RESEARCH STUDY
English Version

OPEN ACCESS

The Relationship between Iron and Vitamin C Intake, Risk Beverage Consumption Frequency, and Dietary Behavior with Anemia Adolescent Girls in Depok City

Hubungan Asupan Zat Besi dan Vitamin C, Frekuensi Konsumsi Minuman Berisiko, serta Perilaku Diet dengan Anemia Remaja Putri Kota Depok

Aulia Dewi Fitripancari[1], Firlia Ayu Arini[1]*, Iin Fatmawati Imrar[1], Taufik Maryusman[1]

[1]Program Studi Sarjana Gizi, Fakultas Ilmu Kesehatan, UPN "Veteran" Jakarta, Depok, Indonesia

ABSTRACT

Background: Anemia is a condition when the hemoglobin level is lower than normal hemoglobin. In Indonesia, Anemia is a nutritional disorder still commonly found in schools and society environment, especially in female adolescents because they are at an age prone to having hemoglobin deficiency.

Objectives: To determine the relationship between iron and vitamin C intake, consumption frequency of risky drinks, and dietary behavior with the incidence of iron deficiency Anemia in female adolescents at SMAN 6 Depok.

Methods: This is a quantitative research type that uses a cross-sectional research design. The sample used was 123 respondents of 16 to 18-year-old young females obtained using the stratified random sampling method. Data regarding iron and vitamin C intake and the consumption frequency of risky drinks was obtained through interviews using the Semi Quantitative-Food Frequency Questionnaire (SQ-FFQ) and Food Frequency Questionnaire (FFQ) sheets. While data on female students' dietary behavior was obtained from filling out questionnaires, hemoglobin level data was obtained from direct data collection by competent nursing students.

Results: The result of the univariate analysis shows that the incidence of Anemia in female adolescents at SMAN 6 Depok was 13%. Using the chi-square test, the result of bivariate analysis shows that there was a relationship between iron intake (p=0.016), vitamin C intake (p=0.0245), and dietary behavior (p=0.024), and there was no relationship between the frequency of tea consumption (p=1.000) and the frequency of coffee consumption (p=1.000) with the incidence of iron deficiency Anemia in female adolescents at SMAN 6 Depok.

Conclusions: Female adolescents need to increase awareness of the incidence of Anemia and preventive behavior by paying attention to iron and vitamin C intake, limiting the consumption of tea and coffee as Fe inhibitors, and implementing healthy dietary behavior.

INTRODUCTION

Female adolescents will have been in a group of people who are vulnerable to having a lack of red blood cells or Anemia if the nutritional sources they need, one of which is iron and vitamin C, are deficient[1]. Anemia is a nutritional disorder still commonly found in adolescents in the school environment. The most common type of Anemia experienced by them is Iron Deficiency Anemia[2]. Based on RISKESDAS (Indonesia Basic Health Research) 2018, the prevalence of Anemia in young women aged 15-24 years in West Java was 32%. Then, based on data from Central Statistics Agency (BPS) Depok in 2019, the prevalence of Anemia in young women was 16.42%.

Anemia occurs due to a severe Iron deficiency in the body that disrupts erythropoiesis[3]. It happened because of a lack of iron, low levels of Iron absorption, and increased iron requirements during adolescence[4]. Low iron intake is influenced by poor dietary habits, insufficient consumption of food components that can increase Iron absorption (Iron enhancers), and excessive consumption of Iron-inhibitor food components[5]. Changes in lifestyle and environment influence adolescents' food choices. Young women tend to have less conducive food choice behavior by choosing food according to their preferences without paying attention to the nutrients contained. They consume less meat as a source of iron, and vegetables and fruit as a source of

Amerta Nutrition

e-ISSN: 2580-1163 (Online)
p-ISSN: 2580-9776 (Print)
Fitripancari et al. | Amerta Nutrition Vol. 7 Issue 2SP (December 2023). 100-106

101

vitamin C, which is the best iron enhancer. In addition, teenagers often like to consume tea and coffee for social reasons or to consume them for an energy boost to increase their activity [6].

