The Relationship Of Lila To The Incidence Of Anemia In Pregnant Women

Mona Lisa[1] **, Winnie Tunggal Mutika**[2] **, Melda Maulia Herlisya**[2] **, Ambariani**[2]
[1]University of Indonesia, Health Research Center
[2]Bachelor of Midwifery Study Program, Faculty of Health Sciences and Pharmacy, Gunadarma University
Correspondence email: mona.lisa@ui.ac.id

ABSTRACT

Anemia in pregnant women is the highest cause of maternal mortality, with 40% of pregnant women suffering from anemia. Maternal health during the pre-pregnancy period, during pregnancy, and during breastfeeding is a very critical period for the growth and development of the child. The first 1000 days of life is a sensitive period or *"window of opportunity"* Nutritional factors are direct factors that cause anemia during pregnancy, one of which is Chronic Energy Deficiency (CHD) by measuring Upper Arm Circumference (LILA). This study aims to determine the relationship of Upper Arm Circumference (LILA) to the incidence of anemia in pregnant women at Haryanti Depok Independent Midwife Practice (PMB). This study used a *cross-sectional* approach with a population of first trimester pregnant women in May 2019-May 2020 at PMB Haryanti Depok, totaling 118 pregnant women. Sampling using *purposive sampling* technique, namely pregnant women who meet the inclusion criteria of 105 pregnant women with complete medical record data. Data analysis used with *chi-square* test with sig <0.05. The results obtained as many as 68 pregnant women (64.8%) who experienced anemia, LILA measurements below normal limits as many as 62 pregnant women (59%). The statistical test results showed that there was a significant relationship between LILA and the incidence of anemia in pregnant women in the first trimester. Screening nutritional status by measuring LILA and checking hemoglobin levels plays an important role in preventing anemia, especially in pregnant women so that early treatment can be carried out.

Keywords: Anemia, LILA, pregnant women

INTRODUCTION

Anemia is a condition where the hemoglobin in the blood is below the normal limit. According to the *World Health Organization* (WHO), hemoglobin is a component in red blood cells that is responsible for carrying oxygen in the blood. The threshold level of hemoglobin in the blood is <120 g/L in non-pregnant women and 110 g/L in pregnant women within the age range of 15-49 years (1). *The World Health Organization* (WHO) estimates that the highest percentage of maternal deaths are bleeding (28%), infections that can be caused by anemia, and chronic energy deficiency (CED). The prevalence rate of anemia is around 40% which occurs in pregnant women around the world, especially in developing countries WHO (2). The incidence of anemia in pregnant women in Indonesia is still quite high. Based on the results of the Basic Health Research (Riskesdas) in 2018, there has been an increase in anemia in pregnant women in the last 5 years. In 2013 anemia in pregnant women was 37.1% while in 2018 there was an increase in anemia to 48.9%. This data shows that the prevalence of anemia in pregnant women increased by 11.8%. Based on the age group, it can be seen that the group of pregnant women aged 15-24 years has the highest percentage of anemia, which is 84.6%, followed by the age group 23-34 years at 33.7%.

The trend of anemia in pregnant women in West Java and Depok City is also in line with the results of Riskesdas, there has been an increase in the last 5 years, the highest cases of anemia in pregnant women occurred in 2019 (3). The rate of anemia among pregnant women in the first trimester is 20%, the second trimester is 70%, and the third trimester is 70% (4). Another study also mentioned that the incidence of anemia is more experienced by pregnant women in the second and third trimesters compared to the first trimester. In the second trimester there is a very rapid development of the fetal body and brain nerves while in the third trimester is a critical point of fetal development and in preparation for birt (5).

Pregnant women who experience anemia have various symptoms, ranging from mild anemia to severe anemia which can be seen from the hemoglobin level in their blood. The symptoms that often appear are 5L (tired, weak, lethargic, tired, and lunglai), pale lower eyelids, memory and concentration begin to decline (5). The incidence of anemia is closely related to nutritional factors during pregnancy because it improves Fe consumption which is important to overcome anemia, the results of research showing that most pregnant women experience anemia with irregular Fe consumption. Because the iron reserves of pregnant women will be depleted for the needs of the fetus (2).

Pregnant women with LBW have a prevalence of 6.2% and the risk is higher if pregnant at the age of 15-19 years with LBW (proportion of 33.5%) (6). More than 20 million babies in the world (15.5% of all births experience LBW and 95% of them occur in developing countries (7). LBW can occur due to nutritional factors at the global level and in developing countries, especially Indonesia. Nutritional factors are direct factors that cause anemia during pregnancy. At each stage of pregnancy, a pregnant woman needs food with different nutrient content and adapted to the condition of the body and fetal development (8). Balanced nutrition for pregnant women indicates that pregnant women must meet the nutritional needs of the fetus during pregnancy, then the reserve supplies in the mother's body will be taken by the fetus. Therefore, pregnant women must have a good nutritional status and consume a variety of foods to meet the nutritional needs of the mother and fetus. This can be done by ensuring adequate intake of macronutrients, such as protein, as well as adequate intake of micronutrients, such as iron, folic acid, vitamin C, and vitamin B12, which are needed by the mother during pregnancy (9).

