

# **THE CORRELATION BETWEEN FOLATE AND VITAMIN E WITH ANEMIA INCIDENCE OF ADOLESCENTS WOMAN IN ISLAMIC BOARDING SCHOOL**

***(Hubungan Asam Folat dan Vitamin E dengan Kejadian Anemia pada Remaja***

***Putri di Pondok)***

Safira Kholifatul Ummah<sup>1\*</sup>, Hasanah Fatarizka Ali Ratibi<sup>2</sup>

<sup>1</sup>Istanbul Sabahattin Zaim University

<sup>2</sup>Nutrition and Health, Wageningen University and Research

\*safirakummah@gmail.com

## **ABSTRAK**

Anemia is the occurrence of a lack of red blood cells and not sufficient psychological needs. Adolescent girls are a group that is prone to anemia. Folate and vitamin E are micronutrients that have a role in preventing anemia. Young women in islamic modern boarding schools have less controlled intake due to favorite factors or even the density of activities, so micronutrient intake is not fulfilled. This study aims to determine the relationship between folate and vitamin E with the incidence of anemia in adolescents in modern boarding schools. This study used an observational analytic method with a case-control study design. The results of this study was that there was a significant correlation between folate intake and anemia ( $p=0.000$ ) and there was no significant relationship between vitamin E intake and anemia ( $p=0.099$ ). Conclusion: Folate was associated with the incidence of anemia and vitamin E was not associated with anemia. Although there are many other factors that cause anemia in adolescents, the fulfillment of folate and vitamin E intake is still important and must be considered.

Key Word : Anemia, Folate, Adolescents woman, Vitamin E.

## INTRODUCTION

Globally, the prevalence of anemia was 1.62 billion, where the majority of anemia sufferers were 468.4 million at non-pregnant women. The highest prevalence of anemia was in school-age girls at about 47.4%, while in men only 12.7% (WHO, 2016). Indonesia is experiencing three health problems, namely health problems related to obesity, stunting and electrolyte deficiency which can cause anemia. In Indonesia, the prevalence of anemic adolescent girls were 27.2% and anemic male adolescents were 20.3%. (Riskasdas, 2018). This illustrates that anemia is one of the main health problems among adolescents, especially young women because young women are more at risk of experiencing anemia (Zhu, 2021).

Anemia is the occurrence of a lack of red blood cells that do not meet physiological needs (Fernandez, 2019). Adolescent girls are more likely to experience anemia because at this age young women are in their fertile period, so they experience menstruation regularly every month (Yunarsih, 2017). According to the Indonesian Ministry of Health in 2015, the need for red blood cells in women of childbearing age is > 12 mg/dl.

Adolescents who experience anemia can cause several health problems such as decreased fitness, slow mental, motor and intelligence development and also decreased reproductive health. (Kalsum, 2016).

Symptoms experienced by people with anemia include fatigue, weakness, dizziness, drowsiness and shortness of breath (WHO, 2021). One of the causes of anemia is lack of macro and micro intake. Both types of intake can help metabolize intake in the body, so that it can balance the body's minerals and transport blood to cells that need oxygen (O<sub>2</sub>) supply. The group that is prone to anemia is the group of

adolescent women aged 15-19 years, because during this period women have experienced menstrual cycles as well as changes in hormones and lifestyle (Nursetia, 2016). Ekasanti`s, *et al* (2020) said that menstrual status was the most dominant determinant of anemia. Teenage girls who have menstruated have a 3.181 times more at risk of developing anemia than young women who have not experienced menstruation.

Factors that cause the high incidence of anemia in adolescents include low intake of iron and other nutrients such as vitamin A, vitamin C, folate, riboflavin and vitamin B12, errors in iron consumption such as iron consumption along with other substances that can interfere with absorption of iron. the iron (Nasruddin, 2021).

Folic acid intake is one of the most important nutrients because it can reduce the risk factors for neural tube defects (NTDs) (Wal., *et al*, 2018). Folic acid, together with vitamin B12, is necessary to form red blood cells. A deficiency of folic acid can reduce the ability of red blood cells to carry oxygen, this is called 'macrocytic' (large cell) anaemia (BDA.2019). This B-group vitamin occurs naturally in green leafy vegetable, citrus fruits and legumes, as well as in animal source foods, such as egg and liver (Myszczyszyn, 2019).

Michaela and Cara`s research (2020) said that national fortification with folic acid is not associated with a significant decrease in the prevalence of NTDs at the population level.