Tea contains tannins, and coffee contains polyphenols. Both tannins and polyphenols are Iron inhibitors that inhibit Iron in the body [7]. According to a study, respondents with normal hemoglobin levels have a common limit of frequency in consuming coffee and tea per day [8]. Young women also tend to diet to have a good body appearance. Diet is interpreted differently by each individual; some adhere to healthy practices, but some are detrimental. Dangerous diets are characterized by not eating food, limiting food intake, and using certain substances such as weight loss drugs to lose weight. The lack of macronutrients and micronutrients entering the body is an unhealthy diet indicator [9].

Low hemoglobin levels or Anemia status in young women will have noticeable impacts on daily life – Anemia can affect the ability to concentrate and daily productivity. In addition, this can also worsen the body's immune system, making young women more susceptible to contracting diseases and infections [10]. Based on a preliminary study, the result suggested that female students at SMAN 6 Depok appeared to experience symptoms of Anemia like weakness, lethargy, and dizziness during the learning process. In addition, in terms of diet, problems found were a majority of female students consumed less nutritious food in the school canteen, and there were neither foods that are sources of iron nor fruit and vegetables that contain vitamin C. This study aims to see how significant the relationship is between iron and vitamin C intake, frequency of consumption of risky drinks, and dietary behavior with iron deficiency Anemia in young women at SMAN 6 Depok.

METHODS

The research was carried out after obtaining an ethical approval letter from the Health Research Ethics Commission (KEPK) of the Jakarta Veterans National Development University with letter number 51/III/2023/KEPK. This research uses a cross-sectional design, quantitative methods, and analytical observational research. The research was carried out in March-April 2023 at SMA Negeri 6 Limo, Depok, West Java. The dependent variable was Anemia status (Hb levels) measured using a tool – EasyTouch GCHb (Glucose, Cholesterol, Hemoglobin). Meanwhile, the independent variables selected were Iron and vitamin C intake measured using the SQ-FFQ for the past month, the frequency of consumption of risky drinks measured using the FFQ, and dietary behavior attached in the questionnaire.

School selection was based on the results of preliminary study observations and the number of class samples taken using stratified random sampling and representatives from each class using simple random sampling. The population in this study was 207 young women attending SMAN 6 Depok. The minimum number of the sample was 123 young women, calculated using the Lemeshow (1997) formula for survey research (cross-sectional) if the population size (N) is known. The sample has met the inclusion criteria. The inclusion criteria were female students aged 16-18 years, willing to be respondents, and not menstruating when checking Hb levels. Meanwhile, the exclusion criteria included female students who were sick during the data collection process.

To collect data, researchers conducted interviews and administered questionnaires. The data analysis used went through two stages - univariate and bivariate analysis. Univariate data analysis aims to identify the characteristics of the subjects studied: age, Anemia status, iron and vitamin C consumption, frequency of tea and coffee consumption, and dietary behavior. SQ-FFQ data was processed using Nutrisurvey software. To measure nutritional intake, the intake category used was sufficient intake if the intake is ≥77% of the Nutrition Adequacy Rate (RDA) and insufficient intake if the intake is <77% of the RDA [11]. Data on the frequency of consumption of risky drinks, namely tea and coffee, was obtained by processing FFQ data. To measure the frequency of tea consumption, the category used was the rare category if the frequency of consumption was ≤1 glass (size 200 ml) per day and the frequent category if the frequency of consumption was >1 glass (size 200 ml) per day with a habit of drinking tea at the same time as eating <1 hour before eating and ≥1 hour after eating [12]. Meanwhile, for the frequency of coffee consumption, the category rarely was used if the frequency of consumption was 1-3 times/week and often if the frequency of consumption was >3 times/week. Dietary behavior data was obtained by processing dietary behavior modification questionnaire data, with the category of healthy dietary behavior if the score was ≥mean and unhealthy dietary behavior if the score was <mean [13].

Bivariate analysis was carried out to determine the relationship between iron intake, intake of vitamin C sources, frequency of consumption of risky drinks, and dietary behavior with the incidence of Anemia. The test used Chi-Square with a value of $\alpha=0.05$ in SPSS 25 software in that the data presented used tables by looking at the p-value to see the significance of the relationship and OR to see the magnitude of the variable problem in the incidence of Anemia.