This condition greatly affects the health of children and mothers during pregnancy and childbirth. Babies born to mothers with anemia have the potential to be born with low birth weight (LBW) and mothers also have the potential to experience bleeding, other complications and can cause maternal death (6). Anemia is a condition characterized by a reduced number of red blood cells and or hemoglobin (Hb) concentration which causes a reduced ability of the blood to carry oxygen in order to meet the body's physiological needs (10). Anemia that occurs has an adverse effect on pregnancy, childbirth, and postpartum. Anemia that occurs in the first trimester results in abortion while if it occurs in the second trimester it causes premature labor. The effect of anemia in the puerperium is the occurrence of uterine subinvolutions that can cause postpartum bleeding, facilitate puerperal infections, reduced breast milk output, and easy breast infections (11).

Maternal health before pregnancy, during pregnancy, and during breastfeeding are very critical periods for the growth and development of children. The first 1000 days of life is a sensitive period or *"window of opportunity".* If the child experiences nutritional problems during this infancy period, the consequences are permanent and irreversible (12). Iron is an essential nutrient used in forming hemoglobin to carry oxygen throughout the body, and is also involved in several enzymatic reactions in body tissues, currently anemia during pregnancy is defined as serum hemoglobin less than 11 gr/dl. Anemia of pregnant women can cause preplacental hypoxia with subsequent changes to the placenta and also cause changes in vascular flow in the fetus (13).

Efforts can be made to conduct screening such as hemoglobin (Hb) checks to detect whether pregnant women suffer from anemia or not. If the pregnant woman falls into the criteria for anemia, it must be identified as mild, moderate, or severe. In addition, the examination of supporting signs and symptoms such as blood pressure, pulse, and conducting a history related to it. The discovery of anemia cases can be followed up by reporting the incidence of anemia in pregnant women in an area in order to deal with the incident. Oral therapy in the form of giving blood supplement tablets can be given and follow-up referral to the hospital if severe anemia occurs (14).

LILA measurement is one of the fastest tools to determine the nutritional status of pregnant women, especially with regard to the potential for SEZ and correlates with Body Mass Index (BMI). Upper Arm Circumference (LILA) is implemented for adult care under resource settings, and to monitor maternal undernutrition and fetal growth (15). Thus, LILA allows assessment of protein intake and storage, associated with severe malnutrition (13). Currently, the use of LILA as an indicator of SEZ has been widely used in developing countries including Indonesia. If the LILA size is <23.5 cm, the pregnant woman is considered to be undernourished, this condition can be concluded that the pregnant woman has been indicated to be malnourished for a long period of time and can cause the process of fetal growth and development to be hampered and as a result can result in the birth of a LBW baby (16, 17). The application of easy and reproducible tools to monitor the nutritional status of pregnant women is a great opportunity to improve risk assessment so that nutritional interventions during pregnancy can be carried out earlier and facilitate the provision of more comprehensive antenatal care (18). Research in India has shown that LILA can be used as a screening tool to assess the nutritional status of women during pregnancy (19).

Several ways that can be done to assess the nutritional status of pregnant women are anthropometric and biochemical measurements, which are often carried out on pregnant women, namely measurements of body weight (BB and height (TB) and LILA measurements. While biochemical measurements are often done is the measurement of blood hemoglobin levels to determine the degree of iron nutrition anemia that is often experienced by pregnant women. LILA measurement is one of the options for determining nutritional status, because it is easy, cheap, fast, does not need the age of the mother because it is sometimes difficult to obtain, provides an overview of the incidence of muscle fat layer under the skin. LILA reflects energy reserves so that it can reflect energy and calorie deficiencies in pregnant women (5).

Reducing the incidence of anemia is one of the targets of the *Sustainable Development Goals* (SDGs). By 2025, WHO targets a 50% reduction in the incidence of anemia in women of childbearing age. Various steps have been taken by WHO in tackling anemia. Providing iron supplements and food fortification are some of the interventions to prevent anemia. In addition, empowering women, improving the economy, and improving health services are also aimed at reducing the incidence of anemia (1). Indonesia as one of the WHO member countries is also obliged to help the anemia reduction program. This is also in accordance with the 2020-2024 National Medium-Term Development Plan, one of which is to reduce stunting related to anemia in women of childbearing age. The anemia prevention program in women of childbearing age in Indonesia includes issuing balanced nutrition guidelines, food fortification, provision of blood supplement tablets (TTD) and treatment of comorbidities.

