Public Health Perspectives Journal

The Relationship between Adolescent Girls' Lifestyle and the Incidence of Anemia in High School Students in Cirebon City

Anggie Puspitasari✉, Oktia Woro Kasmini Handayani, Sofwan Indarjo

Master of Public Health, Universitas Negeri Semarang, Indonesia

Article Info

Abstract

Anemia is still one of the health problems in society, especially adolescent girls. The prevalence of anemia in adolescent girls in Cirebon City in 2023 was 36.6%. This study aims to determine the relationship between the lifestyle of adolescent girls and the incidence of anemia in high school students in Cirebon City. The method used in this study is observational analytic using a cross-sectional design. The sample used in this study was 116 adolescent girls. Data collection was carried out by means of structured interviews using questionnaires and checking Hb levels using auto check. Data analysis used includes univariate and bivariate analysis using the chi-square test and multivariate analysis using the logistic regression test. This study shows the results of a significant relationship between dietary patterns including energy consumption $p = (0.001)$, protein consumption $p = (0.009)$, iron consumption $p = (0.001)$, rest patterns p (0.010) with the incidence of anemia and there is no significant relationship between physical activity patterns $p = (0.331)$ with the incidence of anemia. Logistic regression test in multivariate analysis showed that the most influential factor on anemia was the energy consumption diet with OR 7.305. From the results of the study, it can be concluded that there is a significant relationship between diet including energy, protein and iron consumption and rest patterns with the incidence of anemia and the most influential factor on the incidence of anemia is energy consumption.

✉Correspondence Address:
Kampus UNNES Jl Kelud Utara III, Semarang, 50237, Indonesia
E-mail: anggiepuspitasari784@gmail.com

INTRODUCTION

Anemia is defined as a condition of low red blood cell count or low hemoglobin levels in the blood. Among the known causes of anemia, iron deficiency is the most common. (WHO, 2020).

The World Health Organization (WHO) reports that the global prevalence of anemia ranges from 40-88%. In Africa, it is estimated that 106 million women and 103 million children suffer from anemia, while in Southeast Asia, there are 244 million women and 83 million children who suffer from anemia. experience the impact of the incident anemia (WHO, 2023). Based on the results of the 2022 Riskesdas, the prevalence of anemia in adolescent girls in Indonesia was 72.3%. The trend that occurs in cases of anemia in the proportion of anemia in the 15-24 years old age group of adolescent girls continues to increase, this shows that the incidence of anemia in Indonesia has not yet reached the expected national target of 30% (Ministry of Health of the Republic of Indonesia, 2023). West Java Province has a fairly high prevalence of anemia, namely 41.93% in 2018, this has increased compared to 2013, which was 37.1% (Ministry of Health of the Republic of Indonesia, 2023).

Cirebon City has a prevalence of anemia in adolescent girls of 36.6% in 2023 and 34.7% in 2022. This shows an increase in the prevalence of anemia in adolescent girls from the previous year (Cirebon City Health Office, 2024).

Factors causing anemia in adolescent girls are due to inadequate food intake such as improper diet and unhealthy diet patterns so that protein intake is reduced while the formation of hemoglobin in the blood can be obtained, one of which is by consuming protein (Paramastri et al., 2021). In addition, most adolescent girls have anemia status because they menstruate every month so that need large iron intake (Wiafe et al, 2023). Other causal factors too play a role in the occurrence of anemia in adolescent girls, including the lifestyle of adolescent girls, including rest patterns (Oktavianis., 2023) lack of exercise (Fahira Lubis et al., 2023), tea drinking habits (Febianingsih et al., 2019), nutritional status (Putri et al., 2024), infectious diseases (Bharati et al., 2009), parental education (Chowdhury & Chakraborty, 2017), knowledge (Lismiana & Indarjo, 2021), iron supplement consumption (Nadiyah et al., 2022), family income (Sappani et al., 2023), Body Mass Index (Indriastuti Kurniawan et al., 2006). Therefore, adolescent girls are more at risk of anemia caused by iron deficiency. Anemia will affect the health of adolescent girls, especially on body immunity, academic achievement, concentration, physical fitness and productivity of adolescents if anemia is not treated properly (Miguel et al., 2021).