RESULTS AND DISCUSSION

Univariate and Bivariate Tests were performed that resulted in univariate and bivariate analysis. Univariate analysis aims to analyze the distribution of data or characteristics of respondents, independent and dependent variables consisting of age, Hb levels, iron and vitamin C intake, tea and coffee consumption frequency, and dietary behavior. The results of the univariate analysis are in Table 1 below.

Table 1. Distribution of Frequency Characteristics of Female Adolescents at SMAN 6 Depok

Characteristics	Frequency	Percentage (%)
Age (Years)		
16	71	57.7

Characteristics	Frequency	Percentage (%)
17	48	39.0
18	4	3.3
Anemia Status		
Anemia	16	13.0
Non-Anemia	107	87.0
Fe Intake		
Insufficient	85	69.1
Sufficient	38	30.9
Vitamin C Intake		
Insufficient	68	55.3
Sufficient	55	44.7
Frequency of Tea Consumption		
Infrequent	93	75.6
Frequent	30	24.4
Frequency of Coffee Consumption		
Infrequent	107	87.0
Frequent	16	13.0
Dietary Behavior		
Unhealthy	60	48.8
Healthy	63	51.2

From the characteristics of female adolescents presented in Table 1, it needs to be noted that the age group of respondents is the majority (57.7%): 16 years, 17 years (39%), and 18 years (3.3%). From the univariate analysis of the Anemia incidence, there are two result categories - Anemia and non-anemia. The findings of the analysis involving 123 female students at SMAN 6 Depok showed that 107 (87%) respondents did not suffer from Anemia, while 16 (13%) respondents did.

Based on the iron variable analysis finding, the result showed that 85 respondents (10.1%) had insufficient iron intake, while 38 respondents (30.9%) had sufficient iron intake. This means that the majority of female students still consume less iron. From the vitamin C intake variable finding, the result showed that with a percentage of 55.3%, 68 respondents had insufficient vitamin C intake, and 44.7% or 55 respondents had sufficient intake. It means that the majority of female students had less vitamin C intake. In the variable frequency of risky drinks consumption, this research studied types of drinks - tea and coffee. The majority of respondents had an infrequent tea consumption frequency of 93 respondents (75.6%), and the number of respondents having in-frequent coffee consumption was 107 respondents (87%). The results of the dietary behavior variable based on Table 1 showed that the number of respondents with a healthy diet was 63 respondents (51.2%), and the number of respondents with an unhealthy diet was 60 respondents (48.8%).

Table 2. Average Distribution of Nutritional Intake of Females Adolescents at SMAN 6 Depok and Percentage of RDA

Nutrients	Amount of Intake		RDA	RDA Percentage of Compliance (%)
	Mean ± SD	Min - Max		
Iron (mg)	9.68 ± 5.91	1.1 - 30.4	15	64.53
Vitamin C (mg)	67.99 ± 57.40	2.3 - 271.4	75	90.65

*SD = Standard Deviation, *RDA= Recommended Dietary Allowance

The average daily vitamin C and iron consumption is 67.99 mg and 9.68 mg. The data showed that the average consumption of iron and vitamin C among young females aged 16 to 18 years old at SMAN 6 Depok was still insufficient compared to the 2019 Recommended Dietary Allowance standard. For iron, the percentage of compliance with the RDA was only 64.53%, while Vitamin C fulfillment has almost reached 90.65%.

Bivariate Analysis Results

Bivariate analysis aims to determine whether there is a statistical relationship between two variables. Bivariate analysis was carried out using the Chi-Square test to see the p-value. Besides, the OR value obtained determined how much risk one variable affects other variables. The results of the bivariate analysis can be seen in Table 3.