Anemia is not caused by a single factor, several studies have identified potential risks associated with anemia in pregnant women including hypertension, diabetes, placental abruption, LILA, physical inactivity, history of non-communicable diseases, parity, birth spacing, pregnancy spacing, education, maternal knowledge, LILA, maternal age, and gestational age (16, 17, 20-22). The results of other studies show that there is a significant relationship between mothers with SEVERITY and the incidence of anemia in pregnant women. Pregnant women with SEZ have a

greater chance of anemia as much as 1.68 times compared to pregnant women who are not SEZ (22). This study is also in line with research conducted in the city of Tanjung Pinang, pregnant women with SEZ experience more anemia than pregnant women who are not SEZ (17).

In general, pregnant women who are overweight tend to experience more anemia than those who are not anemic. This is due to unbalanced food consumption and absorption patterns during pregnancy. If pregnant women during pregnancy do not consume balanced nutrition, they are at risk of nutritional disorders or the occurrence of SEZ which can lead to anemia (17). Based on the phenomenon and accompanied by the data and facts above, the author is interested in knowing the effect of LILA on the incidence of anemia in pregnant women at PMB Haryanti Depok.

METHODS

The type of research used in this study uses quantitative research which aims to determine "The Relationship between Nutritional Status and the Incidence of Anemia in Pregnant Women". The research design used was analytic with a *cross-sectional* approach using secondary data. The research subjects were pregnant women, while the object of research was anemia. The dependent variable in this study was anemia and the independent variable was LILA which was examined at the beginning of pregnancy. Covariate variables that were also observed were parity and age. Anemia was measured by professional midwives using an *easy touch* measuring instrument where pregnant women were categorized as anemic who had hemoglobin check results <11.0. For the LILA category, it was done using the LILA tape tool, where pregnant women who have the LILA category are at risk of SEZ with the measurement results <23.5 cm. Furthermore, for the covariate variable parity was measured by asking pregnant women about their previous childbirth history, pregnant women with risky categories were with the number of children≥ 4. Finally, for the age variable by calculating the mother's own age from the date of birth found in the pregnant woman's medical record, then categorized according to the operational definition used by the researcher. This research was conducted at PMB X Depok in April-May 2020.

The population in this study were all pregnant women who examined themselves at PMB X totaling 118 pregnant women from May 2019 - May 2020. The sampling technique in this study used *total sampling* which means all pregnant women who conducted self-examination at PMB X from May 2019 - May 2020. The inclusion criteria in this study were pregnant women with complete medical record data according to the variables collected. The number of respondents who successfully participated in this study was 105 pregnant women. The statistical test used was bivariate analysis using *chi-square* to determine the effect of LILA on the incidence of anemia in pregnant women using SPSS 25 software.

RESULTS AND DISCUSSION

Table 1. Characteristics of Pregnant Women

Variables	n	%
Age		
<20 years	2	1,9
20-35 years	88	83,8
>35 years old	15	14,3
Parity		
Not at risk	37	35,2
At Risk	68	64,8

Most of the pregnant women were aged 20-35 years, namely 88 people (83.8%) and followed by the age group> 45 years, namely 15 (14.3%). Parity≥ 4 is one of the dangerous conditions in pregnant women because it can increase the incidence of complications in pregnancy and childbirth such as fetal death in the womb and bleeding before and after childbirth which is also very dangerous for the mother's health condition, because women who have given birth frequently can cause damage to blood vessels and uterine walls due to previous childbirth so that blood flow to the placenta becomes disrupted which results in disruption of circulation to the fetus.

Based on table 2, 68 pregnant women (64.8%) experienced anemia. The results of research on pregnant women at PMB X Depok showed that out of 105 pregnant women there were 68 pregnant women (64.8%). This data shows that there is still a high rate of anemia in pregnant women. The rate of anemia in pregnant women in Indonesia is quite high at around 67% of all pregnant women with variations depending on their respective regions, around 10-15% are classified as severe anemia which will certainly affect the growth and development of the fetus in the womb. Meanwhile, the results of Riskesdas in 2018 showed 76.2% of adolescent girls received Blood Addition Tablets (TTD) but only 1.4% consumed≥ 52 grains, while in pregnant women, there were 73.2% of pregnant women who had received TTD but pregnant women who received TTD≥ 90 grains were still quite low at 24%, while of those who received≥ 90 grains only 38.1% took TTD consistently (≥ 90 grains). The latest data states that pregnant women affected by anemia reach 40-50%, which means that 5 out of 10 pregnant women in Indonesia are anemic (23).

