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OVERVIEW OF MOTHER`S BODY MASS INDEX (BMI) BEFORE PREGNANCY, WEIGHT GAIN, UPPER ARM CIRCUMFERENCE, AND HEMOGLOBIN LEVELS DURING PREGNANCY, AND BABY BIRTH WEIGHT AT CILANDAK DISTRICT HEALTH CENTER

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ABSTRACT

Pregnancy is a critical period that determines the quality of human resources in the future. The growth and development of children are largely influenced by the condition of the fetus in the womb. The fetus's growth can be influenced by the mother's nutritional status before and during pregnancy. A healthy and normal weight baby is likely to be born from a mother with a normal nutritional status before and during pregnancy. Therefore, strategic efforts are needed during the pre-pregnancy and pregnancy period to create a healthy and resilient generation. The mother's nutritional status before pregnancy can be determined by her body mass index (BMI), while the nutritional status during pregnancy can be evaluated based on weight gain, upper arm circumference, and hemoglobin levels. The purpose of this study is to describe the mother's BMI before pregnancy, weight gain, upper arm circumference, hemoglobin levels during pregnancy, and baby birth weight at the Cilandak District Health Center. This research is descriptive and based on secondary data from the Cilandak District Health Center, with a cross-sectional research design. The results show that pregnant women with very low and low BMI before pregnancy had a higher proportion of Low Birth Weight (LBW) infants (69.2%). Pregnant women who did not gain weight up to the standard during pregnancy also had a risk to have LBW infants (55.8%). Pregnant women with chronic lack of energy based on upper arm circumference measurements also found to have a higher proportion of LBW infants (71.4%), Additionally, non-anemic pregnant women also had a higher proportion of LBW infants (54.3%). Overall, this study highlights the importance of maintaining a healthy nutritional status before and during pregnancy to promote healthy and normal-weight babies. Further research may be required to investigate the factors that affect maternal nutritional status during pregnancy and identify interventions that can be implemented to improve maternal and fetal health outcomes.

Keywords: *Body Mass Index (BMI), Upper Arm Circumference, Hemoglobin Level, Baby Birth Weight*

INTRODUCTION

The gestation period plays a crucial role in determining the future quality of human resources as the growth and development of a child is largely dependent on the condition of the fetus while in the womb (1). Nutritional status of the mother before and during pregnancy can significantly impact the growth of the fetus (2). According to Basic Health Research (Riskesdas), there is an increasing trend in the proportion of low birth weight (LBW) babies (<2500g) in Indonesia, from 5.7% in 2013 to 6.2% in 2018 (3).

LBW babies can lead to adverse conditions in growth, development, vitality, and disease development in adulthood (4). Rini and Puspitasari's research indicates that LBW babies are 13.542 times more likely to cause infant death than normal birth weight babies (5). Ramadhanif's research also shows that students with a history of LBW are eight times more likely to have an abnormal IQ than those without a history of LBW (6). Furthermore, children with a history of LBW had a risk of 5.87 times to experience stunting, according to Rahayu et al. (7).

Malnutrition problems, such as anemia and chronic energy deficiency (CED), are still prevalent among pregnant women and can significantly affect the health and safety of mothers and babies, as well as the quality of babies born (8). The best intervention to achieve an ideal baby birth weight is to prepare the mother's pre-pregnancy nutritional status (10).

Nutritional status before pregnancy can be measured by body mass index (BMI) (9). During pregnancy, the nutritional status of pregnant women can be assessed based on weight gain, upper arm circumference measurement (LILA), and hemoglobin level (Hb) measurement (2). The size of the upper arm circumference in women of childbearing age can be used to determine the risk of chronic energy deficiency (CED) (11), while weight gain aims to monitor fetal growth (2). Hemoglobin (Hb) levels indicate anemia status, which is a condition where hemoglobin levels are below normal. Pregnant women who experience anemia can cause fetal death in the womb, abortion, birth defects, LBW, and anemia in babies born (12). The purposes of this research are to describe the mother's body mass index (BMI) before pregnancy, weight gain, upper arm circumference (LILA), and hemoglobin levels during pregnancy, and the weight of the baby born at the Cilandak District Health Center.