Table 3. The Results of Bivariate Analysis of the Relationship between Iron Intake and Iron Deficiency Anemia in Female Adolescents at SMAN 6 Depok

Variable	Anemic Status		Total	OR (95% CI)	p-value
	Anemia	Not Anemic			
Iron Intake					
Insufficient	15 (12.2%)	70 (56.9%)	85 (69.1%)	7.929 (6.202 - 9.655)	0.016*
Sufficient	1 (0.8%)	37 (30.1%)	38 (30.9%)		
Vitamin C Intake					

Variable	Anemic Status		Total	OR (95% CI)	p-value
	Anemia	Not Anemic			
Insufficient	13 (10.6%)	53 (44.7%)	66 (55.3%)	4.097 (3.317 - 5.512)	0.024*
Sufficient	3 (2.4%)	54 (42.3%)	57 (44.7%)		
Frequency of Tea Consumption					
Frequent	4 (3.3%)	26 (21.1%)	30 (24.4%)	-	1.000
Infrequent	12 (9.8%)	81 (65.9%)	93 (75.6%)		
Frequency of Coffee Consumption					
Frequent	2 (1.6%)	14 (87.5%)	16 (89.1%)	-	1.000
Infrequent	14 (11.4%)	93 (86.9%)	107 (97.3%)		
Dietary Behavior					
Unhealthy	12 (9.8%)	48 (39%)	60 (48.8%)	3.688	0.024*
Healthy	4 (3.3%)	59 (48%)	63 (51.2%)		

OR = Odds Ratio, *Significantly associated with Anemia status (Chi-Square Test) (p<0.05)

This study found that there was a significant relationship between iron intake, vitamin C intake, and dietary behavior with levels of iron deficiency Anemia in young women at SMAN 6 Depok. The female students who experienced insufficient iron intake were 15 (12.2%). Meanwhile, among female students who did not experience Anemia, there were 37 female students (30.1%) who had sufficient iron intake. The Chi-Square statistical test showed that the p-value is 0.016 (p≤0.05), meaning that there was a significant relationship between iron intake and the incidence of Anemia with an OR of 7.929 (CI = 6.202 - 9.655). So, it can be concluded that female students with insufficient Iron intake had a 7.929 times greater risk of experiencing Anemia compared to female students who have sufficient Iron intake [14].

Iron level in the body is still relatively low among nearly all female students at SMAN 6 Depok because respondents rarely consume iron-rich foods. They only consumed the daily food available at home and in the school canteen. Based on the interview, the result showed that their iron intake is low because their daily food consumption is mostly not high iron sources. So, daily iron need is difficult to fulfill. On average, food provided at home is predominantly non-iron.

Apart from that, most of them and their families did not know which foods were sources of iron, so they only ate food provided at home. They more frequently consume plant-based foods. Most of them said they didn't like chicken liver and red meat. Only a few consume chicken liver and red meat with the frequency of once a week, even though these two foods contain very high levels of iron and are easy to prepare as daily side dishes. Meanwhile, food with complete nutritional sources is unavailable in the school canteen. The only food found in the school canteen is food made from poultry and eggs. These two ingredients were low in iron, so their iron intake did not increase significantly. In this study, the average iron intake of female adolescents at SMAN 6 Depok in the Anemia group was only 7.94 mg, which means that iron intake was classified as a deficit. This result was still below the average iron intake of female students at SMAN 9 Mataram whose average iron intake is 11.19 mg.

Following the findings of research conducted at SMAN 9 Mataram, the results showed that iron consumption was significantly related to the incidence of Anemia (p=0.000). Based on research conducted at SMAN 9 Mataram, Anemia occurred in 85.5% of the population, and Iron deficiency occurred in 69.1% [15]. The research conducted at SMAN 4 Surabaya showed a statistically significant relationship (p <0.001) between iron intake and Anemia prevalence [16]. The OR value obtained was 8.737 (CI=3.309-29.560). The odds ratio showed that female adolescents who consumed insufficient iron were 8.737 times more likely to develop Anemia than those who consumed sufficient iron. According to research At SMAN 3 Kota Bukit Tinggi, there was a significant relationship between iron intake and the incidence of Anemia, p-value=0.025 with OR=3.345, which shows that female students with insufficient iron intake were 3.345 times more likely to experience Anemia than female students with sufficient iron intake. A lack of a variety of foods consumed daily causes low iron intake [17].