Table 2. Frequency distribution of anemia incidence and LILA measurement

Variables	n	%
Incidence of anemia		
No Anemia	37	35,2
Anemia	68	64,8
LILA Measurement		
Normal	43	41,0
Less	62	59,0

Source: Secondary Data, 2019-2020

The research conducted is in line with Aminin and Novyriana's research, showing that most pregnant women experience anemia, namely 61.3% and 82.3% (17, 24). Other studies have shown that infants born to anemic mothers have a higher risk of preterm birth (8.9% compared to 6.5%) and are also more likely to experience other abnormalities related to prematurity (13). Some studies have also observed an association of risk of adverse birth outcomes with maternal Hb, where low Hb levels have a positive association with birth outcomes such as LBW, stillbirth, *pre-eclampsia,* and hemorrhage (25). Another different study mentioned that pregnant women who were compliant with taking Fe tablets were 11.8% while pregnant women who were not compliant with taking Fe tablets were 88.2%. The results of the *chi-square* statistical test showed no effect of Fe tablet consumption on the incidence of anemia in pregnant women (p=0.057; OR=0.7). This may be due to several things, such as sample availability, differences in methods, or indeed anemia does not occur due to Fe tablet consumption alone (26).

Table 2 also shows LILA measurements that have a risk of SEZ (<23.5 cm) as many as 62 respondents (64.8%), LILA measurements in the normal category with a size of≥ 23.5 cm indicate good nutritional status and if the size is <23.5 cm indicates poor nutritional status (27). Based on the results of table 1, it is known that 59% of pregnant women experience the risk of SEZ. This indicates that pregnant women have poor nutritional status. In particular, LILA in pregnant women has a correlation with the birth weight of the baby (28). While in other literature also shows the relationship of small LILA can adversely affect birth, several factors affect LILA in pregnancy. In Ethiopia, *stunting* in infants and children under 24 months of age has been found to be related to birth weight, maternal height, and maternal BMI. Poor diet, hygiene, sanitation and anemia are also significant contributors to maternal and child stunting (29).

Table 3. Analysis of the Relationship between LILA and Anemia Incidence at PMB X Depok City

Variables	Incidence of Anemia				*p value*
	No		Yes		
	n	%	n	%	
LILA Measurement					
No SEZ	36	83,7	7	16,3	<0,001
SEZ	1	1,6	61	98,4	

Source: Secondary data, 2019-2020

The proportion of pregnant women with anemia with LILA at risk of SEZ was 98.4% higher than that of pregnant women who were not at risk of SEZ. From the results of this study, it is known that almost all mothers who have LILA size at risk of SEVERITY experience anemia compared to those who have normal LILA size. Based on the results of statistical tests showed that there was a significant relationship between LILA and the incidence of anemia in pregnant women with a *p-value* <0.001. Pregnant women who experienced anemia had a risky parity of 66.2% higher than pregnant women whose parity was not at risk. The statistical test results showed that there was no relationship between parity and the incidence of anemia during pregnancy with a *p-value of* 0.676. The proportion of pregnant women with anemia was highest in the age group <20 years by 100%, followed by the age group >35 years by 86.7%. The statistical test results showed that there was no relationship between age and the incidence of anemia in pregnant women because the *p-value was* 0.081. Based on the results of this study, the size of LILA is one of the factors that need attention for pregnant women as a tool to determine and detect the nutritional status of pregnant women in order to avoid the dangers of anemia that can endanger pregnant women and babies.

Based on the analysis using the relationship test, namely *chi-square* in table 2 above which shows that there is a relationship between LILA and the incidence of anemia in pregnant women *sig* p <0.05 (<0.001). This study is in line with the research of Lestari and Zilmer LILA <23.5 cm increases the *Odds of* anemia (30, 31). Another study conducted by Tulu showed that there was a relationship between economic status, consumption of Fe tablets, LILA, and dietary diversity with the incidence of anemia in pregnant women (32). The results of other studies also show that mothers with LILA are most strongly associated with LBW, each increase of one unit of maternal upper arm circumference results in an increase in infant birth weight by 36.1 g (33). The results of a significant relationship were also shown between Hb and LILA with the incidence of anemia in third trimester pregnant women with a value of p = 0.047 which refers to the importance of screening nutritional status by measuring LILA and Hb examination which plays an important role in preventing anemia in pregnant women (34). Nutritional status and anemia were also associated

with a p value = 0.012 with an OR of 5.5 with 95% CI at 1.316 - 32.097. In addition, nutritional status contributes 30.6% in influencing the incidence of anemia (35). Another study stated that 72 people (74.2%) experienced anemia and Fe tablet consumption had a relationship with the incidence of anemia with a p value = 0.006. (36).

The association of anemia status with LILA size among pregnant women included in our analysis is consistent with the findings of other studies. A case-control study conducted in 2020 reported LILA <23 cm had a positive association with the occurrence of anemia. Pregnant women with LILA <23 cm had 3.83 times the risk of anemia compared to those with LILA >23 cm. (37). Research also conducted in Kenya (38), Ethiopia (39), Aceh Besar (40), Indonesia (20) showed a significant relationship between LILA measurements and hemoglobin levels in pregnant women.