According to research by Fadila and Risca (2022), adolescent girls have a higher risk of anemia because they are in the process of growing up and need more nutritional intake, especially iron intake (Fadila Putri & Risca Fauzia, 2022).

According to Miguel et al (2021) Anemia can be caused by an unhealthy lifestyle such as poor diet, rest patterns, and physical activity patterns that are not considered, resulting in a deficiency of iron, folic acid, vitamin B12 and vitamin A. Anemia can also be caused by acute or chronic inflammation, parasitic infections, congenital disorders that affect hemoglobin synthesis, and lack of red blood cell production (Miguel et al., 2021). The impact of anemia on adolescent girls may cause fatigue, poor concentration, alopecia, brittle/ridged nails, sore and restless legs, reduced exercise tolerance, anxiety, low mood/depression, and poor work performance. (Benson et al., 2021).

Based on the background above, the researcher is interested in conducting a study on the relationship between the lifestyle of adolescent girls and the incidence of anemia in high school students in Cirebon City. By knowing the relationship between the lifestyle of adolescent girls and the incidence of anemia, it is hoped that the lifestyle of the community, especially high school students in Cirebon City, can be further improved in order to support the control of anemia in adolescent girls to prevent the severity of symptoms in order to improve the quality of life for the better.

METHOD

This study is a quantitative research using a cross-sectional design approach. The sample in

this study were 116 high school students in Cirebon City. The study was conducted in August 2024. The independent variable in this study is the lifestyle of adolescents which includes eating patterns, rest patterns and physical activity patterns, the dependent variable in this study is the incidence of anemia in female adolescents. The sampling technique in the study was cluster random sampling. Researchers used data collection tools in the form of a 24-hour Food recall form questionnaire which was carried out for 2 days and the Food Frequency Questionnaire (FFQ), a rest pattern questionnaire using the Pittsburgh Sleep Quality Index (PSQI) questionnaire and a physical activity pattern questionnaire using the Global Pshycal Activity Questionnaire (GPAQ) and checking hemoglobin levels with a digital Hb tool (auto check). Data analysis using univariate analysis, bivariate analysis with the chi square test and multivariate analysis using the logistic regression test.

RESULTS AND DISCUSSIONS

The incidence of anemia in female adolescents in high school students in Cirebon City showed that out of 116 respondents, 34 respondents (29.3%) experienced anemia and 82 respondents (70.7%) did not experience anemia.

Table 1. Respondent characteristics based on age of female adolescents in high school students in Cirebon City

Age	N	%
15 years	63	54.3
16 years	27	23.3
17 years	23	19.8
18 years	3	2.6
Total	**116**	**100**

Based on the table 1, the characteristics of respondents based on the age of adolescents in high school students in Cirebon City, there are 63 respondents (54.3%) aged 15 years, 27 respondents (23.3%) aged 16 years, 23 respondents (19.8%) aged 17 years and 3 respondents (2.6%) aged 18 years.

Based on the results of the analysis of the relationship between energy consumption and the incidence of anemia in high school students in Cirebon City on table 2, it shows that female adolescents with a poor energy consumption category tend to experience anemia as many as 31 respondents (39.7%) compared to female adolescents with a good energy consumption category, namely 3 respondents (7.9%). Meanwhile, female adolescents who are not anemic have a poor energy consumption category of 47 respondents (60.3%) and a good energy consumption category of 35 respondents (92.1%). The results of the bivariate analysis using the chi-square test obtained a p-value of 0.001 (p <0.05) so that H_0 is rejected and Ha is accepted, meaning that there is a significant relationship between energy consumption eating patterns and the incidence of anemia in female adolescents.

