Relationship Between Hydration Status and Anemia Status in Female Students at SMK Bekasi City

Utami Wahyuningsih[1*], Fatien Triananda Kusuma Putri[2], Afrinia Eka Sari[2], Muhammad Nur Hasan Syah[1]

[1]*Nutrition Study Program, Faculty of Health Science, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia*
[2]*Nutrition Science Study Program, STIKes Mitra Keluarga, Bekasi, Indonesia*
[*]*Corresponding author. Email: utamiwahyuningsih@upnvj.ac.id*

ABSTRACT

Nowadays, anemia is a serious problem especially for girl adolescents. The high prevalence of anemia for girl adolescents needs to be handled to prevent long phase impact or short phase impact. One of any method handling for anemia is by knowing the cause and overcoming it probably. Dehydration is one of the problems. The purpose of this research was to analyzed the relationship between hydration status and anemia status in female students at SMK Bekasi City. This research was a cross sectional among 255 female students who were selected by purposive sampling technique and was conducted in November 2018. Hydration status was measured using PURI method and anemia status was measured using cyanmethaemoglobin method. Data were analyzed by chi square test. The result showed the prevalence of female students with anemia was 32.2% and dehydration was 55.6%. The results of the chi square test obtained p value of 0.433. There is no correlation between hydration status and anemia status of female students at SMK Bekasi City.

Keywords: anemia, Dehydration, Girl Adolescents, Hydration Status

1. INTRODUCTION

Adolescence is a transitional period from childhood to adulthood which is marked by many changes such as increase in muscle mass, body fat tissue and hormonal changes. Physical, cognitive, and psychosocial growth are changes that occur rapidly when entering adolescence. Adolescents need optimal nutritional intake to support their growth and development. Nutritional problems that are still experienced by adolescents is anemia.

anemia is a decrease in the quantity of red blood cells in the circulation or the amount of haemoglobin that is below normal limits [2]. anemia can affect the productivity and academic ability of adolescents and later anemia can become a serious problem if it is not handled, especially for young women who are prospective mothers because anemia can affect the nutritional status of children who are born or have low birth weight (LBW) even at risk of stunting [3].

The incidence of anemia is more common in young women than young men. Based on data from the World Health Organization (WHO) 2010 [4], the prevalence of anemia in adolescent girls in developing countries is around 53.7%. This figure is certainly quite high when compared with the incidence of anemia in the world, which ranges up to 88%. Likewise, with the incidence of anemia in Indonesia, the 2013 Riskesdas results also showed a fairly high prevalence of anemia was 26.4% for ages 5-14 years, while 18.4% for 15-24 years. The prevalence of anemia was higher in young women, which was 23.9% compared to young men, at 18.4%. The number of adolescent girls aged 10-18 years who experienced anemia was 57.1% and those aged 19-45 years were 39.5% [5]. The incidence of anemia in one of the SMK Bekasi city in adolescents aged 16-18 years is 21.6% [7]. anemia in adolescent girls can be caused by several factors, such as the length of menstruation and certain diets so that there is a lack of nutrient intake that functions in the formation of haemoglobin or the formation of erythrocytes such as iron, protein, vitamin B12, and folic acid. In the metabolism of these nutrients, of course, water is needed so that these nutrients can be properly absorbed in the digestive system and then flowed into the blood and used by the body. Metabolism in the body will run well if body fluids are fulfilled [8]. In addition, water also functions as a transportation medium to transport the nutrients needed to help cell growth and regeneration [9]. A stable water supply can affect haemoglobin synthesis, thereby reducing the risk of anemia. This is due to the large number of water molecules required for allosteric regulation of haemoglobin [10].

Water is very much needed in human life as well as for the body and one of which functions as a building block for cells and body fluids, the main component of cells except fat cells is water, namely 70 - 85% [9]. Hydration status is very important for erythrocyte survival, water imbalance due to interference with cationic content causes erythrocyte hydration disorders which cause many diseases in humans [16].

Vocational high school students are more likely to suffer from anemia than high school students because they do more activities including practical activities [1]. Adolescents usually do a lot of physical activity so that if it is not balanced with adequate fluid intake, they will become dehydrated [11].