Another case-control study on factors affecting the incidence of anemia in pregnant women stated that age (*p=0.*002, OR=1.956), iron intake (*p=0.*006, OR=0.16), education level (*p=0.*020, OR=0.07), knowledge (*p=0.*001, OR=1.266), and ANC visits (*p=0.*001, OR=2.04) while pregnancy spacing (*p=0.*619, OR=0.942), protein intake (*p=0.*493, OR=1.193), parity (*p=0.*494, OR=1.060), LILA (*p=0.*086, OR=0.658) and Fe consumption compliance (p=0.0571, OR=0.07) had no effect on the incidence of anemia in pregnant women (26). The results of other studies show different things that the effect of LILA with the incidence of anemia in pregnant women with the value of statistical test results proved insignificant (*p=0.*086, OR=0.658), meaning that there is no influence between LILA with the incidence of anemia in pregnant women (26).

Anemia in pregnant women is called "*potential danger to mother and child*" anemia. Therefore, anemia requires serious attention from all parties involved in health services in the future. Anemia in pregnant women is a condition in which red blood cells decrease or hemoglobin decreases, so that the oxygen carrying capacity for the needs of vital organs in the mother and fetus is reduced. During pregnancy, anemia is indicated if the hemoglobin concentration is less than 10.5-11.0 g/dl. The low capacity of blood to carry oxygen triggers the body's work by spurring the heart to increase heart rate. A constantly overworked heart can lead to heart failure and other complications such as pre-eclampsia (41).

Table 4. Relationship between characteristics and the incidence of anemia in pregnant women

Variables	Incidence of Anemia				*p value*
	No		Yes		
	n	%	n	%	
Parity					
Not at risk	14	37,8	23	62,2	0,676
At Risk	23	33,8	45	66,2	
Age					
<20 years	0	0,0	2	100	
20-35 years	35	39,8	53	60,2	0,081
>35 years old	2	13,3	13	86,7	

Based on the results of the study, the proportion of parity mothers who are at risk also experience anemia is higher than mothers with parity not at risk, which is 66.2%. However, statistically there is no significant relationship between parity and the incidence of pregnant women. This could be because the respondents of this study were mostly first or second pregnancies. Women who have a history of giving birth more than 3 times have a higher chance of anemia than pregnant women who have a history of giving birth < 3 times. The results of this

study are in line with research conducted by Sjahriani in Lahat district where respondents who experienced anemia were more in mothers with risky parity than mothers with non-risky parity. The absence of a relationship may be due to other factors that influence the condition of pregnant women such as attitudes, the distance of previous pregnancies. In addition, at the time of the study, it was known that some respondents had parity <3, including pregnant women who were pregnant with their first child, so there was no significant difference between parity and the incidence of anemia in pregnant women (42).

The results of this study showed that pregnant women with risky parity were 68 respondents (64.8%). Having a history of childbirth more than three times or more can cause anemia in subsequent pregnancies (42). However, parity in this study did not affect the incidence of anemia in pregnant women. From the results of the study it is known that those included in the risk category are 5.9%, and 94.1% are included in the non-risk parity with a value of (*p=0*.494, OR=1.060) (26).

Based on the research data, the age groups that have a higher chance of experiencing anemia are the age groups <20 years and >35 years. Where the percentage of pregnant women aged <20 years has the highest proportion to experience anemia, which is 100% compared to the age group > 35 years and the age group 20-35 years. Whereas for the age of >35 years has a proportion of 86.7% higher to experience anemia than the age of 20-35 years. Women who were <18 years old at the time of delivery were more likely to experience anemia while mothers over 34 years old were less likely than women between 18-34 years old (p<0.05). Age in other studies states that it affects the incidence of anemia in pregnant women. From the results of the study, it is known that the age of respondents affects the incidence of anemia in pregnant women. 41.2% of the age group had a high risk, while 58.8% were not at risk (26). Inadequate prenatal care increases the risk of anemia during pregnancy (13). Studies conducted in Argentina can show differences in the LILA cutoff for undernutrition according to gestational week, LILA 24.5 cm for pregnant women≤ 16 weeks, < 25.5 cm at 28 weeks and < 26.5 cm at 36 weeks (43). In India, LILA was assessed in the first trimester to detect LBW, with an accuracy of 58.7% and a PPV of 38.8% and NPV of 76.8%. The authors defined <22.5 cm as the best LILA *cut off* which warns of underweight measurement and is a predictor of LBW in the first trimester (44).