This is in line with research conducted by Agustina et al. (2017), where there was a significant relationship between energy nutrient intake and the incidence of anemia in adolescent girls in Kebumen district. Energy consumption is one of the main factors in the body's metabolic process. Low energy nutrient intake can be caused by the amount of energy intake not being met. Consumption of varied energy-producing foods and breakfast habits are possible factors for the lack of energy intake in adolescent girls (Agustina, Laksono, & Indriyanti, 2017) .

Another study was also conducted by Junengsih and Yuliasari (2017) obtained a p value <0.05 which means there is a significant relationship between energy intake and the incidence of anemia in female adolescents at SMU 98 East Jakarta. (Junengsih & Yuliasari, 2017) . Energy consumption can be one of the determining factors of nutritional status and can be the cause of a disease, one of which is anemia in female adolescents. In addition, the adequacy of energy nutrient intake can be influenced by the ability to buy food and the availability of food in the family (Junengsih & Yuliasari, 2017) .

Based on the results of the analysis of the relationship between protein consumption and the incidence of anemia in high school students in Cirebon City, it shows that female adolescents with a category of poor protein consumption tend to experience anemia as many as 32 respondents

Table 2. Relationship between Lifestyle of Adolescent Girls and the Incidence of Anemia in High School Students in Cirebon City

Variable	Anemia Occurrence						P Value	PR (CI 95%)
	Anemia		No Anemia		Total			
	N	%	N	%	N	%		
Dietary habit								
Energy Consumption								5.034 (1.643-15.427)
Not good	31	39.7	47	60.3	78	100	0.001	
Good	3	7.9	35	92.1	38	100		
Protein Consumption								4.854 (1.243-18.952)
Not good	32	36	57	64	89	100	0.009	
Good	2	7.4	25	92.6	27	100		
Iron Consumption								4.840 (1.581-14.818)
Not good	31	39.2	48	60.8	79	100	0.001	
Good	3	8.1	34	91.9	37	100		
Rest Pattern								2.938 (1.234-6.994)
Bad	29	37.7	48	62.3	77	100	0.010	
Good	5	12.8	34	87.2	39	100		
Physical Activity Patterns								0.712 (0.402-1.259)
Not enough	15	24.6	46	75.4	61	100	0.331	
Enough	19	34.5	36	65.5	55	100		

(36%) compared to female adolescents with a category of good protein consumption, namely 2 respondents (7.4%). Meanwhile, female adolescents who are not anemic have a category of poor protein consumption of 57 respondents (64%) and a category of good protein consumption of 25 respondents (92.6%). The results of the bivariate analysis using the chi-square test obtained a p-value of 0.009 (p <0.05) so that H_0 is rejected and Ha is accepted, meaning that there is a significant relationship between dietary patterns of protein consumption and the incidence of anemia in female adolescents. This is not in line with research conducted by Junengsih and Yuliasari (2017), which states that there is no significant relationship between protein intake consumption and the incidence of anemia in female adolescents at SMU 98 East Jakarta (Junengsih & Yuliasari, 2017).

However, this study is in line with the study of Agustina et al. (2017), which was conducted in Kebumen Regency, obtained a p value <0.05, which means that there is a significant relationship between protein consumption intake and the incidence of anemia in adolescent girls. Low iron absorption can be caused by a lack of protein consumed by the body, this can cause the body to lack iron so that

there is a decrease in hemoglobin levels which will continue to cause anemia (Agustina et al., 2017).

Protein has the function of building, regulating, and driving the body's metabolism. Protein is a provider of amino acids which are important components of cells in the body. Two types of proteins such as transferrin and ferritin, help transport and store iron. Protein deficiency can cause low hemoglobin levels, which are bonds of globin and heme proteins. Protein helps growth and stores energy when energy intake is reduced (Salisa, 2023). Daily protein intake must be met. Daily protein intake can be obtained by consuming foods that contain lots of protein such as fish, meat, chicken, eggs, tofu, and tempeh. Adequate protein intake shows that consumption of side dishes is generally supplied from vegetable and animal side dishes (Miguel et al., 2021).