Dehydration is part of the hydration status where the body's condition is dehydrated because there is no balance between the fluids that enter and the fluids that come out such as through sweat, urine, faeces, and respiratory air [12]. The results of the Indonesian Regional Hydration Study (THIRST) [13] showed that 46.1% of 1200 subjects experienced mild dehydration and the number was more in adolescents (49.5%) compared to adults (42.5%). The incidence of dehydration in young women is around 49%. This figure is greater than that of young men, which is 40% [14].

Dehydration is bad for the body because it will experience headaches, lethargy, seizures to fainting and decreased cognitive abilities or difficulty concentrating while studying at school [15]. Water fulfilment is often ignored and drinking only when thirsty is a sign of mild dehydration. Therefore, in addition to nutritional factors, the hydration status of adolescents needs to be considered as a factor causing anemia. Based on what has been explained, this study aims to see the relationship between hydration status and anemia status in female students at SMK Bekasi City.

2. METHODS

The research method was used observational analytic with cross sectional design. The population in this study were all female students at SMK Bekasi City. The research was conducted in November 2018 and 171 of a total of 2712 respondents participated in the study. Their selection was the result of a purposive sampling of subject in class with inclusion and exclusion criteria. This study was used questionnaire to analysis of characteristic sample (age).

The independent variable in this study was hydration status, while the dependent variable was the anemia status. Hydration status data were obtained by measuring the colour of urine based on the PURI method (Check Your Own Urine) by looking at the level of urine colour on the PURI card. The assessment of hydration status is categorized based on the colour table of the self-check urine card (PURI) provided that if the urine colour is in the range of 1 - 3 then the respondent does not experience dehydration while if it is in the range 4 - 8 then the respondent is dehydrated. A person is said to be mildly dehydrated if it is at the colour level 4 - 6 and severe if it is at the colour level 7 - 8 [9].

anemia status obtained by measuring the haemoglobin value based on the cyanmethemoglobin method. A person is said to be anemia if the haemoglobin level is less than normal, which is less than 12 g/dl. Descriptive statistics were used to describe the variables. Chi-square were used to analysis the relationship both of variables with p-values<0.05 were considered to be statistically significant.

3. RESULTS

The results of the univariate analysis showed that the age of the respondents in this study ranged from 14-19 years. Based on table 1, most of the subjects are in the age range
17-19 years with a percentage 54.9%. Based on table 2, the results of respondents who experienced anemia were 32.2%, while most respondents did not experience anemia (67.8%).

Table 3 showed that most of the respondents experienced dehydration was 55.6%. The results of the bivariate analysis in table 4 show the p-value = 0.433, which means that there is no relationship between hydration status and anemia status in adolescents. Based on table 4 it can be seen that there is 29.2% of respondents (28) who experienced anemia were also dehydrated. On the other hand, as many as 36% of respondents who have anemia are not dehydrated.

Table 1 Distribution of respondents based on age

Age (years)	n	(%)
14 - 16	77	45.1
17-19	94	54.9
Total	171	100

Table 2 Distribution of respondents based on anemia status

anemia status	n	(%)
anemia	55	32.2
Not anemia	116	67.8
Total	171	100

Table 3 Distribution of respondents based on hydration status

Hydration status	n	(%)
Mild dehydration	94	55
Severe dehydration	1	0.6
Not dehydrated	76	44.4
Total	171	100

Table 4 Distribution of respondents frequencies Based on relationship of hydration status and anemia status

Hydration Status	anemia Status		Total (%)	p-value
	anemia (%)	Not anemia (%)		
Dehydration	28 (29.2)	68 (70.8)	96 (100)	0.433
Not Dehydrated	27 (36)	48 (64)	75 (100)	
Total	55 (32.2)	116 (67.8)	171 (100)	

4. DISCUSSION

anemia is a condition of reduced red blood cells or indicated by a decrease in the haemoglobin value from normal values in the blood. Young women are the group at greater risk of developing anemia [17]. In this study, 32.2% of adolescent girls experienced anemia. This falls into the moderate category of public health problems [18]. Every day the body needs water, one of which functions in the formation of cells and body fluids such as blood, enzymes, hormones, stomach fluids and others [9]. In carrying out this function, of course, the body needs adequate fluids as needed.