Folate has an important role in cell division and it is especially needed during infancy and pregnancy. Human body requires folate in order to produce healthy red blood cells and prevent anemia, while vitamin B12 plays an

important role in supplying essential methyl groups for protein and DNA synthesis (Mahmood, 2014).

Vitamin E can increase Hb levels because it can protect the erythrocyte membrane from being easily lysed (Sy, *et al.*, 2010). Therefore, the occurrence of vitamin E deficiency causes the condition of red blood cells to become weak and abnormal because vitamin E is an essential factor for the integrity of red blood cells. (Citrikesumasari, 2012). In Juffrie's research (2020) it was stated that vitamin E supplementation can increase Hb levels in children.

All students who study at Islamic boarding school are young women who are prone to anemia. With the theory that has been mentioned, the researcher wants to know the relationship between folate intake and vitamin E in adolescents in Islamic modern boarding schools.

## METODE

The research has been carried on analytic observational study with case-control study design. This research was conducted at Darussalam Gontor Modern Boarding School 1<sup>st</sup> campus on March-July 2020. The population was adolescents age of 15-19 years with a

total of 1359 people who have menstruated. Samples were taken using quota sampling in each group there were 46 people, so the total respondents were 92 people.

Measurement of Hb using easytouch GCHB tools and strips, Hb checks were carried out at 8 to 10 in the morning. Measurement of intake using SQ-FFQ measurement was done once.

In this study, a case control with matching criteria was menstrual status in the 15-19 year age group, had no infectious disease, was not fasting at the time of checking Hemoglobin, to analyze the correlation between risk factors and effect factors, for the case group classification was the anemia group, and the control group was the non-anemia group.

Univariate analysis was used to analyze data by describing data that has been collected (Matsuroh, 2018). Bivariate analysis was carried out by testing the relationship between micro intake with anemia in adolescents was used Mc Nemar's statistical test.

This research has graduated from the Ethics commission for public health research by having its headquarters at NO.2930 / B.2 / KEPK-FKUMS / III / 2020 which was legalized by the Muhammadiyah University Surakarta.

**Tabel 1. Karakteristik Responden**

Variable		Anemia 46		Non Anemia 46	
		n	%	n	%
Age	15	1	2.17	1	2.17
	16	23	53.17	24	50
	17	18	39.13	15	32.6
	18	3	6.5	7	15.2
Mineral Intake	Inadequat	38	82.6	40	87
	Adequat	8	17.4	6	13
Nutritional Status	Malnutrisi	7	15.2	6	13
	Normal	39	84.8	40	87
Diastol	Abnormal	38	73.9	34	80.4
	Normal	8	26.1	16	19.6
Sistol	Abnormal	44	89.1	43	93.5
	Normal	2	10.9	3	6.5
MUAC	Abnormal	29	63	24	52.2
	Normal	17	37	22	47.8
Circumference	Abnormal	35	76.1	33	71.7

Normal	11	23	13	28.3
Uji statistik Deskriptiv Crosstab				

**RESULT AND DISCUSSION**

Characteristics of respondents studied in this study include age, mineral intake, nutritional status, diastole, systolic, MUAC and circumference. Characteristics of the respondents shown in table 1 shows that the largest number of samples was 16-year-old girls with non-anemic status with a percentage of 50%. Adolescent girls with inadequate mineral intake

were not anemic with a percentage of 87%. Adolescents with normal nutritional status did not experience anemia (87%). Adolescents with abnormal diastolic status had more anemia (73.9%) as well as abnormal systolic status (89.1%). Adolescents with abnormal arm circumferences experienced more anemia (63%) and adolescents with abnormal abdominal circumferences experienced more anemia (76.1%).

**Tabel 2. Correlation Test Results of Folate and Vitamin E Intake with Anemia in Adolescents in Islamic Modern Boardingschool with Mc Nemar's Statistical Test**

Variable		Anemia		Non Anemia		OR 95%	Lower	Upper	P-Value
		46		46					
		n	%	n	%				
Folate (Vitamin B9)	Inadequat	46	50.5	45	49.5	0.495	0.402	0.609	0.000
	Adequat	0	0	1	100				
Vitamin E	Inadequat	33	57.9	24	42.1	2.327	0,9891	5,521	0,099
	Adequat	13	37.1	22	62.9				

Hasil uji beda signifikan (p<0,05)

The research results are shown in the table. 2 shows that there are 46 adolescents with inadequate folate intake experiencing anemia with a percentage of 50.5% and the result is a significant relationship between folate intake and the incidence of anemia in adolescents in modern boarding schools (p = 0.000; OR = 0.495). Adolescents with inadequate folate intake have a 0.495 times risk of developing anemia than adolescents with adequate folate intake.