Based on the results of the analysis of the relationship between iron consumption and the incidence of anemia in high school students in Cirebon City, it shows that adolescent girls with a poor iron consumption category tend to experience anemia as many as 31 respondents (39.2%) compared to adolescent girls with a good iron consumption category, namely 3 respondents (8.1%). Meanwhile, adolescent girls

who are not anemic have a poor iron consumption category of 48 respondents (60.8%) and a good iron consumption category of 34 respondents (91.9%). The results of the bivariate analysis using the chi-square test obtained a p-value of 0.001 (p <0.05) so that H_0 is rejected and Ha is accepted, meaning that there is a significant relationship between dietary iron consumption patterns and the incidence of anemia in adolescent girls. These results are not in line with research conducted by Fadila and Risca (2022) which states that there is no significant relationship between consumption of iron sources and the incidence of anemia in junior high and high school adolescent girls in the Bantul area (Fadila Putri & Risca Fauzia, 2022).

However, these results are in line with research conducted by Kharisma Putri et al (2024), obtained p value <0.05 which means there is a significant relationship between iron consumption and the incidence of anemia in adolescent girls. Adolescence requires sufficient iron intake to support growth and replace iron lost when adolescent girls menstruate every month (Putri et al., 2024). Research conducted by Paramastri et al (2021) shows that there is a significant relationship between diet and the incidence of anemia. The possible mechanism of the relationship between diet and anemia, especially iron deficiency anemia, can be associated with the effect of food components on iron absorption (Paramastri et al., 2021).

Iron is a very important component in the formation of hemoglobin, which functions to synthesize hemoglobin. Excess iron that occurs in the body in the form of ferritin protein will be stored in the liver, spleen, spinal cord and muscles (Wiafe et al., 2023). If the formation of red blood cells iron is not met, an imbalance will occur which will result in low serum ferritin and anemia. Adolescents have an iron requirement of 26 mg/hr (Agustina et al., 2017).

Based on the results of the analysis of the relationship between rest patterns and the incidence of anemia in high school students in Cirebon City, it shows that female adolescents who have poor rest patterns tend to experience anemia as many as 29 respondents (37.7%) compared to female adolescents who have good rest patterns, namely 5 respondents (12.8%).

Meanwhile, female adolescents who are not anemic have poor rest patterns as many as 48 respondents (62.3%) and good rest patterns as many as 34 respondents (87.2%). The results of the bivariate analysis using the chi-square test obtained a p-value of 0.010 (p <0.05) so that H_0 is rejected and Ha is accepted, meaning that there is a significant relationship between rest patterns and the incidence of anemia in female adolescents.

These results are in line with research conducted by Oktavianis et al (2023), on the relationship between lifestyle and the incidence of anemia in adolescents with a p value of 0.003 (<0.05) which means there is a significant relationship between rest patterns and the incidence of anemia. to maintain optimal health, rest and sleep are needed. Rest and sleep greatly affect cells in the body and repair damage to cells more quickly, if rest and sleep are met, the amount of energy expected to meet daily needs is met (Oktavianis et al., 2023).

Research was also conducted by Paramastri et al (2021) on the relationship between lifestyle and the incidence of anemia which showed a p-value <0.001, which means that there is a significant relationship between sleep duration and the incidence of anemia (Paramastri et al., 2021).

According to research by Astutik et al. (2023), there is a significant relationship between sleep patterns and the incidence of anemia in adolescents. Lack of rest, especially sleep, can cause several effects on the body such as drowsiness during the day, fatigue and can affect mood so that this is one of the main factors that influences student learning achievement (Astutik et al., 2023).