METHODS

This study analyzed secondary data from the mother's medical record, specifically from the Mother Cards of women who underwent examinations and deliveries in the Cilandak District Health Center's working area in South Jakarta between January 2018 and December 2020.

The population in this study included pregnant women who underwent examinations and deliveries in the Cilandak Health Center's working area, and the inclusion criteria are data on respondents with variables such as age, parity, pregnancy interval, weight and height before pregnancy, body weight, upper arm circumference (LILA), and hemoglobin levels during pregnancy, as well as the weight of the baby born on the mother's card, and the baby was born at full term. Exclusion criteria included pregnant women whose deliveries were referred to the hospital, babies born with twins, and babies with a birth weight over 4000g.

RESULTS AND DISCUSSION

A. Characteristics of Pregnant Women

In this study the characteristics of pregnant women included mother's age, parity, and pregnancy interval. The following table showed the results of data collection:

Table 1. The Distribution of Pregnant Women Based on the Characteristics of Pregnant Women (n=56)

Characteristics of Pregnant Women	n	%
Mother's Age		
At risk (<20 years and >35 year)	7	12.5
No Risk (20-35 years)	49	87.5
Parity		
At risk (≥4 times)	3	5.4
No Risk (<4 times)	53	94.6
Pregnancy Distance		
At risk (<2 years)	10	17.9
No Risk (≥2 years)	46	82.1

The results showed that 7 mothers (12.5%) were at risk due to their age during pregnancy, which was either <20 years or >35 years. On the other hand, 49 mothers (87.5%) were not at risk because their age fell between 20-35 years. In terms of parity, 53 mothers (94.6%) had a non-risk parity of <4 times, while only 3 mothers (5.4%) had an at-risk parity of ≥4 times. Based on pregnancy spacing, 46 mothers (82.1%) had non-risk pregnancies with spacing of ≥2 years, and 10 mothers (17.9%) had at-risk pregnancies with spacing of <2 years than the previous pregnancy.

B. Anthropometry Data for Pregnant Women

The anthropometric data of pregnant women are presented in table 2, including Body Mass Index (BMI) of Mother before Pregnancy, Maternal Weight Gain During Pregnancy, Status of Upper Arm Circumference (LILA) of Pregnant Women as follows:

Table 2. The Distribution of Anthropometric Data for Pregnant Women (n=56)

Mother's BMI Before Pregnancy	n	%
Very Thin (<17.0)	5	8.9
Underweight (17.0 - <18.5)	8	14.3
Normal (18.5 – 25.0)	34	60.7
Fat (>25.0 – 27.0)	0	0.0
Obese (>27.0)	9	16.1
Maternal Weight Gain During Pregnancy		
As per standards	13	23.2
Not achieve standard	43	76.8
Mother's Arms		
CED (<23.5)	7	12.5
Not CED (>= 23.5)	49	87.5

The table indicated that out of 56 mothers, 5 mothers (8.9%) were classified as very thin, 8 mothers (14.3%) were classified as thin, 34 mothers (60.7%) were classified as having a normal weight, and 9 mothers (16.1%) were classified as obese. Furthermore, the results showed that out of the 56 mothers, 43 mothers (76.8%) had non-standard weight gain during pregnancy, while 13 mothers (23.2%) had standard weight gain during pregnancy.

Additionally, the data revealed that out of the 56 mothers, 7 mothers (12.5%) were classified as being at risk, while 49 mothers (87.5%) were classified as not categorized as chronic energy deficiency (CED).

C. The Hemoglobin Levels of Pregnant Women

Data on hemoglobin levels of pregnant women were taken in Trimester III and were categorized into Anemia (<11gr%) and Not Anemia (≥ 11gr%). Below are the results of this study.

