blood supplement tablets, use of drugs and supplements and other factors.

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