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Analysis of Hemoglobin Levels on Menstrual Duration in Students for the 2017 Class of Faculty of Medicine University Muslim Indonesia

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Abstract: *Hemoglobin (Hb) which is the main component of red blood cells (RBC) is a conjugated protein that functions as the transport of oxygen (O2) from the lungs to the tissues and carbon dioxide (CO2). Anemia is a common condition diagnosed based on laboratory results in which the hemoglobin concentration is abnormally low or the red blood cell count is decreased. Anemia in adolescent girls is still quite high, according to the World Health Organization (WHO, 2013), the prevalence of anemia in the world ranges from 40-88%. Adolescent girls have a ten times greater risk of suffering from anemia compared to young men. This is because young women experience menstruation every month and are in a period of growth so they need more iron intake. The purpose of the study was to determine the relationship between the length of menstruation and changes in hemoglobin levels in FK UMI students class 2017. This study used a descriptive analytical observational research design with a cross-sectional approach. The population in this study were students of the Faculty of Medicine, Muslim University of Indonesia class 2017. The sample size in this study used a purposive sampling technique, namely all students of the UMI medical faculty class 2017. Data analysis was carried out by univariate and bivariate analysis. The results of the study showed that 91.2% of female students had normal menstrual periods and 8.8% had hypermenorrhea. Changes in female Hb levels before and during menstruation were found to be 61.8% decreased and 38.2% increased. Based on data analysis, it can be concluded that there is no relationship between the length of menstruation and changes in hemoglobin levels in respondents.*

Keywords - *Hemoglobin, Menstruation, Faculty of Medicine, University of Muslim Indonesia*

I.   INTRODUCTION

Blood is a special connective tissue that is different from other connective tissues in the body is a liquid consisting of elements suspended in a fluid component known as plasma (Leslie P, n.d.). Blood functions to provide adequate oxygen and nutrients to the skin, maintain homeostasis and normal tissue function, and meet the increased nutritional needs of the skin in various pathological conditions. (Detmar and Hirakawa, n.d.). Hemoglobin (Hb) which is the main component of red blood cells (RBC) is a conjugated protein that functions as the transport of oxygen (O2) from the lungs to the tissues and carbon dioxide (CO2) (Detmar and Hirakawa, n.d.).

Anemia is a common condition diagnosed based on laboratory results in which the hemoglobin concentration is abnormally low or the red blood cell count is decreased (Brit Long MD and Alex Koyfman MD, n.d.). Iron deficiency anemia is a global health problem and recent analyzes estimate that approximately one third (eg > 2.5 billion individuals) of the world's population is anemic. However, in addition to anemia, iron deficiency causes a decrease in energy metabolism, daily activities, quality of life, cognitive and sexual

function, cardiac performance and work productivity. However, iron overload can cause cellular oxidative stress and damage by catalyzing the formation of toxic radicals via Fenton chemistry (Nielsen et al., 2018). Anemia is a health problem in all developing countries, with an estimated 30% of the world's population suffering from anemia. Anemia is common in the community, especially in adolescents and pregnant women. Anemia in adolescent girls is still quite high, according to the World Health Organization (WHO, 2013), the prevalence of anemia in the world ranges from 40-88%. Adolescent girls have a ten times greater risk of suffering from anemia compared to young men. This is because young women experience menstruation every month and are in a period of growth so they need more iron intake. (Sma et al., 1994)