Meanwhile, according to vitamin C intake research, 13 out of 16 (10.6%) female students who experienced Anemia had insufficient vitamin C intake, while among female students who did not experience Anemia, there were 54 out of 107 (42.3%) female students who had sufficient vitamin C intake. The resulting p-value is 0.024 (p≤0.05). There is a significant relationship between vitamin C intake and the incidence of Anemia with an OR of 4.097 (CI = 3.317 - 5.512). So, it can be concluded that female students with less vitamin C intake have a 4.097 times higher risk and are more likely to experience Anemia than female students with sufficient vitamin C intake. The average vitamin C intake of female students at SMAN 6 Depok was only 67.95 mg, slightly higher than that in Bekasi, which was 63.8 mg [18]. Then, 66 out of 123 female students had insufficient vitamin C intake, and those who suffered from Anemia predominantly consumed fewer sources of vitamin C. Most female students at SMAN 6 Depok rarely consumed fruit as a source of vitamin C. Some consumed vegetables and fruit, but the portions did not meet the teenager's needs.

Based on the results obtained, most female students only consume fruit once a week, not at the same time as eating, so it does not help iron absorption and results in insufficient daily vitamin C requirements. The unavailability of fruit at home makes them not used to consuming fruit sources of vitamin C every day. Meanwhile, to meet daily vitamin C intake, the minimum vitamin C consumed is 75 mg or the equivalent of 1-2 sources of vitamin C, depending on the type of fruit.

Amerta Nutrition

e-ISSN: 2580-1163 (Online)
p-ISSN: 2580-9776 (Print)
Fitripancari et al. | Amerta Nutrition Vol. 7 Issue 2SP (December 2023). 100-106

104

Based on observations, there was no nutritious food such as food containing vegetables and fruit in the school canteen. Most of the food available was only fast food, whereas foods made from fresh vegetables and fruit contain high levels of vitamin C.

Similar research conducted at SMAN 3 Surabaya showed a p-value of 0.020 so that there was a relationship between vitamin C intake and Anemia in that 83.3% of female students experienced a vitamin C deficit [19]. Research at SMAN 1 Manyar Gresik resulted in a significant relationship between vitamin C intake and Anemia with a p-value=0.000 [20]. Then, research conducted at SMAN 1 Kebomas Gresik also showed a notable relationship between vitamin C intake and the incidence of Anemia with a p-value=0.028 [21]. Female students with Anemia had inadequate vitamin C intake, with an average intake of 6.8 milligrams, which is significantly less than the RDA standard; therefore, their Hb levels are below normal Hb. The participants' lack of vitamin C consumption was caused by the decrease in their foods containing vitamin C intake, including fruit and vegetables.

Meanwhile, the dietary behavior variable showed that 12 female students (9.8%) who had unhealthy dietary behavior experienced Anemia, while 59 female students (48%) with healthy dietary behavior did not experience it. The p-value was 0.024 (p≤0.05), and there was a significant relationship between dietary behavior and the incidence of Anemia with an OR of 3.688 (CI = 2.689 - 4.686). It can be concluded that female students who have unhealthy dietary behavior are 3.688 times more likely to experience Anemia compared to female students who have healthy dietary behavior.

Female adolescents engage in dieting for the reason of maintaining their body's appearance so they don't look fat. Unfortunately, some don't know how to have a healthy diet. Unhealthy dietary behavior can increase the risk of developing Anemia because an unhealthy diet can result in nutritional deficiencies. From the research at SMAN 6 Depok, the majority of female students with unhealthy diets experienced Anemia in 12 out of 16 female students. The results found that the unhealthiest diet behavior was carried out by female students at SMAN 6 Depok, where most of them preferred to consume snacks rather than main courses and often skipped lunch and breakfast, and most of them often reduced the frequency of eating meals that were not appropriate. It makes energy and other nutrient consumption low. Several respondents who suffered from Anemia did not consume rice, consumed red meat rarely, and had irregular eating frequency. This fact is the factor in low iron consumption below the RDA and causes Anemia.