Based on table 4, it is obtained p-value=0.433, which indicates that there is no relationship between hydration status and anemia status in adolescents. However, 29.2% (28) young women who experience dehydration also suffer from anemia. There are still few studies that discuss the relationship between hydration status and anemia in adolescent girls. Changes in blood volume and composition reflect changes in hydration status. Blood volume and plasma osmolality are the main variables that are regulated homeostatically, but both are very sensitive to exercise, food consumption, fluid intake, changes in posture and several factors [23].

When dehydration occurs, there is an increase in plasma osmolality and an increase in plasma sodium levels (hypernatremia) so that intracellular water will leak out into the extracellular and the intracellular fluid volume will decrease [9]. When this condition occurs, there will be a change in the shape and size of red blood cells to become smaller and even become damaged so that the level haemoglobin in the red blood cells will decrease. Erythrocytes present at hypertonic concentrations have a lower haemoglobin concentration compared to normal conditions [19].

In this study, there was no significant relationship between hydration status and anemia status due to dehydration experienced. Most of the respondents were not at the stage of severe dehydration, which is already dangerous to the body and can damage cells including red blood cells that contain haemoglobin. Most of the dehydration experienced by respondents in this study were in the category of mild or moderate dehydration so it's possible there is no risk of severe dehydration causing decreased blood volume. Severe dehydration or that causes weight loss of up to> 5% can cause seizures, swollen tongue, decreased blood volume and pressure, kidney failure and even death [9]. Based on the Disorder of Erythrocyte Hydration study, it was explained that erythrocytes have the ability to regulate salt and water levels when facing intracellular and extracellular osmotic disorders so they must maintain haemoglobin concentrations so that red blood cells continue to function normally [20]. However, based on other studies [10] found that consumption of adequate water will help overcome anemia by increasing the value of haemoglobin and air has a role in the formation of haemoglobin. When viewed from the role of water in helping haemoglobin formation, lack of fluid intake can be a cause of anemia. So it can be seen that anemia that occurs when a person is dehydrated is a condition where there is a change in the size of smaller red blood cells accompanied by reduced haemoglobin. This condition is categorized as microcytic hypochromic anemia. Based on the morphological approach, anemia can be classified into 3 types and one of them is microcytic anemia, which is characterized by small red blood cells and is usually accompanied by a decrease in haemoglobin in red blood cells [21].

The respondents who experienced dehydration but did not experience anemia were 70.8%, as it is well known that the causes of anemia include insufficient iron intake, protein intake, or poor nutritional status. In this study, it is possible that the respondents have met the intake of these nutrients, as well as those who are not dehydrated but suffer from anemia which can be caused by other things that affect anemia. The condition of good hydration status but lack of consumption of nutrients needed in the formation of haemoglobin such as iron, folic acid, vitamin B12 or even vitamin C which helps iron absorption, a person will still experience anemia. Iron is the main component that plays an important role in blood formation, namely synthesizing haemoglobin [22]. There are also respondents who are not dehydrated and do not experience anemia, which indicates that the person is in a good balance of body fluids and meets the needs of nutritional intake in the formation of red blood cells so that anemia does not occur.

5. CONCLUSION

Based on the results of research that has been conducted regarding the relationship between hydration status and the anemia in female students at SMK Bekasi City. In conclusions, most of female students in SMK Bekasi City are aged 17-19 years. Female students at SMK

Bekasi City who experience anemia are 32.2%. Female students in SMK Kota Bekasi who experience dehydration amounted to 55.6%. There is no relationship between hydration status and anemia status in female students at SMK Bekasi City.

REFERENCES

[1] Fitriani, K & Rita I. 2014. The Relationship between Food Intake and Incidence of Anemia and Practice Value in Class XI Catering Students at SMKN 1 Buduran Sidoarjo. e-journal culinary, Volume 03, Number 1, judicial edition for the period February 2014, p. 46-53

[2] Corwin, Elizabeth J. 2009. Handbook of Pathophysiology, 3rd Ed. Jakarta: EGC.

[3] Ruaida, Nilfar. 2013. The Relationship between Mother Hamjil's Anaemia and the Incidence of Stunting in Children aged 6-24 Months in Yogyakarta City. Thesis. Public Health Science Master Program. Gadjah Mada University. Yogyakarta.