In some studies, say that normal blood volume ranges from 25 ml to 60 ml. The normal hemoglobin (Hb) concentration is 14 g/dl and the Hb iron concentration is 3.4 mg/g, this blood volume contains about 12 to 29 mg iron and represents a blood loss equivalent to 0.4 to 1.0 mg iron daily for cycle. The amount of iron absorbed from food is usually quite limited, so the expenditure of iron that seems insignificant becomes important, because it helps reduce iron stores which in most women are already low (Cunningham, F G, 2006). According to WHO, to diagnose anemia in adolescent girls if the Hb level is less than 12 g/dl. Anemia can cause stunted growth in children, lack of muscle cell formation so that the muscles become weak, decreased immune system so that they are susceptible to infection, dizziness, pale, tachycardia, chest pain, dyspnea, tinnitus, decreased performance and changes in behavior. (In et al. , 2008) Other symptoms that can be seen in patients with severe iron deficiency have brittle and fine hair, flat thin nails and break easily, atrophy of the papillae of the tongue causing the tongue to look pale, slippery, shiny and sore. (Susanto, 2007) closely related to female students is easily tired which causes decreased concentration in learning so that achievement is reduced and can reduce work productivity. (Permaesih and Herman, 2005). Menstruation is a cycle of physiological discharge of blood and mucous tissue through the vagina from the nonpregnant uterus, under hormonal control and recurs normally, usually at intervals of about four weeks in the absence of pregnancy (Dorland W. A. N., 2002).

In each woman, the menstrual cycle is different, which is about 25 to 35 days. However, there are some women who do not have regular menstrual cycles and this can happen due to fertility problems. (Biohealth Indonesia, 2007) The first menstruation in adolescent girls is called menarche. The age of menarche varies between 10–16 years, but the average is 12.5 years.(Wiyono, n.d.). Menstruation is a process in a woman's body in which the egg (ovum) travels from the ovaries to the uterus, through a channel called the fallopian tube. At this time, the endometrial tissue in the endometrial lining in the uterus thickens in preparation for fertilization by sperm. If fertilization occurs, this wall will thicken and provide a place for the fetus to grow. However, if fertilization does not occur, this endometrial tissue will shed and come out through the vagina in the form of menstrual fluid. While the menstrual cycle itself starts from the first day of menstruation until one day before the next menstruation. Under normal circumstances, the menstrual cycle is different for every woman from 28 to 35 days. In the explanations in this chapter, we use a 28 day cycle. There are four phases in the menstrual cycle, namely the menstrual phase, the preovulatory phase, ovulation and the post-ovulatory phase. (Tortora, G.J. and Derrickson, 2009).

In this phase, the endometrium is separated from the uterine wall accompanied by bleeding and the only layer that is still intact is the stratum basale. This phase lasts five days (range three to six days). At the beginning of the menstrual phase, levels of estrogen, progesterone, LH (Luteinizing Hormone) decrease or at their lowest levels during the cycle and levels of FSH (Follicle Stimulating Hormone) are just starting to increase. (Hanafiah, Jusuf, 1997). The proliferative phase is a period of rapid growth that lasts from about day 5 to day 14 of the menstrual cycle, for example the 10th day of the 24-day cycle, the 15th day of the 28-day cycle, and the 18th day of the 32-day cycle. The endometrial surface completely returns to normal in about four days or before the bleeding stops. In this phase, the endometrium grows to a thickness of ± 3.5 mm or about 8-10 times its original size, which ends at ovulation. The proliferative phase depends on the stimulation of estrogen from the ovarian follicle (Tympanometry, 2012). The secretory phase lasts from the day of ovulation until about three days before the next menstrual period. At the end of the secretory phase, the fully mature secretory endometrium attains a thick, silky, velvety thickness. The endometrium becomes rich with blood and glandular secretions.(Tympanometry, 2012). Implantation or nidation of a fertilized ovum occurs about 7 to 10 days after

ovulation. If fertilization and implantation do not occur, the corpus luteum which secretes estrogen and progesterone shrinks.

As estrogen and progesterone levels decrease rapidly, the spiral arteries spasm, resulting in the interruption of blood supply to the functional endometrium and necrosis. The functional layer separates from the basal layer and menstrual bleeding begins.(Tympanometry, 2012). Ovulation is an increase in estrogen levels which inhibits the release of FSH, then the pituitary secretes LH (lutenizing hormone). Increased levels of LH stimulate the release of secondary oocytes from the follicle. Primitive primary follicles contain immature oocytes (primordial cells). Before ovulation, one to 30 follicles begin to mature in the ovary under the influence of FSH and estrogen. The LH surge prior to ovulation affects selected follicles. Within the selected follicle, the oocyte matures and ovulation occurs, the empty follicle begins to form the corpus luteum. The corpus luteum reaches peak functional activity 8 days after ovulation, and secretes both the hormones estrogen and progesterone. If implantation does not occur, the corpus luteum decreases and hormone levels decrease. So that the functional layer of the endometrium cannot survive and eventually sheds. (Tympanometry, 2012). Towards the end of a normal menstrual cycle, blood levels of estrogen and progesterone decrease. Low levels of ovarian hormones in the blood stimulate the hypothalamus to secrete gonadotropin releasing hormone (Gn-RH). In contrast, Gn-RH stimulates the secretion of follicle stimulating hormone (FSH)[1].