The results of this study are in line with Chayu's research (2019) which states that there was a significant relationship between vitamin folic acid intake and Hb levels (p = 0.001 ; r = 0.426) which has a moderate

relationship, while the direction of the relationship is positive. So it can be seen that the higher the intake of folic acid consumed, the higher the Hb level and vice versa. Rajendra (2014) which states that 79.5% of adolescents with folate deficiency are anemic. Consumption of foods high in iron and anemia has been shown to reduce the risk of anemia in pregnant women.

In the study of Ng`ethe, et al (2020) stated that the intake of Iron Folic Acid Supplements (IFAS) had a significant relationship with the prevalence of anemia with p = 0.018. Iron and folic acid are essential micronutrients for proper physiological activity, growth and survival. Like so many other nutrients, during pregnancy their demand increases

and a supplement is needed to meet the daily needs of pregnancy.

Consumption of folate can be obtained from the consumption of green leafy vegetables and liver, because folate is not stored in large amounts in the body, it is necessary to maintain its intake so that folate levels remain normal, vegetarians have higher levels of folate in the body than non-vegetarians (WHO, 2006). Young women in modern cottages have different levels of preference for the dishes that have been provided. So for teenagers who don't like vegetables, they will not eat the vegetables even though they have been provided by the agency.

Iron in combination with folic acid also has a beneficial impact on anemia at term and should be routinely used in pregnant women at least in developing countries to reduce the incidence of anemia (Yakoob, 2011). Untuk mencegah dan menurunkan kejadian anemia pada remaja putri maka The national nutrition programme to control and manage anaemia by distributing a weekly iron and folate supplement for adolescent girls together with a deworming programme twice per year appears to have partly successful but could be strengthened (Kounnavong., *et al*, 2020).

In the vitamin E variable, 33 adolescents with inadequate vitamin E intake experienced anemia (57.9%), but there were 22 adolescents with adequate vitamin E intake and did not experience anemia (62.9%). That there was no significant relationship between vitamin E intake and the incidence of anemia in adolescents in modern boarding schools ( $p = 0.099$ ; OR = 2.327).

The results of this study are in line with research by Rempel (2021) which states that there is no significant relationship between vitamin E and

anemia with  $p=0.708$ . Vitamin E is not the main cause of anemia. In Agustina's research, *et al* (2020) stated that there was no significant relationship between vitamin E intake and anemia in pregnant women. The cause of anemia in pregnant women is rarely caused by vitamin E deficiency, but there are other factors such as iron and folate deficiency.

Anemia deficiency gizi disebabkan karena tidak tersedia zat-zat gizi di dalam tubuh yang berperan membentuk sel darah merah. Zat-zat yang berperan dalam hemopoesis protein, vitamin (asam folat, vitamin B12, vitamin C dan vitamin E) dan mineral (Fe dan Cu). Tetapi dari sekian banyak penyebab, yang paling menonjol menimbulkan hambatan hemopoesis adalah kekurangan zat besi, asam folat, dan vitamin B12 (Citrikesumasari, 2012)

The results of this study are different from research conducted by Rahman (2020) which states that there was a significant relationship between vitamin E intake and hemoglobin levels. The vitamin E intake measured by the respondents was the intake of Santa E supplements, so that the respondent's vitamin E intake could be clearly calculated.

Teenagers in modern boarding schools who experience anemia with inadequate intake of vitamin E as much as 57.9%, but anemia is not the only factor that causes anemia. Vitamin E deficiency is not common in healthy people, generally due to other diseases such as genetic disorders in the alpha-tocopherol transport protein or fat malabsorption disorders (Traber, 2014).

In Ariguntar's research, *et al* (2021) stated that students with anemia status had good learning achievements. The role of parents, teachers and health workers is very important in the education process to

increase adolescents' knowledge of anemia and the importance of consuming iron folate tablets (Tirthawati, *et al.* 2020).

There are three types of interventions, including education, administration of specific foods/supplements, and their combinations (Surtimanah, 2021). To deepen adolescent knowledge about anemia, an anemia education simulation at school can be practiced (Ramdany, 2021) or in the form of a team game tournament. (Sulistiani, *et al.*, 2021).