[4] World Health Organization. 2010. Worldwide Prevalence of Anaemia 1993 - 2005. WHO Global Database on Anemia.

[5] Ministry of Health RI. Basic Health Research (Riskesdas). 2013. Research and Development Agency for Health Ministry of Health RI. Jakarta: Ministry of Health RI

[6] Syah, Muhammad Nur Hasan and Alfi Fairuz Asna. 2018. Risk of Eating Disorders and Incidence of Anemia in Female Students of Undergraduate Nutrition Study Program, STIKes Family Partners. GHIDZA: Journal of Nutrition and Health: Volume 2 No.1 (2018): 01-06.

[7] Briawan, Dodik., Ermita Arumsari., Pusporini. 2011. Risk Factors for Anaemia in Students Participating in the Supplementation Program. Journal of Nutrition and Food, 2011, 6 (1): 74–83.

[8] Maslicha, LWS & Tri, WA 2017. Relationship between Potassium and Sodium Intake and Dehydration in Adolescents at SMK Muhammadiyah 04 Boyolali. Profession 2017; Volume 15, No.1, 1-7.

[9] Santoso BI, Hardinsyah, Siregar P, Pardede SO. 2011. Water for Health. Jakarta: Centra Communication.

[10] Kim, Hyun-Kyung; Soo-Hwan Kim; Jae-Ki Ryu. 2017.*Changes in the Blood Components Caused by Water Intake.* Korean J Clin Lab Sci. 2017; 49 (3): 227-232.

[11] Dieny, Fillah Fithra. 2014. Nutrition Problems in Young Women. Yogyakarta: Graha Science.

[12] Hardinsyah and I Dewa Nyoman Supariasa. 2016. Book of Nutrition Theory and Application. Jakarta: EGC Medical Book.

[13] Hardinsyah, Endang S. Soenaryo, Dodik Briawan, Evy Damayanthi, Cesila M. Dwiriani. 2008. Study of Adolescent and Adult Drinking Habits and Hydration in Two Different Ecological Areas. Bogor: Association of Indonesian Nutrition and Food Enthusiasts (PERGIZI), Department of Community Nutrition, FEMA IPB.

[14] Gustam. 2012. Risk Factors for Dehydration in Adolescents and Adults (Thesis). Bogor: Department of Community Nutrition, Faculty of Human Ecology, IPB.

[15] Rismayanthi, Carika. 2012. Perceptions of Athletes on Types, Fluid Function, and Body Hydration Levels in the Student Sport Activity Unit of Yogyakarta State University. Yogyayakarta: Faculty of Sports Science.

[16] Caulier, Rapetti-Mauss, Guizouarn, Picard, Garcon, Badens. 2018. Primary Red Cell Hydration Disorders: Pathogenesis and Diagnosis. Int J Lab Hem. 2018; 40 (Suppl. 1): 68–73.

[17] World Health Organization. 2014. WHA Global Nutrition Targets 2025: anemia Policy Brief. (www.who.int/nutrition/topics/nutrition_globaltargets2025/en/ accessed 4 September 2018).

[18] Ministry of Health RI. 2017. Guidelines for Puskesmas Nutritional Care Process. Jakarta: Ministry of Health RI.

[19] Goodhead, Lauren K & Frances M. MacMillan. 2017.Measuring Osmosis and Hemolysis of Red Blood Cells. Adv Physiol Educ 41: 298-305.

[20] Ghallager, Patrick. 2017. Disorders of Erythrocyte Hydration. Department of Pediatrics, Pathology and Genetics, University School of Medicine, New Haven, CT.

[21] Oehadian, Amaylia. 2012. Clinical Approach and Diagnosis of Anemia. CDK-194 / vol. 39 no. 6, th. 2012.

[22] Jaelani, Mahmud; Betty Yosephin Simanjuntak; Emy Yuliantini. 2017. Risk Factors Associated with the Incidence of Anaemia in Young Women. Journal of HealthVolume VIII, Number 3, November 2017, pp. 358-368.

[23] JM Ayuso, BM Sanchez, RL Socorro, G. Palacios, NPG Antunano and MG Gross. Evaluation of nutritional status and energy expenditure in athletes. Nutr Hosp. 15, 31 (Supl. 3): 227-236 (2015).