Table 5. Frequency Distribution of Pregnant Women Based on Mother's Hemoglobin Level Status (n = 56)

Hemoglobin (Hb) Levels of Pregnant Women	n	%
Anemia (<11g/dl)	10	17.9
Not Anemia (≥ 11g/dl)	46	82.1
Amount	56	100.0

The study results showed that out of a total of 56 mothers, there were 10 mothers (17.9%) who were classified as Anemia and 46 mothers (82.1%) who were classified as not Anemia.

D. Baby Birth Weight

Data on birth weight are categorized into Low (<2500 grams) and Normal (2500-4000 grams). Following are the results of data collection:

Table 6. Frequency Distribution of Baby Birth Weight (n=56)

Baby Birth Weight	n	%
Low (<2500 grams)	28	50
Normal (2500–4000 grams)	28	50
Amount	56	100.0

The results of data collection showed that out of a total of 56 babies, there were 28 babies (50%) who were classified in the Low category and 28 babies (50%) who were classified in the Normal category.

E. Baby Birth Weight Based on Mother's Body Mass Index (BMI) before Pregnancy

Mother's Body Mass Index (BMI) before pregnancy is grouped into 3 categories, namely less, normal, and more. An overview of the baby's birth weight based on the mother's body mass index (BMI) before pregnancy can be seen in the following table:

Table 7. Frequency Distribution of Birth Based on Body Mass Index (BMI) of Mother Before Pregnancy (n=56)

Mother's BMI Before Pregnancy	Baby Birth Weight				Amount	
	Low		Normal			
	n	%	n	%	n	%
Thin and Very Thin	9	69.2	4	30.8	13	100
Normal	14	41.2	20	58.8	34	100
Overweight and Obesity	5	55.6	4	44.4	9	100

From the group of pregnant women with a very thin and underweight BMI, namely 13 women, 9 babies (69.2%) were born with low birth weight. Among pregnant women with a normal pre-pregnancy BMI, 34 women, showed that 14 babies (41.2%) were born with low birth weight. And from those with a pre-pregnancy BMI categorized as overweight and obese, 9 women, 5 babies (55.6%) were born with low birth weight. These results suggest that there is a higher likelihood of low birth weight in babies born from mothers with thin and very thin BMI before pregnancy.

The mother's nutritional status before pregnancy can be assessed using body mass index (BMI). This index reflects the mother's nutrient stores for the growth and development of the fetus (9). Pregnant women who experience malnutrition in early pregnancy and then gain insufficient weight during pregnancy may experience a weight deficit (8). Therefore, having a BMI below the normal standard can increase the risk of giving birth to low birth weight (13).

F. Baby Birth Weight Based on Mother's Weight Gain During Pregnancy

Maternal weight gain during pregnancy is classified into two categories: achieved the standards and did not achieve the standards. To gain a better understanding of birth weight based on maternal weight gain during pregnancy, refer to the table below.

Table 8. Frequency Distribution of Birth Weight Based on Mother's Weight Addition During Pregnancy (n=56)

Maternal Weight Gain During Pregnancy	Baby Birth Weight				Amount	
	Low		Normal			
	N	%	n	%	n	%
Did Not Achieve Standard	24	55.8	19	44.2	43	100.0
Achieved Standard	4	30.8	9	69.2	13	100.0

There were 24 babies born with very low baby birth weight (55.8%) mostly found in mothers who did not achieved standard of maternal weight gain during pregnancy. Among those with a normal pre-pregnancy BMI (34 pregnant women), showed that 14 babies (41.2%) born with low birth weight. Among pregnant women with a pre-pregnancy BMI indicating they were overweight or obese (9 pregnant women), there were 5 babies (55.6%) born with low birth weight. These findings suggest that the highest proportion of babies with low birth weight were born to mothers who were very thin or underweight before pregnancy. Nutritional status before pregnancy can be measured by body mass index (BMI), which reflects nutrient stores for fetal growth and development (14). Pregnant women with malnutrition early in pregnancy, followed by inadequate weight gain during pregnancy, are at risk of having a weight-deficient baby. Having a BMI below normal standards can also increase the risk of giving birth to a low-birth-weight baby. When maternal weight gain during pregnancy does not meet standard guidelines, there is a higher proportion of babies born with low birth weight. Out of 43 babies born from pregnant women who did not meet weight gain standards during pregnancy, 24 babies (55.8%) were born with low birth weight. By contrast, among 13 pregnant women who met weight gain standards during pregnancy, 4 babies (30.8%) were born with low birth weight. Weight gain during pregnancy is a key indicator of the nutritional status of both mother and fetus. It is important to monitor weight gain during