### KESIMPULAN

Folate is a variable that has been shown to be associated with the incidence of anemia, in contrast to vitamin E intake which has not been shown to be associated with the incidence of anemia. Although there are many other factors that affect anemia, it is very important to meet the intake of folate and vitamin E. To get more specific results, it is hoped that in future studies, it is expected to be able to check Hb using Ferritin and adding the other variable which influence the blood formation. So it is necessary to do several ways to expand the knowledge of adolescents about anemia so that awareness arises to meet the intake of macro and micronutrients in preventing the incidence of anemia.

### DAFTAR PUSTAKA

- Agustina, H., Hidayat, HM., Bustamam, N. 2020. Korelasi Asupan Vitamin E dengan Kadar Hemoglobin pada Ibu Hamil di Puskesmas Kaliwiro Tahun 2019. *Seminar Nasional Riset Kedokteran*.
- Ariguntar, T., Yuasri, H., Mohammad, L., *et al.* 2021. Gambaran Anemia Pada Santri di Pondok Baitul Qurra` Jakarta. *Jurnal Tahdzibi: Manajemen*

*Pendidikan Islam*. (6)1. p-ISSN 2502-9398.

- BDA. 2019. *Food Fact Sheet Folic Acid*. The British Dietetic Association
- Chayu, AID. 2019. Hubungan Asupan Vitamin C, Vitamin B12, Asam Folat dengan Kadar Hb Remaja Putri Kelas VIII di SMP Negeri 3 Lubuk Pakam. *Karya Tulis Ilmiah Politeknik Kesehatan Medan Jurusan Gizi*.
- Citrakesumasari. 2012. *Anemia Gizi, Masalah dan Pencegahannya*. Kalika. Yogyakarta.
- Ekasanti, I., Adi, AC., Yono, M., *et al.* 2020. Determinants of Anemia among Early Adolescent Girls in Kendari City. *Amerta Nutr.* 271-279 272. doi: 10.2473/amnt.v4i4.2020.
- Fernández-Gaxiola AC, De-Regil LM. 2019. Intermittent Iron Supplementation for Reducing Anaemia and its Associated Impairments in Adolescent and Adult Menstruating Women. *Cochrane database Syst Rev.* 1(1):CD009218.
- Jeffrie, M., Helmyati, S., Hakimi, M. 2020. Nutritional Anemia in Indonesia Children and Adolescents: Diagnostic Reliability for Appropriate Management. *Asia Pacific Journal Clinical Nutrition.* 29(1). S18-S31
- Kalsum, U., Raden, H. 2016. Kebiasaan Sarapan Pagi Berhubungan dengan Kejadian Anemia pada Remaja di SMA Negeri 8 Muaro Jambi. *Jurnal Penelitian Universitas Jambi Seri Sains*, 18(1), 09-18.
- Kemendes RI. 2015. *Situasi Kesehatan Reproduksi Remaja*. Infodatin.
- Kounnavong, S., Vonglokhom, M., Kounnavong, T., *et al.* 2020. Anaemia Among Adolescents:

