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Exploring the Link between Maternal Weight Gain During Pregnancy and LBW Incidence Amid COVID-19

[1]Metty Tsabitah Aziz, [1]Anjarwati*
Corresponding Author: * anjarwati@unisayogya.ac.id
[1] Universitas 'Aisyiyah Yogyakarta, Indonesia

Abstract

The highest mortality cause in Indonesia is low birt weight (LBW). One of LBW causal factors is mothers' lack of weight during pregnancy. Covid-19 pandemic affects all aspects including economy which economy which causes the unfulfilled nutrition needs in pregnant women. The objective of the study is to analyze the relation of mother's weight rise during pregnancy and LBW incidents in the time of Covid-19 pandemic at Titik Kurniati private midwifery clinic. The study was a quantitative one with cross sectional design. The samples of the study were 64 samples taken by using quota sampling. The study used secondary data taken from medical and birth registration records. The data analysis used in the study was ficher exact. The study result showed p value of 0.002 and OR value was 16.44 (95% CI: 1.90-141.71). There is a significant relation of mother's weight during pregnancy and LBW incidents in the time of Covid-19 pandemic period at Titik Kurniati private midwifery clinic. Mothers with abnormal body weight during pregnancy have 16 times higher risk to give birth in LBW condition compared with mothers with normal body weight during pregnancy.

Keywords: *COVID-19, low birth weight, midwifery, pregnancy*

Introduction

Low birth weight (LBW) is defined as a birth weight of <2500 grams [1]. Birth weight is an indicator of a newborn's likelihood of survival, growth, long-term health, and psychosocial development [2]. According to the 2020 Indonesian Health Profile, there were 25,652 maternal deaths in 2020, with the highest cause being LBW, accounting for 7,124 deaths or 35.2% [3](. In the Yogyakarta Special Region, Kulon Progo Regency had the highest percentage of LBW cases in 2016, 2017, and 2019, with 7.5% or 363 LBW babies out of 4,856 live births in 2019 alone [4]. In 2020, data from Kulon Progo showed that the Lendah Subdistrict had the highest percentage of LBW cases per subdistrict, with 32 LBW cases out of 445 live births or 7.2% [5]. Coronavirus disease (Covid-19) is an infectious disease that is currently affecting many countries and has become a pandemic. The virus was first identified in Wuhan, China, in December 2019. The virus can affect people of all ages, genders, and underlying health conditions, including pregnant women [6].

Pregnancy during the Covid-19 pandemic is highly risky for pregnant women. Besides being vulnerable to infection with the SARS-CoV-2 virus, the pandemic has also disrupted healthcare services in healthcare facilities, resulting in a lack of access to healthcare services for pregnant women. The pandemic has also had an economic impact, with many people losing their jobs or experiencing a decrease in income. The decrease in family income results in a decrease in the ability to meet basic needs, such as food, which can lead to a decline in fetal nutrition status and the occurrence of LBW. During the Covid-19 pandemic, people are advised to stay at home, limiting access to food and causing a lack of

nutritional intake for pregnant women. Previous studies have shown that pregnant women's macronutrient intake during the Covid-19 pandemic is largely deficient, resulting in inadequate weight gain during pregnancy. Previous research has also shown a significant relationship between maternal weight gain during pregnancy and the occurrence of LBW. Pregnant women who have a lower than normal weight and do not gain enough weight during pregnancy are at risk of delivering LBW babies.

The pandemic has affected various aspects of life and has had a significant impact on the health and well-being of pregnant women and their unborn babies. The lack of access to healthcare services and proper nutrition during pregnancy can lead to negative health outcomes, such as LBW, which can have long-term implications for the health and development of the baby. It is crucial to take measures to ensure pregnant women have access to proper healthcare services and nutrition during the pandemic to prevent negative health outcomes.