FSH stimulates ovarian follicle development and estrogen production. Estrogen levels begin to decrease and hypothalamic Gn-RH triggers the anterior pituitary to secrete luteinizing hormone (LH). LH peaks around day 13 or 14 of a 28 day cycle. If fertilization and implantation of the ovum do not occur at this time, the corpus luteum shrinks, therefore the levels of estrogen and progesterone decrease, then menstruation occurs. (Tympanometry, 2012). The length of the menstrual cycle is the distance between the start date of the last menstrual period and the start of the next menstruation. The day the bleeding starts is called the first day of the cycle. The menstrual pattern is a normal menstrual cycle, with menarche as the starting point. In general, menstruation will take place every 28 days for approximately 7 days. The duration of bleeding is about 3-5 days, some are 1-2 days followed by a little blood and no pain. The amount of blood lost is about 30-40 cc. The peak is on the 2nd or 3rd day with the use of about 2-3 sanitary napkins. (Manuaba, I.B.G., I.A. Chandranita Manuaba, 2007). Generally, the first menstruation comes around the age of 10-16 years. According to Bobak, menstruation or menstruation is periodic bleeding in the uterus that begins about 14 days after ovulation. Menstruation is an event that every woman experiences. A woman who first gets her period is a sign that she is ready to reproduce or produce offspring (Zuiatna, 2008). Menstrual cycles are considered normal if they occur at intervals of 22-35 days (from the first day of menstruation to the beginning of the next menstrual period). It should be noted that menstrual discharge consists of tissue fluid (20-40 percent of the total discharge), blood (50-80 percent), and endometrial fragments. However, to women the menstrual discharge looks like blood and this is what is reported. Menstrual disorders most commonly occur at the beginning and end of the reproductive period, namely under the age of 19 years and above the age of 39 years. This disorder may be related to the length of the menstrual cycle, or the number and duration of menstruation. A woman can experience both disorders. (George, J. M., 2002)

II. MATERIALS AND METHOD

This study used a descriptive analytic observational research design with a cross-sectional approach. This research was conducted at the Faculty of Medicine, Universitas Muslim Indonesia from November 2018 to February 2019. The population and sample in this study were students of the Faculty of Medicine, Muslim University of Indonesia class 2017. The sample size in this study was determined using a purposive sampling technique. The data collected in the form of primary data, namely data taken directly from the sample in the form of the results of the examination of Hb levels in the 2017 UMI medical faculty students. This study uses primary data, namely data collected by the researcher himself. Before the data was taken, the research subject was the entire sample. Ethics commission approval has been submitted and has been approved. The research subjects first explained the aims and objectives of this research. After that, they were asked again about whether their last menstrual cycle was normal or not, and then asked about their willingness to have their blood drawn to

measure hemoglobin levels. Blood sampling to check hemoglobin levels was carried out when the study sample was menstruating.

III. RESEARCH RESULT

The research was conducted at the Faculty of Medicine, Indonesian Muslim University, Makassar. Data collection started from November 2018 to February 2019 with a total sample of 34 people. The data collection process was carried out by recording the results of the questionnaire and examining the hemoglobin levels of the respondents. The collected data was then analyzed analytically and processed using SPSS. Based on the results of the study, it is known that the average age of students of the Faculty of Medicine UMI 2017 is 19 years. From the results of this study, it can be seen that the UMI Medical Student is classified as a teenager entering adulthood. Where women ranging from adolescence to adult hood, normally will experience menstrual periods or menstruation, the length of menstruation experienced by adolescents is generally not regular, thus allowing adolescents to experience excessive blood loss during menstruation which can cause anemia which is characterized by hemoglobin (Hb) and red blood cells (erythrocytes) are lower than normal. Data from the Household Health Survey (SKRT) in 2004 stated that the prevalence of nutritional anemia in toddlers was 40.5%, pregnant women 50.5%, postpartum mothers 45.1%, adolescent girls aged (10-18 years) 57.1% and age 19. -45 years 39.5%. Of all these age groups, women have the highest risk of suffering from anemia, especially adolescent girls.