Consistent with research at SMAN 97 Jakarta, many respondents carried out unhealthy diet behaviors such as frequently consuming snacks, skipping breakfast, and consuming fast food [22]. These unhealthy dietary habits cause Anemia, and the nutrients that come in are not following needs. In line with research at SMA Negeri 5 Jambi City, the results showed that the subject's p-value was p=0.003 at a significance level of 5%, meaning there was a relationship between dietary behavior and hemoglobin levels. Most of the subjects in the study had poor diet quality (68.2%). Dietary behavior in this study was measured by dietary diversity and by the average daily frequency of food in the FFQ [23]. Research at SMAN 1 Giki Surabaya showed that diet variables were related to hemoglobin levels, with a p-value=0.003 [24]. In the case of poor diet patterns in anemia sufferers, there were 41 (47.1%) respondents; poor diet patterns without Anemia were 46 (52.9%) respondents, while good diet patterns contributed to the incidence of Anemia, there were 0 (0.0 %) respondents, and for the category of good diet patterns with no Anemia, there were 11 (100.0%) respondents.

There was no relationship (p-value>0.05) between the frequency of consumption of anemic risky drinks such as tea or coffee and iron deficiency anemia among female students at SMAN 6 Depok. Less optimal iron absorption constituted the presence of inhibitory substances, such as tannins in tea. This theory is wrong because it contradicts the findings of researchers who concluded that there was no correlation between the frequency of tea consumption and anemia. There was no significant relationship between the frequency of consumption of tea and the incidence of anemia in female students at SMAN 6 Depok.

It was because, mostly, female students who had Anemia rarely consumed tea. According to the analysis, 12 female students out of 16 who had Anemia rarely drank tea. Based on the data obtained, female students rarely or never consume tea in the meantime or 1-2 hours after mealtime. When they had snacks at the school canteen, they didn't choose tea because they didn't like drinking it. They preferred to consume the other sweet drinks sold in the school canteen. It was consistent with the findings of research conducted at SMKN 5 Bekasi City that there was no statistically significant correlation (p-value=0.126) between the consumption of inhibitory substances such as tea and the prevalence of Anemia in adolescents [18]. The frequency of tea consumption was not a cause of Anemia because most female students did not like drinking tea. The results showed that at SMKN 5 Bekasi City, 68.7% of female students had never consumed tea in the last month. Based on research involving 110 participants conducted at SMA Negeri 1 Sukoharjo, the relationship between the frequency of tea consumption and the incidence of Anemia was not significant (p=0.302). Female students who experienced Anemia with the frequency of drinking tea rarely (1-3 times/week) was 47.1%[25].

The caffeine content in coffee can damage iron quickly. Of the 16 female students classified as anemic, 14 students rarely consumed coffee. It meant that the frequency of coffee consumption was not a factor causing anemia in female students at SMAN 6 Depok. From the data obtained, the low frequency of drinking coffee is because most female students did not like drinking coffee, most of them were uncomfortable after drinking it, and there was also no availability of coffee-based drinks in the school canteen.

In line with the research at SMAN 1 Sukoharjo, this research resulted in no relationship between the frequency of coffee consumption and the incidence of anemia with a value of p=0.657 (p≤0.05). The highest coffee consumption among Anemia sufferers in the

uncommon category (1-3 times per week) was 64.7% [25]. In line with research at the Islamic Boarding School Jakarta, there was no relationship between the frequency of coffee consumption and anemia [26]. Most female students only drink coffee occasionally, for example, after waking up in the morning or while studying late at night, to help them stay awake, so it did not affect iron absorption. This research also stated that coffee should not be consumed at mealtime or should be consumed more than 1 hour after mealtime so that it does not affect iron absorption.

CONCLUSIONS

Anemia is related to dietary behavior, iron intake, and vitamin C intake in female students at SMAN 6 Depok. Several factors, including a lack of various and qualified diets, contribute to the Iron and vitamin C deficiencies that occur almost universally. A higher susceptibility to Anemia is observed in female students who consume unbalanced iron and vitamin C, and female students who have unhealthy dietary behavior will affect the quality of intake and influence the incidence of Anemia, thereby increasing the risk of developing Anemia. The researcher suggests that schools provide education about Anemia to the students at least once a month and have a routine program to check female students' Hb levels so that they are more aware of the incidence of Anemia, and also hold a regular TTD (Iron supplement) take program. Apart from that, conducting a campaign to bring meals to school with 3-5 types of food every day can be done to improve the quality of eating and prevent Anemia in teenagers. As another option to raise the quality of students' food, the school can pay attention to the food sold in the canteen and educate traders to provide more nutritious food to students.