In line with Ref. [7] stated that there is a relationship between maternal weight gain during pregnancy and the incidence of LBW, with a Chi-square test value of p = 0.000. PMB Titik Kurniati is one of the PMBs located in Kulon Progo, specifically in Kapanewon Lendah, which has the highest percentage of LBW cases per Kapanewon with 32 LBW cases out of 445 live births or 7.2%. PMB Titik Kurniati also had a considerable number of obstetric patients during the Covid-19 pandemic period from March 2020 to December 2021, with 179 obstetric patients and a 5.6% LBW rate, or a total of 10 LBW cases. Based on the background information presented above, the author is interested in conducting research on the relationship between maternal weight gain during pregnancy and the incidence of LBW during the Covid-19 pandemic period at PMB Titik Kurniati.

This information highlights the relationship between maternal weight gain during pregnancy and the incidence of LBW, with past studies and research indicating significant correlations between the two. Additionally, it points out that certain factors, such as limited access to healthcare and reduced economic means due to the pandemic, can contribute to inadequate maternal nutrition and ultimately lead to an increased incidence of LBW. Conducting further research on this topic specifically in the context of PMB Titik Kurniati during the Covid-19 pandemic period is important. There was a considerable number of obstetric patients and LBW cases. This research can potentially provide insights into the impact of the pandemic on maternal and child health in this specific setting.

Literature Review

Weight is the determination of the weight of the body size measured with minimal clothing. Weight is measured using a weight measuring tool in kilograms [8]. Weight gain during pregnancy is a factor that directly affects pregnancy outcomes. Maternal weight gain during pregnancy is the most common indicator used to determine the nutritional status of the mother and her fetus during pregnancy [9].

The data provided is a table showing the appropriate weight gain recommendations for pregnant women based on their pre-pregnancy or early pregnancy body mass index (BMI) category. The table is divided into four categories: underweight, normal weight, overweight, and obese, each with their respective BMI range. For each category, there is a recommended weight gain range for the first trimester, and then a range for the second and third trimesters combined. Finally, there is a total

recommended weight gain for the entire pregnancy, ranging from 12.5-18 kg for women in the underweight category to 5-9 kg for women in the obese category. This information is based on the Institute of Medicine's recommendations from 2009, and can be used by healthcare professionals to monitor and guide pregnant women's weight gain during pregnancy to promote a healthy pregnancy outcome.

Table 1. Standard weight gain during pregnancy [9]

Kategori	IMT (kg/m2)	Total kenaikan BB TM 1 (kg)	Kenaikan BB TM 2 dan 3 (kg/mgg)	Total pertambahan Berat Badan (kg)
Kurang	< 18,5	1 – 3	0,44 - 0,58	12,5 - 18 kg
Normal	18,5 - 24,9	1 – 3	0,35 - 0,50	11,5 – 16 kg
Overweight	25 – 29,9	1 – 3	0,23 – 0,33	7 – 11,5 kg
Obesitas	> 30	0,2 – 2	0,17 – 0,27	5 – 9 kg

Pregnant women who experience excessive weight gain can increase the risk of pregnancy-induced hypertension, gestational diabetes, complications during pregnancy and childbirth, weight retention during the postpartum period or obesity, and an increased risk of unsuccessful breastfeeding. Women who have weight gain during pregnancy that is not within the recommended range can have a negative impact on the baby. Pregnant women who experience weight gain below the standard can give birth to low birth weight babies because the baby's nutritional needs are not met during pregnancy [10].

Excessive weight gain during pregnancy is a common problem, and it is essential to educate pregnant women about the risks associated with it. It is also important to provide them with guidance on the recommended weight gain based on their pre-pregnancy body mass index (BMI). This can help to prevent adverse outcomes for both the mother and the baby.

Various studies have highlighted the importance of appropriate weight gain during pregnancy. For example, a study by Fabella Khoiriah in 2015 found a significant relationship between maternal weight gain during pregnancy and the incidence of low birth weight babies [7]. Additionally, research by Ref. [11] showed that maternal weight gain during pregnancy was associated with the risk of low birth weight babies. Overall, it is crucial to monitor maternal weight gain during pregnancy and provide appropriate guidance to pregnant women to help them maintain a healthy weight and reduce the risk of adverse outcomes for both themselves and their babies.