Statistical tests found no significant relationship between maternal age and the incidence of anemia in pregnant women. This is in line with research conducted by Sinaga in 2019 which stated that there was no relationship between the age of pregnant women and the incidence of anemia. Pregnant women aged <20 years and more than 35 years are more at risk of suffering from anemia due to physical and psychological factors. According to the theory that women aged <20 years are biologically mentally unstable and emotionally inclined. Mental immaturity can lead to a lack of attention to nutritional conditions related to endurance (45).

The results are different from the research conducted by Astriana, showing that there is a relationship between age and the incidence of anemia in pregnant women (15). Based on the results obtained by the researcher, it is known that respondents with ages <20 years and >35 years experience more anemia in pregnant women than respondents with ages 20-34 years, according to the researcher this can be caused by pregnancy at the age of less than 20 years emotions tend to be unstable and immature also supported by knowledge that is still lacking so that less attention to nutrition intake into the body during pregnancy. While at the age of more than 35 years biologically there is a decrease in metabolism and endurance and various diseases that often occur at that age which can cause the absorption of nutrients to be disrupted.

Government efforts to overcome MMR in pregnant women have been made, including improving the quality of services in health facilities, financing health insurance, direct community efforts by implementing government programs in providing 90 Fe tablets during pregnancy, nutrition education to the community so that they can know a nutritious diet so as to increase the level of nutrition in every pregnant woman. Pregnant women need a lot of nutrients and good nutritional status during pregnancy (Putri, 2017). The causes of anemia are malnutrition, iron deficiency, past childbirth blood loss and chronic diseases. The decrease in hemoglobin levels encountered during pregnancy is due to increased food requirements and changes in the blood during pregnancy. (46).

Another factor that can be a concern in pregnant women and can also affect the incidence of anemia in pregnant women is the level of education. According to WHO, educated women will be more open to new innovations/ideas and changes. With the amount of information about pregnancy absorbed by the mother, it will increase the mother's knowledge. Thus the knowledge gained by pregnant women is expected to change the mother's behavior along with the increasing mindset, adequate education makes it easier for pregnant women to receive information, especially related to health in pregnant women.

Strategies for anemia prevention programs in pregnant women according to WHO (2016) include a food-based approach by increasing the diversity of nutritional intake remains the main intervention when socializing to the community, availability and accessibility of micronutrients, exclusive breastfeeding until the baby is 6 months old, improving US complementary feeding, and food fortification. Improved knowledge and changes in dietary behavior also play a very important role in preventing anemia in pregnant women (47). Research also suggests that it is necessary to implement educational programs to improve pregnant women's nutritional knowledge and iron-based diets such as consumption of red meat, fish, vitamin C-rich fruits, milk, eggs, and green vegetables (48).

CONCLUSION

The prevalence of anemia cases in pregnant women in Indonesia is still relatively high, this condition will have an impact on the health of pregnant women and fetal development. Most of the incidence of anemia in pregnant women occurs in mothers who have LILA <23.5 cm. Statistically, LILA has a positive relationship with the incidence of anemia in pregnant women at PMB X in Depok city. Considering this condition, further prevention should be strengthened and considered so that the consequences of the condition can be minimized because when fetal development is disrupted from pregnancy, it is very likely that development afterwards will also be disrupted. This can be done by improving nutrition such as routinely taking Fe tablets and other nutritious foods and increasing knowledge about it during pregnancy and childbirth through education of pregnant women during posyandu. In addition, maintaining routine *antenatal care* based on the period of pregnancy will be beneficial to improve the nutritional status of pregnant women as well as the knowledge of pregnant women. Furthermore, promoting a healthy diet and lifestyle will be beneficial for improving the nutritional status of pregnant women and women of reproductive age in Indonesia.

REFERENCES

1. Organization WH. Global anaemia reduction efforts among women of reproductive age: impact, achievement of targets and the way forward for optimizing efforts. 2020.
2. WHO. Anaemia WHO webpage [Internet] Available from: Anaemia (who.int);cited 2022 April 17.