ACKNOWLEDGMENTS

Conflict of Interest and Funding Disclosure

REFERENCES

1. Rimandini, K. D. et al. Mahasiswa Akademi Kebidanan Keris Husada. (2019).
2. Ayu, K., Prasetya, H., Made Wihandani, D., Wayan, I. & Sutadarma, G. Hubungan Antara Anemia Dengan Prestasi Belajar Pada Siswi Kelas Xi Di Sman I Abiansemal Badung. Jurnal Medika vol. 8 (2019) https://ojs.unud.ac.id/index.php/eum46.
3. Damanik, A. H. Gambaran Imt/U, Asupan Zat Besi (Fe) Dan Inhibitor Zat Besi Dengan Anemia Remaja Putri Di Sma Muhammadiyah 7 Sawangan, Depok Tahun 2018. Jurnal Medika Respati 14, 255–263 (2019).
4. Nabila Sadrina, C. & Sri Mulyani, N. Asupan Protein, Zat Besi, Dan Vitamin C Dengan Kejadian Anemia Pada Mahasiswi Gizi Poltekkes Kemenkes Aceh. vol. 13 (2021).
5. Dhiemitra Aulia Dewi, A., Risca Fauzia, F. & Dyah Astuti, T. Pengetahuan Gizi, Asupan Vitamin C, dan Zat Besi Kaitannya dengan Anemia Remaja Putri di Bantul, Daerah Istimewa Yogyakarta Nutritional Knowledge, Vitamin C, and Iron Intake in Relation to the Anemia of Female Adolescents in Bantul, Special Region of Yogyakarta. 6, 291–297 (2022).
6. Famila, A. & Istianah, I. Relationship Of Iron Substance, Vitamin C, And Breakfast Habits Against Learning Concentration In Sma Taman Madya 5. vol. 4, (2020) http://jos.unsoed.ac.id/index.php/jgps.
7. Royani, I., Alamanda Irwan, A. & Arifin, D. A. Pengaruh Mengkonsumsi Teh Setelah Makan Terhadap Kejadian Anemia Defisiensi Besi Pada Remaja Putri. (2023).
8. Firmansyah Hidayat, G. & Widhiyastuti, E. Hubungan Kebiasaan Minum Kopi Dengan Kadar Hemoglobin Pada Pengunjung Kedai 'Sederhana Kopi' Surakarta. (2022).
9. Kusumawardani, W. Hubungan Perilaku Diet Dengan Massa Lemak Tubuh Pada Remaja Putri Di SMA Negeri 5 Surabaya The Correlation of Dieting Behavior with Body Fat Mass of Adolescent Girls at Senior High School 5 Surabaya. Amerta Nutr 65–71 (2020) doi:10.2473/amnt.v4i1.2020.65-71.
10. Dumilah, P. R. A. & Sumarmi, S. Hubungan Anemia Dengan Prestasi Belajar Siswi Di SMP Unggulan Bina Insani. Amerta Nutrition 1, 331 (2017).
11. Auly Poetry, M., Susila Nindya, T. & Buanasita, A. Perbedaan Konsumsi Energi Dan Zat Gizi Makro Berdasarkan Status Gizi Mahasiswa Fakultas Kesehatan Masyarakat Universitas Airlangga Difference of Energy and Macronutrients Consumption Based on Nutritional Status among Student of Faculty of Public Health Universitas Airlangga. Media Gizi Indonesia 1, 52–59 (2019).
12. Lisisina, N. & Rachmiyani2, I. Hubungan antara frekuensi minum teh dengan anemia pada wanita hamil. Jurnal Biomedika dan Kesehatan 4, (2021).
13. Katolik, U., Semarang, S., Valentina, V. & Retnaningsih, C. Hubungan Body Dissatisfaction dan Perilaku Diet pada Mahasiswa. (2018).
14. Setyaningsih, S.ST, M.Kes, W., Mansur, H. & Naimah, N. Unhealthy Diet Practices And Anemia In Young Women. Indonesian Midwifery and Health Sciences Journal 6, 138–149 (2022).
15. Elda Yosditia, B., Fitria Rahmiati, B., Ardian, J., Thonthowi Jauhari Program Studi Gizi, M. & Kesehatan, F. Asupan Sumber Zat Besi dan Konsumsi Tablet Tambah Darah serta Kadar Hemoglobin Intake of Iron Sources and Blood Supplement Tablet Consumption and Hemoglobin Levels. (2023).