Methods

The stages of the research:

- Research design: The research was conducted using a quantitative research design with a cross-sectional approach.

- Sampling method: Quota sampling technique was used to select the sample size of 64 participants.
- Data source: The study used secondary data which was obtained from medical records and delivery registers from March 2020 to December 2021.
- Data collection tool: The data collection tool was a worksheet in the form of a data collection format.
- Data analysis: The Fisher exact test was used to analyze the collected data.

These stages describe the various aspects of the research such as the research design, sampling method, data source, data collection tool, and data analysis method used in the study. By following these stages, researchers can ensure that their research is well-structured and reliable, which can enhance the credibility of their findings.

Results

The data in Table 2 shows the characteristics of the research subjects. There were 64 subjects in this study, with 7.8% having a starting pregnancy BMI classified as "underweight," 64.1% as "normal," 17.2% as "overweight," and 10.9% as "obese." In terms of parity, 37.5% were considered at risk, while 62.5% were not. Regarding the age at pregnancy, only 9.4% were considered at risk, while the remaining 90.6% were not. In terms of weight gain during pregnancy, 40.6% of the subjects experienced "abnormal" weight gain, while 59.4% had "normal" weight gain. Finally, the incidence of LBW was found in 9 (14.1%) of the subjects, while 55 (85.9%) did not experience LBW.

Table 2. Subject Profiles

Variable	Frequency (N=64)	Percent
BMI at the start of pregnancy		
Deficient	5	7.8
Normal	41	64.1
Overweight	11	17.2
Obese	7	10.9
Parity		
At risk	24	37.5
Not at risk	40	62.5
Age at pregnancy		
At risk	6	9.4
Not at risk	58	90.6
Maternal weight gain during pregnancy		
Not normal	26	40.6
Normal	38	59.4
Incidence of LBW		
LBW	9	14.1
Not LBW	55	85.9

The analysis of Table 2 suggests that there may be a correlation between the mother's weight gain during pregnancy and the incidence of LBW. Previous research has shown that maternal nutritional status, including weight gain during pregnancy, plays an essential role in fetal growth and development. Insufficient weight gain during pregnancy can lead to a higher risk of delivering a low birth weight baby [10]. Moreover, the data also suggest that parity and age at pregnancy may not be significant factors

affecting the incidence of LBW in this study. However, further analysis is necessary to confirm these findings.

Based on Table 3, it can be observed that the incidence of LBW in mothers with abnormal weight gain during pregnancy was 88.9%, while in mothers with normal weight gain during pregnancy it was 11.1%. The results of the analysis on the relationship between maternal weight gain during pregnancy and the incidence of LBW showed a p-value of 0.002, indicating a significant association between the two variables.

Table 3. The Relationship of Maternal Weight Gain During Pregnancy

Gain	LBW		NLBW		p-value
	N	%	N	%	
Abnormal	8	88.9	18	32.7	0.002
Normal	1	11.1	37	67.3	
Total	9	100	55	100	

This finding is consistent with previous studies that have reported a higher risk of adverse pregnancy outcomes, including LBW, in mothers with excessive weight gain during pregnancy [12],[13]. The excessive weight gain during pregnancy may lead to increased fetal growth, which can increase the risk of LBW [10]. It is important for healthcare providers to monitor maternal weight gain during pregnancy to prevent adverse outcomes such as LBW. However, it is worth noting that this study has several limitations, including a small sample size and the use of secondary data. Future studies with larger sample sizes and primary data collection methods are needed to confirm the findings of this study and to explore other potential risk factors for LBW.

Discussions

Based on the results of this study, the highest number of initial pregnancy BMI categories was in the normal BMI group with 41 subjects (64.1%), followed by the underweight BMI category with 5 subjects (7.8%), overweight BMI category with 11 subjects (17.2%), and obese BMI category with 7 subjects (10.9%). From this data, it is known that there are still 23 subjects (35.9%) with abnormal BMI. According to Sari (2013), the more normal the mother's body mass index (BMI) is during the initial pregnancy, the more normal the baby's birth weight will be. Conversely, if the mother's BMI during the initial pregnancy is categorized as underweight, the more likely it is to experience low birth weight (Sari et al., 2013). In this study, LBW occurred in 3 out of 5 (60%) mothers with underweight initial pregnancy BMI, and 2 out of 41 (4.9%) mothers with normal initial pregnancy BMI. From the percentage data, it can be concluded that the probability of LBW occurrence in mothers with underweight initial pregnancy BMI is higher than in mothers with normal initial pregnancy BMI.