In this resting and sleeping condition, the hemostatic function works in the body and provides freshness which plays an important role in normal thermoregulation and energy storage (Astutik et al., 2023). The National Institute of Health says that adolescents have a higher risk of experiencing sleep disorders. This can be proven by the dramatic changes experienced by adolescents such as sleep-wake patterns, such as less sleep duration, differences in sleep patterns on weekends and on weekdays, delayed bedtime, this can cause suboptimal sleep quality in

adolescents (Indriastuti Kurniawan et al., 2006).

Researchers assume that there is a relationship between rest patterns and the incidence of anemia in adolescent girls, one of which is because most adolescent girls often stay up late and sleep less than 7 hours at night to play gadgets and complete school assignments so that they experience sleep delays. As a result, when doing activities the next day, many adolescent girls are sleepy, tired and stressed (Oktavianis et al., 2023).

Based on the results of the research that has been conducted, it shows that adolescent girls who have a pattern of less physical activity tend to experience anemia as many as 15 respondents (24.6%) compared to adolescent girls who have a pattern of sufficient physical activity, namely 19 respondents (34.5%). Meanwhile, adolescent girls who are not anemic have a pattern of less physical activity as many as 46 respondents (75.4%) and a pattern of sufficient physical activity as many as 36 respondents (65.5%). The results of the bivariate analysis using the chi-square test obtained a p-value of 0.331 (p> 0.05) so that H_0 is accepted and Ha is rejected, meaning that there is no significant relationship between physical activity patterns and the incidence of anemia in adolescent girls. This is in line with research conducted by Nadiyah et al (2022) where there was no significant relationship between physical activity patterns and the incidence of anemia in rural adolescent girls in Indonesia (Nadiyah et al, 2022).

Based on research conducted by Oktivianis et al (2023) on the relationship between lifestyle and the incidence of anemia, it shows a p-value of 0.222 or > 0.05, which means there is no significant relationship between the relationship between lifestyle related to physical activity patterns and the incidence of anemia in female adolescents at SMA Negeri 5 Bukittinggi City (Oktavianis et al., 2023). Hasyim's research (2018) states that there is no significant relationship between physical activity patterns and the incidence of anemia in female students at SMA Negeri 2 Pringsewu. This is thought to be because when adolescents are able to meet their calorie needs when doing higher physical activity, energy deficiency can be prevented (Hasyim, 2018). However, this study is not in line

with the research conducted by Paramastri et al (2021) which states that there is a significant relationship between physical activity patterns and the incidence of anemia. Respondents who have a pattern of less physical activity tend to have low hemoglobin levels compared to respondents who have a pattern of sufficient physical activity (Paramastri et al., 2021).

According to WHO (2012), Physical activity patterns are everything we do that requires skeletal muscle movement to carry out daily activities and requires a place to do it (WHO, 2012). The pattern of adolescent physical activity can be seen from how adolescents allocate time during 24 hours in their daily lives to do a type of activity repeatedly. Physical activity helps adolescents in their growth (Vagetti et al., 2014). The physical development and activities of adolescents greatly influence their academic achievement, adolescents who get the opportunity to train their physical will have more intellectual mental aspects compared to children who do not get enough to train their physical (Claudia et al, 2023).

Researchers assume that the absence of a significant relationship between physical activity patterns and the incidence of anemia can be caused because when adolescents do high physical activity, they require a lot of energy intake and a lot of energy is absorbed so that when adolescents do not meet their energy needs, it will cause malnutrition which can increase the risk of anemia (Anwar, Arifin, & Aminarista, 2021). In addition, there are several factors from adolescent habits such as the use of gadgets in everyday life which are needed for learning needs and socializing with friends using social media, this is one of the factors for adolescents to spend time at home playing gadgets so that they ignore eating patterns which can cause a lack of nutritional intake consumed and result in anemia in adolescent girls (Oktavianis et al., 2023).