3. Kesehatan D. Open Data Jabar Jawa Barat2021 [
4. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, et al. Williams obstetrics: McGraw-Hill Medical New York; 2014.
5. Irianto K. Gizi seimbang dalam kesehatan reproduksi. 2014.
6. Kemenkes. Hasil Utama Riskesdas. Jakarta: Kementrian Kesehatan Republik Indonesia; 2018.
7. Akbar MI, Rinaningsih YS, Ekawaty R, Batiari NMP, Abdussalam I, Suharyanto E, et al. Pelaksanaan Program Keping Emas Pada Ibu Hamil Kekurangan Energi Kalori dan Anemia Di Desa Kronjo Tahun 2019. Jurnal Bidang Ilmu Kesehatan. 2020;10(1):108-21.
8. Muliawati SJIJIRMdIK. Faktor Penyebab Ibu Hamil Kurang Energi Kronis di Puskesmas Sambi Kecamatan Sambi Kabupaten Boyolali Tahun 2012. 2013;3(3).
9. Permenkes R. No 88 Tahun.(2014). Standar Tablet Tambah Darah Bagi Wanita Usia Subur dan Ibu Hamil.
10. Chaparro CM, Suchdev PS. Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. Annals of the new York Academy of Sciences. 2019;1450(1):15-31.
11. Sonda M, Rahmawati R, Husnah H, Zulfaidawati A, Hidayati HJMS. Relationship between the ABO blood group and hyperemesıs gravidarum, anemia, and preeclampsia. 2016;5(3):758-60.
12. Bappenas. Kerangka kebijakan gerakan nasional percepatan perbaikan gizi dalam rangka 1000 hari pertama kehidupan. In: RI BPPN, editor. Jakarta2013.
13. Beckert RH, Baer RJ, Anderson JG, Jelliffe-Pawlowski LL, Rogers EE. Maternal anemia and pregnancy outcomes: a population-based study. Journal of Perinatology. 2019;39(7):911-9.
14. Aprianti E. Gambaran Kejadian Kekurangan Energi Kronis (KEK) pada Ibu Hamil di Puskesmas Kasihan I Bantul Yogyakarta Tahun 2017. 2017.
15. Papathakis PC, Singh LN, Manary MJJM, endocrinology c. How maternal malnutrition affects linear growth and development in the offspring. 2016;435:40-7.
16. Bagenda EF, Oka IA, Syamsuddin SD. Hubungan Lingkar Lengan Atas (Lila) dengan Kejadian Anemia pada Ibu Hamil di Wilayah Kerja Puskesmas Tallunglipu Tahun 2021. Maternal & Neonatal Health Journal. 2022;3(2):99-103.
17. Aminin F, Wulandari A, Lestari RP. Pengaruh kekurangan energi kronis (KEK) dengan kejadian anemia pada ibu hamil. Jurnal kesehatan. 2016;5(2).
18. Miele MJ, Souza RT, Calderon I, Feitosa F, Leite DF, Rocha Filho E, et al. Proposal of MUAC as a fast tool to monitor pregnancy nutritional status: results from a cohort study in Brazil. BMJ open. 2021;11(5):e047463.
19. Suresh M, Jain S, Kaul NB. Evaluation of MUAC as a tool for assessing nutritional status during pregnancy (> 20 weeks of gestation) in Delhi India. World Nutrition. 2021;12(1):65-72.
20. Nainggolan O, Hapsari D, Titaley CR, Indrawati L, Dharmayanti I, Kristanto AY. The relationship of body mass index and mid-upper arm circumference with anemia in non-pregnant women aged 19–49 years in Indonesia: Analysis of 2018 Basic Health Research data. PloS one. 2022;17(3):e0264685.
21. Sjahriani T, Faridah V. Faktor-faktor yang berhubungan dengan kejadian anemia pada ibu hamil. Jurnal Kebidanan. 2019;5(2):106-15.
22. Sinaga RJ, Hasanah N. Determinan Kejadian Anemia Pada Ibu Hamil Di Puskesmas Tunggakjati Kecamatan Karawang Barat Tahun 2019. Jurnal Untuk Masyarakat Sehat (JUKMAS). 2019;3(2):179-92.