- Assessing A Public Health Concern in Lao PDR. *Global Health Action*. Informa UK Limited. Vol. 13, 103–111. : <https://doi.org/10.1080/16549716.2020.1786997>
- Mahmood, L. 2014. The Metabolic Processes of Folic Acid and Vitamin B12 Deficiency. *Journal of Health Research and Reviews*. (1)1. IP: 253.75.103.142
- Michaela, E.P., Cara, J, W. 2020. Folic Acid Fortification and Neural Tube Defect Risk: Analysis of the Food Fortification Initiative Dataset. *Nutrients Journal*, 12, 247; doi:10.3390/nu12010247
- Myszczyzyn, A.; Krajewski, R.; Ostapów, M.; Hirnle, L. Folic Acid—Role in the Body, Recommendations and Clinical Significance. *Pielegniarstwo XXI wieku/Nurs*. 21st Century, 18, 50–59.
- Nasruddin., Syamsu, RF., Permatasari, P. 2021. Angka Kejadian Anemia pada Remaja di Indonesia. *Cerdika: Jurnal Ilmiah Indonesia*. 1 (4), 357-364. p-ISSN: 2774-6291.
- Ng'ethe, HM., Mapesa, J., Mugambi, L. 2020. Relationship Between Compliance to Iron and Folic Acid Supplementation and Anaemia among Pregnant Women in Nyeri County, Kenya. *International Journal of Scientific and Research Publications*. (10)11. ISSN 2250-3153
- Nursetia, A., Susindra, Y. 2016. Hubungan Antara Asupan Zat Gizi dan Status Gizi Dengan Kejadian Anemia pada Remaja Putri. *Jurnal Imiah Inovasi*. (1)2. ISSN 1411-5549
- Rahman, HD. 2020. Asupan Protein dan Vitamin E Berhubungan dengan Kadar Hemoglobin Pasien Talasemia di RSUD Kabupaten Tangerang. *ARGIPA (Arsip Gizi dan Pangan)*. (5)1: 18-26. DOI 10.22236/argipa.v5i1.3922
- Rajendra., Sudha., Sreekanthan., *et al*. Iron, Vitamin B12 and Folate Deficiency in Adolescents Having Nutritional Anaemia. *Journal of Evolution of Med and Dent Sci*. (3)43. P-ISSN- 2278-4748. DOI: 10.14260/jemds/2014/3384
- Ramdany, R. 2021. Edukasi Anemia Berbasis Monopoly Simulationpad Remaja Putri di SMK 1 Kota Sorong. *Jurnal Abdidas*. 2(2). 280-286.
- Rempel, J., Grover, K., El-Matary, W. 2021. Micronutrient Deficiencies and Anemia in Children with Inflammatory Bowel Disease. *Nutrients MDPI*. 13.236
- Riskesdas. 2018. *Laporan Hasil Riset Kesehatan Dasar Tahun 2018*. Balitbangkes.
- Sulistiani. RP., Fitriyanti, AR., Dewi, L. 2021. Pengaruh Edukasi Anemia dengan Metode Kombinasi Ceramah dan *Team Game Tournament* pada Remaja Putri. *Sport and Nutrition Journal*. 3(1). 39-47.
- Surtimanah, T., Sjamsuddin, IF., 2021. Risk Factors and Interventions for Anemia among Adolescent Girl. *Annals of Tropical Medicine & Public Health*. 24(01). <http://doi.org/10.36295/ASRO.2021.24198>
- Sy, E., Alioes, Y., dan Almurdi. 2010. Efek Pemberian Vitamin E Terhadap Penurunan Kadar Malondialdehid (MDA) Hati Mencit Strain Jepang Akibat Paparan Minyak Goreng Berulang. *Jurnal Riset Kimia*, 4(1): 15-19.
- Tirthawati, S., Rosidi, A., Sulistyowati, E., *et al*. 2020. Pengetahuan, sikap Remaja Putri dan Dukungan Petugas Kesehatan terhadap

- Konsumsi Tablet Besi Folat SMKN 1 Bangsri Jepara : Sebuah Studi Cross Sectional. *Jurnal Gizi Unimus* (9)2.
- Traber, MG. 2014. Vitamin E Inadequacy in Humans. *Adv Nutr An Int Rev J.* 5(5):503–14. <http://dx.doi.org/10.3945/an.114.006254>
- Wald, N.J., Morris, J.K., Blakemore, C. 2018. Public Health Failure in the Prevention of Neural Tube Defects: Time to Abandon the Tolerable Upper Intake Level of Folate. *Public Health Rev.* 39, 1–11.
- WHO. 2006. *Guidelines of Food Fortification with Micronutrient.* World Health Organization and Food and Agriculture Organization of the United Nations. United Nations.
- WHO. 2016. *Global and Mineral Nutrition System,* <https://www.who.int/data/gho/data/indicatorsdetalis/GHO/prevalence-of-anemia-in-women-of-reproductive-age>
- WHO. 2021. *Health Topic Anemia.* [https://www.who.int/health-topics/anaemia#tab=tab\\_1](https://www.who.int/health-topics/anaemia#tab=tab_1)
- Yakoob, YM., Bhutta, ZA., 2011. Effect of Routine Iron Supplementation with or without Folic Acid on Anemia During Pregnancy. *BMC Public Health,* 11(Suppl 3):S21
- Yunarsih Y, Antono SD. 2017. Hubungan Pola Menstruasi dengan Kejadian Anemia Pada Remaja Putri Kelas VII SMPN 6 Kediri. *Jurnal Ilmu Kesehatan.* 3(1):25-33.
- Zhu., *et al.* 2021. Anemia and Associated Factors Among Adolescent Girls and Boys at 10–14 Years in Rural Western China. *BMC Public Health.* 21:218. <https://doi.org/10.1186/s12889-021-10268-z>