Another factor that causes anemia in adolescent girls is because adolescent girls have experienced menstruation and need more iron intake, one of which is by consuming iron tablets (TTD) to prevent red blood cell deficiency (Deivita et al., 2021). However, many adolescents ignore consuming iron tablets (TTD) due to the lack of adolescent knowledge about the

importance of consuming iron tablets (TTD) so that many adolescent girls experience anemia (Lismiana & Indarjo, 2021).

Multivariate analysis using multiple logistic regression to see the most dominant independent variables related to the incidence of anemia. The initial stage was carried out with bivariate analysis between independent variables and dependent variables with a p-value <0.25 which was considered significant and potential to be included in the modeling. The results of the bivariate selection in table 3

show that the variables that produce p-values <0.25 are energy consumption patterns, protein consumption patterns, iron consumption patterns and rest patterns. While the physical activity pattern variable has a p-value > 0.25 so that the physical activity pattern variable is not included in the multivariate analysis. After bivariate analysis was carried out to examine the impact of each variable on the incidence of anemia, multivariate analysis was carried out by applying a logistic regression test using the backward method.

Table 3. Logistic Regression Analysis of the Relationship between Lifestyle of Adolescent Girls and the Incidence of Anemia in High School Students in Cirebon City

Variable	P Value	PR	95% CI	
			Lower	Upper
Energy Consumption	0.001	5.034	1.643	15.427
Protein Consumption	0.009	4.854	1.243	18.952
Iron Consumption	0.001	4.840	1.581	14.817
Rest Pattern	0.010	2.938	1.234	6.994
Physical Activity Patterns	0.331	0.712	0.402	1.259

Table 4. Logistic Regression Analysis Using Backward Method

Variables	B	P Value	SE	df	Wald	OR	CI 95%
Energy Consumption	1.989	0.002	0.654	1	9.242	7.305	2.027-26.327
Rest Pattern	1.346	0.015	0.553	1	5.913	3.841	1.298-11.364
Constant	0.072	0.778	0.226	1	0.073	1.074	

After controlling for other variables, there are two variables that contribute strongly as factors related to the incidence of anemia in adolescents in high school students in Cirebon City. The results of multiple logistic regression analysis in table 4.15 show that the energy consumption diet and rest patterns have a p-value <0.05, meaning that the two variables have a significant relationship with the incidence of anemia in female adolescents. The variable with the smallest p-value and the largest OR (Exp B) value is the variable that is most dominantly related to the incidence of anemia. So that the energy consumption diet variable is the variable that is most dominantly related or has the greatest influence on the incidence of anemia in female adolescents in high schools in Cirebon City.

CONCLUSION

Based on the results of the research that

has been conducted, it can be concluded that there is a relationship between dietary patterns including energy consumption, protein consumption, iron consumption and rest patterns with the incidence of anemia in female adolescents in high school students in Cirebon City. There is no relationship between physical activity patterns and the incidence of anemia in female adolescents in high school students in Cirebon City and there is a dietary pattern factor (iron consumption) that has the most influence on the incidence of anemia in female adolescents.

ACKNOWLEDGEMENT

conduct this research.

REFERENCES

Agustina, EE, Laksono, B., & Indriyanti, DR (2017). Determinants of the Risk of Anemia in Adolescent Girls Based on Education Level in Kebumen Regency. *Public Health Perspective Journal* , 2 (1), 26–33. Retrieved from https://jou rnal.unnes .ac.id/nju/index.php/phpj/article/view/ 10995/6674

Anwar, IVFS, Arifin, DZ, & Aminarista, A. (2021). Factors Associated with the Incidence of Iron Deficiency Anemia in Adolescent Girls at Sman 1 Pasawahan in 2020. *Journal of Holistic and Health Sciences* , 5 (1), 28–39. https:// doi.org/10.51873/ jhhs.v5i1.121

Astutik, W., Aini, N., Anam, K., & Masyita, G. (2023). Faktor-faktor yang Berhubungan dengan Kejadian Anemia Pada Remaja. *Jurnal Keperawatan Wiyata, 4*(2), 109–118. https://doi.org/10.52742/jgkp.v4i2.177