23. Manuaba. Ilmu Kebidanan, Penyakit Kandungan, dan Keluarga Berencana Untuk Pendidikan Bidan. Jakarta: EGC; 2007.
24. Novyriana E, Rahmadhani W, Zuhroh S. Hubungan Lingkar Lengan Atas Dengan Kejadian Anemia Dalam Kehamilan Di Puskesmas Gombong I. Jurnal Ilmiah Kesehatan Keperawatan. 2016;12(2).
25. Young MF, Oaks BM, Tandon S, Martorell R, Dewey KG, Wendt AS. Maternal hemoglobin concentrations across pregnancy and maternal and child health: a systematic review and meta-analysis. Annals of the New York Academy of Sciences. 2019;1450(1):47-68.
26. Windari L, Lisnawati N, Herutomo TJJoH, Sciences H. Faktor-Faktor yang Mempengaruhi Kejadian Anemia pada Ibu Hamil di Kecamatan Jatiluhur Kabupaten Purwakarta. 2018;2(1):44-8.
27. de Sá SA, Willner E, Pereira TAD, de Souza VR, Boaventura GT, de Azeredo VB. Anemia in pregnancy: impact on weight and in the development of anemia in newborn. Nutricion hospitalaria. 2015;32(5):2071-9.
28. Assefa N, Berhane Y, Worku A. Wealth status, mid upper arm circumference (MUAC) and antenatal care (ANC) are determinants for low birth weight in Kersa, Ethiopia. PloS one. 2012;7(6):e39957.
29. Ghosh S, Spielman K, Kershaw M, Ayele K, Kidane Y, Zillmer K, et al. Nutrition-specific and nutrition-sensitive factors associated with mid-upper arm circumference as a measure of nutritional status in pregnant Ethiopian women: implications for programming in the first 1000 days. PLoS One. 2019;14(3):e0214358.
30. Lestari CR, Saputro AA. Hubungan lingkar lengan atas (LILA) dan kadar hemoglobin dengan kejadian anemia pada ibu hamil trimester III. Jurnal Kesehatan Tambusai. 2022;3(3):384-95.
31. Zillmer K, Pokharel A, Spielman K, Kershaw M, Ayele K, Kidane Y, et al. Predictors of anemia in pregnant women residing in rural areas of the Oromiya region of Ethiopia. BMC nutrition. 2017;3(1):1-8.
32. Tulu BD, Atomssa EM, Mengist HM. Determinants of anemia among pregnant women attending antenatal care in Horo Guduru Wollega Zone, West Ethiopia: Unmatched case-control study. PloS one. 2019;14(10):e0224514.
33. Ogbonna C, Woelk GB, Ning Y, Mudzamiri S, Mahomed K, Williams MA. Maternal mid-arm circumference and other anthropometric measures of adiposity in relation to infant birth size among Zimbabwean women. Acta obstetricia et gynecologica Scandinavica. 2007;86(1):26-32.
34. Lestari CR, Saputro AAJJKT. Hubungan Lingkar Lengan Atas (LILA) dan Kadar Hemoglobin dengan Kejadian Anemia pada Ibu Hamil Trimester III. 2022;3(3):384-95.
35. Mutiarasari DJHTJ. hubungan status gizi dengan kejadian anemia pada ibu hamil di Puskesmas Tinggede. 2019;5(2):42-8.
36. Ruwayda R, Nurmisih NJJBKM. Hubungan Kecukupan Konsumsi Fe, Pola Makan Dan Ukuran Lila Dengan Anemia Ibu Hamil Di Puskesmas Simpang Kawat Kota Jambi. 2019;3(2):81-7.
37. Deriba BS, Bulto GA, Bala ET. Nutritional-related predictors of anemia among pregnant women attending antenatal care in central Ethiopia: An unmatched case-control study. BioMed Research International. 2020;2020.
38. Okube OT, Mirie W, Odhiambo E, Sabina W, Habtu M. Prevalence and factors associated with anaemia among pregnant women attending antenatal clinic in the second and third trimesters at pumwani maternity hospital, Kenya. Open Journal of Obstetrics and Gynecology. 2016;6(1):16-27.

39. Bereka SG, Gudeta A, Reta MA, Ayana LA. Prevalence and associated risk factors of anemia among pregnant women in rural part of JigJiga City, Eastern Ethiopia: a cross sectional study. J Preg Child Health. 2017;4(337):2.
40. Darmawati D, Tahlil T, Siregar TN, Kamil H, Fithria F, Audina M. Antenatal care and iron deficiency anemia among pregnant women. Proceeding of AIC: Health and Life Sciences. 2018;8(1).
41. Roosleyn IPT. Strategi dalam penanggulangan pencegahan anemia pada kehamilan. Jurnal Ilmiah Widya. 2016;3(3):1-9.
42. Sjahriani T, Faridah VJJK. Faktor-faktor yang berhubungan dengan kejadian anemia pada ibu hamil. 2019;5(2):106-15.
43. López LB, Calvo EB, Poy MS, del Valle Balmaceda Y, Cámera K. Changes in skinfolds and mid-upper arm circumference during pregnancy in Argentine women. Maternal & child nutrition. 2011;7(3):253-62.
44. Mohanty C, Prasad R, Srikanth Reddy A, Ghosh JK, Singh T, Das B. Maternal anthropometry as predictors of low birth weight. Journal of Tropical Pediatrics. 2006;52(1):24-9.
45. Sinaga RJ, Hasanah NJJUMS. Determinan kejadian anemia pada ibu hamil di puskesmas tunggakjati Kecamatan Karawang Barat tahun 2019. 2019;3(2):179-92.
46. Aguscik A, Ridwan R. Pengaruh Status Gizi Terhadap Kejadian Anemia Pada Ibu Hamil Di Daerah Endemik Malaria Kota Bengkulu. JPP (Jurnal Kesehatan Poltekkes Palembang). 2019;14(2):97-100.
47. Organization WH. WHO recommendations for prevention and treatment of maternal peripartum infections: World Health Organization; 2016.
48. Sunuwar DR, Sangroula RK, Shakya NS, Yadav R, Chaudhary NK, Pradhan PMSJPo. Effect of nutrition education on hemoglobin level in pregnant women: A quasi-experimental study. 2019;14(3):e0213982.