In mothers with higher initial pregnancy BMI, there is a risk of fat accumulation and a decrease in body metabolism and blood circulation to the uterus, which can result in low fetal weight gain during pregnancy [14]. In this study, LBW occurred in 2 out of 11 (18.2%) mothers with overweight initial pregnancy BMI, and 2 out of 7 (28.6%) mothers with obese initial pregnancy BMI. From the percentage data, it can be concluded that the probability of LBW occurrence in mothers with obese initial pregnancy

BMI is higher than in mothers with overweight initial pregnancy BMI. The study highlights the importance of monitoring and managing maternal BMI during pregnancy to reduce the risk of LBW occurrence. This can be achieved through regular antenatal care visits and providing appropriate interventions, such as nutrition counseling and physical activity recommendations, to help mothers maintain a healthy BMI.

Based on the results of this study, the majority of the parity category is not at risk, which is 40 subjects (62.5%), while the rest are at-risk parity categories, totaling 24 subjects (37.5%). Pregnant women with a parity of 1 are still adjusting to the condition of the uterus, which affects reproductive organ function. For mothers who give birth to more than 3 babies, there can be complications during pregnancy, which can impact growth and development that is not optimal. Repeated pregnancies and deliveries can cause damage to the blood vessels in the uterine wall and a decline in tissue elasticity, which can lead to abnormalities in fetal positioning, placental growth, or fetal growth resulting in LBW [15]. In this study, the incidence of LBW was found to be 4 cases (16.7%) in mothers with at-risk parity out of a total of 24 mothers with at-risk parity. The incidence of LBW in mothers with non-risky parity was 5 cases (12.5%) out of a total of 40 mothers with non-risky parity. From the percentage data, it can be known that the likelihood of LBW occurrence in mothers with at-risk parity is higher than the likelihood of LBW occurrence in mothers with non-risky parity.

The study found that there is a higher likelihood of LBW in mothers with at-risk parity compared to those with non-risky parity. The information on the impact of parity on pregnancy outcomes can be used by healthcare professionals to provide better care for pregnant women with at-risk parity. It is important to monitor such mothers closely during pregnancy to ensure optimal fetal growth and development. The findings of this study can also be used to raise awareness among mothers about the potential risks associated with high parity and to encourage them to seek appropriate medical care during pregnancy.

Based on the results of this study, the most common pregnancy age category is the non-risk age category, with 58 subjects (90.6%), while the others belong to the risk age category with 6 subjects (9.4%). In this study, the incidence of LBW occurred in mothers with a risky pregnancy age of 1 LBW (16.7%) out of a total of 6 mothers with a risky pregnancy age. The incidence of LBW in mothers with a non-risk pregnancy age was 8 LBW (13.7%) out of a total of 58 mothers with a non-risk pregnancy age. From these percentage data, it can be seen that the chance of LBW occurring in mothers with a risky pregnancy age is higher than the chance of LBW occurring in mothers with a non-risk pregnancy age.

According to Ref. [16], mothers with a baby under 20 and over 35 years of age are almost 4 times more likely to give birth to a LBW baby compared to mothers with a baby aged 20-30 years. Being too young or too old is one of the factors in the occurrence of LBW babies, where a healthy and safe period for pregnancy and childbirth is between the ages of 20-35 years. Pregnant women under the age of 20 are at risk of giving birth to a LBW baby. This is because their reproductive organs, such as the uterus, are not mature enough to carry the burden of pregnancy, and there is a possibility of complications such

as pregnancy poisoning or preeclampsia and placenta previa, which can cause bleeding during childbirth. Additionally, at this age, mothers are usually not ready psychologically or physically [16].