Benson, C. S., Shah, A., Stanworth, S. J., Frise, C. J., Spiby, H., Lax, S. J., Klein, A. A. (2021). The effect of iron deficiency and anaemia on women's health. *Anaesthesia, 76*(S4), 84–95. https://doi.org/10.1111/ anae.15405

Bharati, P., Shome, S., Chakrabarty, S., & Bharati, S. (2009). Burden of anemia and its socioeconomic determinants among adolescent girls in India. *Nevin Scrimshaw International Nutrition Foundation, 30*(3), 217–226. https://doi.org/10.1177/15648 2650903000302.

Chowdhury, S., & Chakraborty, P. pratim. (2017). Prevalence, knowledge, and related factors of anemia among school-going adolescent girls in a remote area of western Rajasthan. *Journal of Family Medicine and Primary Care* , 6 (2), 169–170. https://doi.org/10.4103/jfmpc.jfmpc

Claudia, LR, Arif, A., & Anggraini, H. (2023). The Relationship between Physical Activity, Diet, Menstrual Duration and the Incidence of Anemia in Regular Midwifery Students at Kader Bangsa University in 2021. *Scientific Journal of*

Batanghari Jambi University , 23 (2), 2137. https://doi.org/10.33087/jiubj.v23i2.315 0

Deivita, Y., Syafruddin, S., Andi Nilawati, U., Aminuddin, A., Burhanuddin, B., & Zahir, Z. (2021). Overview of Anemia; risk factors and solution offering. *Gaceta Sanitaria* , 35 , S235–S241. https://doi.org /10.1016/j.gaceta.2021.07.034

Cirebon City Health Office. (2024). *Cirebon City Health Profile* . Cirebon: Cirebon City Hea lth Office.

Fadila Putri, T., & Risca Fauzia, F. (2022). The Relationship Between Consumption of Iron Sources and the Incidence of Anemia in Junior High and Senior High School Girls in Bantul. *Journal of Nursing and Midwifery* , 13 (2), 400–411.

Fahira Lubis, A., Lusiana Anggreini, A., Kulsum, AU, Kusumastuti, IK, & Fithri, NK (2023). Anemia and Lifestyle of Adolescents in Indonesia: Literature Review. *Tambusai Health Journal* , 4 (2), 2180–2191. https://doi.org/https://doi. org/10.31004/jkt.v4i2.15328

Febianingsih, NPE, Putra, KAD, & Putra, GY (2019). Prevalence and Risk Factors of Anemia in Adolescent Girls at Sman I Abiansemal Badung. *Bali Health Published Journal* , 1 (1), 52–62. https://doi .org/10. 47859/bhpj.v1i1.102

Hasyim, DI (2018). Knowledge, socio-economic, diet, menstrual pattern, nutritional status and physical activity with the incidence of anemia in adolescent girls. *Aisyiyah Midwifery and Nursing Journal* , 14 (1), 06–14. https://doi.org/10. 31101/ jkk.544

Indriastuti Kurniawan, YA, Muslimatun, S., Achadi, EL, & Sastroamidjojo, S. (2006). Anemia and iron deficiency anemia among young adolescent girls from the peri urban coastal area of Indonesia. *Asia Pacific Journal of Clinical Nutrition* , 15 (3), 350–356. Retrieved from https://ap jcn.nhri.org.tw/server/APJCN/15/3/35 0.pdf

Junengsih, & Yuliasari. (2017). The Relationship Between Iron Intake and the Incidence of Anemia in Female Adolescents of SMU 98 in East Jakarta. *Journal of Health Science and*

Technology , 5 , 55–66. https://doi.org/https ://doi.org/ 10.32668/jitek.v5i1.68

Ministry of Health of the Republic of Indonesia. (2023). *Indonesia Health Profile 2022.* Retrieved from https://kemkes.go.id/id/ profil-kesehatan-indonesia-2022