16. Sholihah, matush, Andari, S. & Wirjatmadi, B. Hubungan Tingkat Konsumsi Protein, Vitamin C, Zat Besi dan Asam Folat dengan Kejadian Anemia Pada Remaja Putri SMAN 4 Surabaya Correlation between Consumption Level of Protein, Vitamin C, Iron and Folic Acid with Anemia among Female Teenagers at SMAN 4 Surabaya. 135–141 (2019) doi:10.2473/amnt.v3i3.2019.135-141.

17. Yunita, M., Novela, V., Ilmu Kesehatan Masyarakat, P. & Fort De Kock, U. Faktor Kejadian Anemia Pada Remaja Putri Di Sma Negeri 3 Kota Bukittinggi Tahun 2019. Jurnal Public Health vol. 7 (2020).

18. Handriyanti, R. F., Dwi Setyowati, Y. & Vidyarini, A. Dengan Kejadian Anemia Pada Siswi Smkn 5 Kota Bekasi. Jurnal Kesehatan Saintika Meditory **5**, 28–36 (2022).

19. Farinendya, A., Muniroh, L. & Buanasita, A. The Correlation of Nutrition Adequacy Level and Menstrual Cycle with Anemia Among Adolescent Girls. 298–304 (2019) doi:10.2473/amnt.v3i4.2019.

20. Almaratus Sholicha, C. & Muniroh, L. Attribution-NonCommercial-ShareAlike license (CC BY-NC-SA 4.0). Hubungan Asupan Zat Besi, Protein, Vitamin C Dan Pola Menstruasi Dengan Kadar Hemoglobin Pada Remaja Putri Di Sman 1 Manyar Gresik Correlation Between Intake of Iron, Protein, Vitamin C and Menstruation Pattern with Haemoglobin Concentration among Adolescent Girl in Senior High School 1 Manyar Gresik. Media Gizi Indonesia **2**, 147–153 (2019).

21. Nuraini, R. F. Hubungan Antara Intake Zat Gizi Makro, Zat Besi, dan Vitamin C dengan Kadar Hemoglobin Siswi SMA di Kecamatan Kebomas. Ghidza Media Journal **4**, 15–29 (2022).

22. Muhayati, A. & Ratnawati, D. Hubungan Antara Status Gizi dan Pola Makan dengan Kejadian Anemia Pada Remaja Putri. Jurnal Ilmiah Ilmu Keperawatan Indonesia **9**, 563–570 (2019).

23. Layak, M., Wulansari, A., Sari, M. T., . K. & Fitrianti, S. Diet Quality as an Indicator of Iron Deficiency Anemia: A Study of Adolescent Girls of Senior High School in Jambi City. Pakistan Journal of Nutrition **18**, 579–586 (2019).

24. Hariyanto, N., Fatimawati, I., Hastuti, P., Budiarti, A. & Poddar, S. Relationship between Diet Patterns and the Incidence of Anemia among Adolescent Girls at SMA Giki 1 Surabaya. Malaysian Journal of Nursing **14**, 14–19 (2022).

25. Hearttalini, A. Dh. Hubungan Asupan Zat Besi Dan Pengetahuan Tentang Anemia Dengan Kadar Haemoglobin Pada Remaja Putri Di Sman 1 Nguter Sukoharjo. (2020).

26. Rahfiludin, M. Z. et al. Plant-based Diet and Iron Deficiency Anemia in Sundanese Adolescent Girls at Islamic Boarding Schools in Indonesia. J Nutr Metab **2021**, (2021).