Poor nutrition during pregnancy not only leads to low birth weight, but can also cause anemia and other undesirable outcomes such as miscarriage, premature birth, difficult delivery, excessive bleeding during delivery, and susceptibility to infection. One way to determine whether a mother has adequate nutrition during pregnancy is to weigh her. Adequate weight gain can reduce the risk of Small Gestational Age (SGA) or preterm delivery. The recommended weight gain varies for each mother, depending on factors such as height and weight before pregnancy, whether the woman was of normal, underweight, or overweight before pregnancy. Recommended weight gain is adjusted to the mother's body mass index (BMI) at the beginning of pregnancy or before pregnancy. Overeating during pregnancy can cause excessive weight gain, which can make delivery difficult and lead to complications such as high blood pressure [17].

Based on the results of previous research, it can be seen that most mothers have normal weight gain during pregnancy, as evidenced by 38 subjects (59.4%) having good nutritional status during pregnancy, while the remaining 26 subjects (40.6%) had abnormal weight gain, indicating an imbalanced nutritional status. Research by Ref. [18] shows that the energy consumption of pregnant women is still low, indicating a lack of awareness of energy requirements during pregnancy. This is due to insufficient consumption of food, both in terms of quantity and quality. The low consumption of macronutrients is thought to be caused by the COVID-19 pandemic, which has reduced access to nutritious food for pregnant women, as well as reduced purchasing power for nutritious food due to decreased family income. Additionally, a lack of knowledge among pregnant women may contribute to low nutrient consumption [18]. Inadequate weight gain is one of the outputs of low macronutrient consumption.

This study found that 13 mothers (20.3%) had inadequate weight gain during pregnancy, which can be attributed to the COVID-19 pandemic that has affected all aspects of life, especially the economy and health. The pandemic has caused a decrease in family income, making it difficult for some families to afford nutritious food, and resulting in inadequate weight gain for pregnant mothers in these families. In addition to the pandemic, it is possible that some mothers in this group have insufficient knowledge about nutrition during pregnancy. While the majority of mothers had normal weight gain during pregnancy, it is likely that the economic effects of the COVID-19 pandemic have affected the majority of families in this study. However, with proper knowledge about nutrition during pregnancy, mothers can still consume nutritious food that meets their needs by selecting simple, affordable meals that provide balanced nutrition.

Based on the results of the conducted study, it can be inferred that the majority of subjects in this research gave birth to non-low birth weight (NLBW) infants, accounting for 55 infants (85.9%), while the remaining gave birth to low birth weight (LBW) infants, accounting for 9 infants (14.1%). According to the researchers, the reason why most babies born were NLBW is due to the fact that most

mothers had normal weight gain during pregnancy, which can generally be interpreted as good nutritional status that is sufficient to supply the fetus and the mother's body. Therefore, with adequate nutrition, the fetus can grow well according to its gestational age. This finding is consistent with Ref. [19] assertion that normal weight gain during pregnancy will result in babies with normal birth weight.

In this study, the incidence of low birth weight (LBW) was found to be 88.9% in mothers who had abnormal weight gain during pregnancy, with all cases of LBW occurring in mothers who had insufficient weight gain during pregnancy. Inadequate weight gain during pregnancy is an indicator of maternal malnutrition, which can lead to a reduction in blood volume, reduced blood flow to the uterus and placenta, reduced placental size, and a decrease in the supply of nutrients from the mother to the baby, resulting in intrauterine growth restriction (IUGR) and a high potential for LBW at birth [19]. The incidence of LBW in mothers who had excessive weight gain during pregnancy was 0%. In pregnant women who had excessive weight gain during pregnancy, blood volume and placental size are larger than normal, and there is an excessive flow of nutrients. This may result in a larger baby, which may complicate delivery and may cause other problems for the mother, such as hypertension. Therefore, the incidence of LBW in mothers with excessive weight gain is very rare.