Anemia is a condition in which the Hb level calculated by erythrocytes is lower than normal. It is said to be anemia if the Hb <12 g in women and <13 g in men. However, in reality, not all young women like to consume foods that contain lots of vitamin B12 or foods that contain lots of iron. This is due to ignorance of the importance of consuming foods that contain lots of protein or that contain lots of iron, vegetables and foods that contain lots of vitamin B12 to prevent anemia.(28)

Based on the results of statistical analysis, p value = 0.163 (p>0.05) which indicates that there is no significant relationship between the length of menstruation and changes in hemoglobin levels in 2017 students of the Faculty of Medicine, UMI, which means that the length of menstruation for a student does not affect changes in hemoglobin levels. This can be caused by various factors, such as the insufficient number of research samples, data that are not normally distributed, and the presence of confounding factors. The number of samples obtained in this study amounted to 34 samples. This number exceeds the sample that should have been obtained, but the data obtained were not normally distributed, this might be the cause of the absence of a significant relationship between the length of menstruation and changes in hemolobin levels in respondents. The results of this study can also be an illustration that changes in hemoglobin levels cannot be a benchmark for determining the presence of anemia symptoms in respondents.

Several confounding factors that can cause the absence of a relationship between the length of menstruation and changes in hemoglobin levels are the absence of intervention regarding the respondent's diet before taking hemoglobin levels and the different activity patterns of each respondent.

According to Hughes (1995), a longer menstrual period can cause blood loss which tends to be more so that iron expenditure due to bleeding will increase which causes hemoglobin levels to decrease, while the results of this study obtained different results, namely there was no significant relationship. Means between the length of menstruation with changes in hemoglobin levels. The average daily iron loss in normal people is about 0.6-1 mg. Whereas in menstruating women iron loss can reach 42 mg per cycle. Thus, the iron in the blood will be very low so that the hemoglobin level in the blood will decrease. (29) The cause of the difference in the results obtained in this study and the previous one is the method and way of working of the research which is somewhat different, where the previous research based on the data This is done only by linking the hemoglobin level taken during menstruation with the length of menstruation from the respondent. In this study, two samples of hemoglobin levels were measured and the difference was then analyzed for the length of menstruation from the respondents.

According to research by Shams, et al in 2010 stated that women who are menstruating are a very important population for their health. In the population of menstruating women, iron deficiency anemia occurs in 5% to 10%. Women who are menstruating, pregnant, and breastfeeding are very susceptible to iron deficiency anemia. Women who experience menstruation for more than 8 days with bleeding and clotting during menstruation have a high risk of iron deficiency so they are prone to anemia. (30) In this study, there are several factors that can affect hemoglobin levels in women that cannot be controlled by researchers, such as the activity and rest patterns of female students or the diet of each female student. In addition, in this study there are still shortcomings, namely that all external factors cannot be disclosed in detail due to the limited measurement instruments, funds, personnel, and research time allocation, where these deficiencies are expected to be completed in further research.

The limitations of this study are that the data collected is not normally distributed, especially in the sample data on the length of the respondent's menstruation and there is no intervention on the respondent's diet and activity that can affect the results of the examination of hemoglobin levels both before and during menstruation from the respondents. It is hoped that in future research, researchers will pay attention to these limitations.