Lismiana, H., & Indarjo, S. (2021). Knowledge and perception of adolescent girls regarding compliance in consuming iron supplement tablets. *Indonesian Journal of Public Health and Nutrition , 1* (1), 22–30. Retrieved from https://journal.unnes .ac.id/sju/IJP HN/article/view/45146

Miguel, A.M.-H., Santos, S.-P., Pablo, C.-O., & Jose, A.G.-E. (2021). Iron Deficiency in Celiac Disease: Prevalence, Health Impact, and Clinical Management. *Nutrients 2021* . Retrieved from https:// www.mdpi.com/2072-6643/13/10/3437

Nadiyah, N., Sitoayu, L., & Dewanti, LP (2022). Rural Adolescent Girls in Indonesia Are at Two Times Higher Risk of Anemia. *Gizi Indonesia , 45* (1), 35–46. https://doi.org/10.36457/gizindo.v45i1. 614

Oktavianis, Wulan Sari, N., Nurhayati, & Yuniliza. (2023). Relationship of Lifestyle to the Incidence of Anemia in Adolescents. *Human Care Journal , 8* (1), 227–233. Retrieved from https://sinta. kemdikbud.go.id/journals/profile/8437

Paramastri, R., Hsu, CY, Lee, HA, Lin, LY, Kurniawan, AL, & Chao, JCJ (2021). Association between dietary pattern, lifestyle, anthropometric status, and anemia-related biomarkers among adults: A population-based study from 2001 to 2015. *International Journal of Environmental Research and Public Health , 18* (7), 1–15. https://doi.org/10.3390/ijer ph18073438

Putri, SK, Jeki, AG, & Fatmawati, TY (2024). Nutritional Status, Level of Consumption of Iron (Fe) Nutrient and Menstrual Cycle with the Incidence of Anemia in Adolescent Girls. *Journal of Scientific Health Discourse , 2* (1), 9–15. https://doi.org/ 10.56303/jdik.v2i1.1 55

Salisa, I. (2023). Overview of Diet, Rest, Activity and Stress Management in Type 2 Diabetes Mellitus in Mondokan Village, Tuban Health Center. *Jurnal Multidisiplin Indonesia , 2* (9), 2435–2444. https://doi. org/10.58344/jmi.v2i9.463

Sappani, M., Mani, T., Asirvatham, ES, Joy, M., Babu, M., & Jeyaseelan, L. (2023). Trends in prevalence and determinants of severe and moderate anemia among women of reproductive age during the last 15 years in India. *PLoS ONE , 18* (6 JUNE), 1–13. https://doi.org/10.1371/ journal. put.0286464

Vagetti, G. C., Barbosa Filho, V. C., Moreira, N. B., Oliveira, V., Mazzardo, O., & Campos, W. (2014). Association between physical activity and quality of life in the elderly: A systematic review, 2000-2012. *Brazilian Journal of Psychiatry , 36* (1), 76– 88. https://doi.org/10.1590/1516-4446- 2012-0895

WHO. (2012). Global Physical Activity Questionnaire (GPAQ) analysis guide. *Geneva: World Health Organization* , 1–22. Retrieved from https://www.who.int/ publications/m/item/global-physical- activity-questionnaire

WHO. (2020). Global anaemia reduction efforts among women of reproductive age: impact, achievement of targets and the way forward for optimizing efforts. *Geneva: World Health Organization, 4*(1), 9– 15. Retrieved from https://www.who. int/publications/i/item/9789240012202

WHO. (2023). World health statistics 2023: monitoring health for the sdgs, sustainable development goals. In *The Milbank Memorial Fund quarterly* (Vol. 27). Retrieved from https://www.who.int/ publications/book-orders.

Wiafe, M. A., Ayenu, J., & Eli-Cophie, D. (2023). A Review of the Risk Factors for Iron Deficiency Anaemia among Adolescents in Developing Countries. *Anemia, 2023.* https://doi.org/10.1155 /2023/6406286