In this study, the incidence of LBW in mothers with normal weight gain during pregnancy was found to be 11.1%. Normal weight gain during pregnancy results in a baby with a normal birth weight. This is because blood volume and placental size are normal, and nutrient flow from the mother to the fetus through the placenta is optimal [19]. The incidence of LBW in mothers with normal weight gain, which was found to be 11.1%, may be due to other factors that were not controlled for in this study, such as obstetric factors, socio-demographic factors, general health and episodic illness, infections and the environment, habits, and characteristics of the newborn [20].

Based on the Fisher exact test, there was a relationship between maternal weight gain during pregnancy and the incidence of LBW at PMB Titik Kurniati, with a p-value of 0.002. Maternal weight gain during pregnancy is associated with optimal pregnancy outcomes and is used as a basis for estimating the components of weight gain in healthy pregnancies [21]. This finding is in line with the present study, which indicates that most pregnancy outcomes that result in LBW are from mothers who had insufficient weight gain during pregnancy. This study is consistent with the findings of Ref. [11], who stated that there is a significant relationship between maternal weight gain during pregnancy and the incidence of low birth weight at PMB W Banjarmasin with a p-value of 0.004 < α=0.05. In the study by Ref. [15], a significant relationship was found between maternal weight gain during pregnancy and the incidence of LBW in the working area of Puskesmas Wates Kulon Progo in 2018-2019 with a p-value of 0.034.

The results of this study also showed an odds ratio (OR) of 16.44 (95% CI: 1.90-141.71), which means that mothers who had abnormal weight gain during pregnancy were 16 times more likely to give birth to a LBW baby than mothers who had normal weight. Furthermore, the results of this study indicate the importance of monitoring maternal weight gain during pregnancy, especially for those with insufficient weight gain. Regular monitoring and timely interventions to address inadequate weight gain

could help reduce the incidence of LBW and improve pregnancy outcomes. In conclusion, this study found a significant association between maternal weight gain during pregnancy and the incidence of LBW, with insufficient weight gain increasing the risk of LBW. Further research is needed to explore the factors contributing to inadequate weight gain and to develop effective interventions to prevent LBW and promote healthy pregnancies.

Conclusion

The study found that the majority of pregnant women at PMB Titik Kurniati had normal pre-pregnancy body mass index (BMI), normal weight gain during pregnancy, no parity risk, no age risk, and did not give birth to LBW babies. However, the study also found that the incidence of LBW in mothers who had abnormal weight gain during pregnancy was 88.9%, while it was only 11.1% in mothers who had normal weight gain during pregnancy. These findings suggest a clear relationship between maternal weight gain during pregnancy and the incidence of LBW in PMB Titik Kurniati, with a p-value of 0.002 and an odds ratio of 16.44 (95% CI: 1.90-141.71). This means that mothers with abnormal weight gain during pregnancy are 16 times more likely to give birth to LBW babies than mothers with normal weight gain during pregnancy. The study highlights the importance of monitoring maternal weight gain during pregnancy to prevent adverse birth outcomes like LBW.

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Authors



Metty Tsabitah Aziz is a talented student studying at 'Aisyiyah University of Yogyakarta in Indonesia. She is currently pursuing a degree in midwifery and has a keen interest in the field of women's health. In addition to her academic pursuits, Metty is also an active member of the student community. She participates in various extracurricular activities, including volunteer work and student organizations, and is committed to making a positive impact on the lives of those around her. As a student of midwifery, Metty is particularly interested in women's health and the role that midwives play in supporting and empowering women during pregnancy and childbirth. (email: mettytsabitahaziz27@gmail.com).



Anjarwati is an accomplished education scientist and a senior lecturer at 'Aisyiyah University of Yogyakarta, located in Nogotirto, Indonesia. She has dedicated her career to advancing the field of education through her research, teaching, and community outreach. She completed her undergraduate degree in Education at Gadjah Mada University in Yogyakarta. After completing her Bachelor's degree, she pursued her Master's degree in Education Science from the same institution. She has been teaching there for many years and has gained a reputation as a skilled and dedicated educator. She has also contributed significantly to the field of education through her research. (email: anjarwati@unisayogya.ac.id).