IV.   FIGURES AND TABLES

Table 1 Distribution of Hemoglobin Levels Before Menstruation of FK-UMI Students Class of 2017

Hb Level (gr %)	Total	Percentage (%)
< 8	0	0
8 – 9	0	0
9 – 10	4	11,8
10 – 11	6	17,6
11 – 12	7	20,6
> 12	17	50

Source: Primary Data

In table 1 above shows the distribution of hemoglobin levels for students of FK-UMI Class 2017, there were no female students who had premenstrual hemoglobin levels below 9 gr%, while 4 female students who had premenstrual hemoglobin levels of 9-10 gr% (11, 8 %), 10 – 11 g% as many as 6 female students (17.6% %), 11 – 12 g% as many as 7 female students (20.6% %), and hemoglobin levels above 12 g% as many as 17 female students (50%).

Hemoglobin Levels During Menstruation in FK-UMI Students Class of 2017

Table 2 Distribution of Hemoglobin Levels During Menstruation for FK-UMI Students Class of 2017

Hb Level (gr %)	Total	Percentage (%)
< 8	1	2,9
8 – 9	0	0
9 – 10	1	2,9

10 – 11	10	29,4
11 – 12	11	32,4
> 12	11	32,4

Source: Primary Data

In table 2 above shows the distribution of hemoglobin levels for students of FK-UMI class 2017, there were no female students who had hemoglobin levels during menstruation below 8 – 9 gr%, while female students who had hemoglobin levels during menstruation less than 8 gr% found 1 female student (2.9 %), 9 – 10 gr% 1 student (2.9 %), 10 – 11 gr% 10 female students (29.4%), 11 – 12 gr% 11 female students (32.4%) , and hemoglobin levels above 12 g% as many as 17 female students (32.4%).

Changes in Hemoglobin Levels Before and During Menstruation in FK-UMI Students Class of 2017

Table 3 Distribution of Changes in Hb Levels of FK-UMI Students Class of 2017

Changes in Hb Levels	Total	Percentage (%)
Decrease	21	61,8
Increase	13	38,2
Total	**34**	**100**

Source: Primary Data

Table 3 above shows the distribution of changes in Hb levels for FK-UMI female students in the 2017 class, it was found that students with changes in Hb levels decreased by 21 people (61.8%), while students with changes in Hb levels were 13 people (38.2%). .

Period of Menstrual Cycle in the Last 3 Months for FK-UMI Students Class of 2017

Table 4 Distribution of Menstruation Length for FK-UMI Students Class of 2017

Length of Menstruation	Total	Percentage (%)
Hypomenore (< 3 hari)	0	0
Normal (3 – 8 hari)	31	91,2
Hypermenore (> 8 hari)	3	8,8
Total	**34**	**100**

Source: Primary Data

Table 4 above shows the distribution of menstrual duration for FK-UMI female students in the 2017 class, there were no female students with menstrual periods of less than 3 days (hypomenorrhea), 31 students with menstrual periods of 3 to 8 days (normal) (91.2%) , while female students with menstrual periods of more than 8 days (hypermenorrhea) were 3 people (8.8%).

Bivariate Analysis

The Relationship between Menstruation Length and Hemoglobin Levels in FK-UMI Students Class of 2017

Table 5 Relationship between Menstruation Length and Hemoglobin Levels in FK-UMI Students Class of 2017

	Changes in Hb Levels	
	p	r
Menstruation Length	0,163	-0,245

Table 5 above shows the relationship between the length of menstruation and hemoglobin levels in FK-UMI female students class 2017, there was no significant correlation between the length of menstruation and changes in Hb levels (p: 0.163 ; r: -0.245).

V.   CONCLUSION

The Hb level of female students before menstruation was found that 50% of respondents had normal hemoglobin levels, and 50% had low hemoglobin levels. The Hb level of female students during menstruation was found that 32.4% of respondents had normal hemoglobin levels, and 67.8% had low hemoglobin levels. Changes in female Hb levels before and during menstruation were found to be 61.8% decreased and 38.2% increased. It was found that 91.2% of respondents experienced normal menstrual periods, and 8.8% experienced hypermenorrhea, and there were no respondents who experienced hypomenorrhea. Based on the results of research and discussion, it can be concluded that there is no relationship between the length of menstruation and changes in hemoglobin levels in respondents.

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