pregnancy, as it reflects fetal growth rates in the womb (14). Underweight or excessive weight gain can cause serious problems for both mother and baby (15). The Institute of Medicine (IOM) recommends that weight gain during pregnancy should be calculated based on a pregnant woman's BMI before pregnancy (14).

G. Baby Birth Weight Based on Upper Arm Circumference Status (LILA) of Pregnant Women

The status of the upper arm circumference (LILA) of pregnant women is grouped into 2 categories, namely chronic energy deficiency (CED) and not CED. For an overview of the weight of the baby born based on the status of the upper arm circumference (LILA) of pregnant women, it can be seen in the following table.

Table 9. The Distribution of Weight Birth Based on The Status of the Upper Arm circumference (LILA) of Pregnant Women at Cilandak Public Health Center

LILA Mother	Baby Birth Weight				Amount	
	Low		Normal			
	n	%	n	%	n	%
CED	5	71.4	2	28.6	7	100
not CED	23	46.9	26	53.1	49	100

There were 5 babies (71.4%) having low birth weight from pregnant women with CED. While from pregnant women without chronic energy deficiency (CED), 23 babies (46.9%) were reported having low birth weight. Upper arm circumference (LILA) can describe nutritional status. A large upper arm circumference indicates a large amount of body fat, whereas a small size indicates a small amount of fat (11) . A study stated that pregnant women who experience CED cause impaired placental function as indicated by the relatively smaller weight and size of the placenta. Pumping blood from the heart (*cardiac output)* is also not sufficient because of reduced blood volume expansion. Thus, blood flow to the placenta is reduced resulting in a non-optimal size of the placenta and a reduction in the distribution of nutrients to the fetus which causes fetal growth to be stunted (9). The results of the study show that pregnant women with CED have a 4.317 times higher risk of giving birth to LBW compared to pregnant women who are not CED (17).

H. Birth Weight Status Based on the Status of Pregnant Women's Hemoglobin Levels

The status of hemoglobin (Hb) levels of pregnant women is grouped into 2 categories, namely anemia and not anemia. The Relationship between Hb status and Baby's birth weight is described in Table 10.

Table 10. The distribution of Birth Weight Based on Hemoglobin Status in Pregnant Women (n=56)

Mother's hemoglobin (Hb) status	Baby Birth Weight				Amount	
	Low		Normal			
	n	%	N	%	n	%
Anemia	3	30.0	7	70.0	10	100.0
Non-Anemia	25	54.3	21	45.7	46	100.0

From the group of babies born from pregnant women with anemic status, consisting of 10 babies born from pregnant women, only 3 babies (30%) had low birth weight, while from the group of baby born from pregnant women with non-anemic condition, consisting of 46 pregnant women, 25 babies (54.3%) had low birth weight. Low Hb levels can result in abnormal birth weight due to insufficient supply of nutrients and oxygen to the placenta, which can affect its function for the fetus. Decreased hemoglobin levels in pregnant women can increase the risk of having a low-birth-weight baby, bleeding before and during delivery, and even cause the death of both the mother and the baby, especially if the pregnant woman suffers from severe Hb deficiency (16).

CONCLUSION

Based on the study results, it can be concluded that the highest proportion of low birth weight babies was found in pregnant women with thin and very thin based on-BMI before pregnancy (60%), maternal weight gain during pregnancy not according to standards (55.8%), upper arm circumference (LILA) status (71.4%), and hemoglobin (Hb) status (54.3%). Therefore, it is important to monitor nutrient intake before pregnancy until the time of pregnancy to increase the proportion of babies born with normal birth weight. The pre-pregnancy period is crucial in determining the necessary actions to be taken during pregnancy.

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