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Association of Low-Birthweight Incidence with Hemoglobin Levels in Pregnant Women at Puskesmas Demangan, Madiun In 2022

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Abstract

Background: The incidence of low birth weight babies (LBW) is important because it is an indicator to measure a child's health status, and until now it is still one of the health problems generally faced by developing countries, including Indonesia. One of the risk factors for LBW is the level of hemoglobin (Hb). Hemoglobin is a parameter that is widely used to determine the prevalence of anemia. **Objective:** The purpose of this study was to analyze the relationship between hemoglobin levels of pregnant women and the incidence of low birth weight babies. **Method:** The research method used a cross-sectional design with a sample size of 49 respondents who were taken by simple random sampling method after fulfilling the inclusion and exclusion criteria at the Ngegong, Mangunharjo and Demangan Health Centers, Madiun City. **Result:** Data obtained through the patient's medical record. Data analysis in this study using the Chi Square test obtained a p- value of 0.02 <0.05 and OR = 0.75. **Conclusion:** So it can be concluded that there is a relationship between low hemoglobin levels and the incidence of low birth weight, where low hemoglobin levels have a 0.75 times higher risk of experiencing LBW. The Spearman rank correlation coefficient value of 0.445 indicates the strength of the relationship between these two variables in the moderate category.

Keywords: hemoglobin, levels, pregnant women, LBW

Original Research Article

INTRODUCTION

Reducing the Infant Mortality Rate (IMR) is one of the factors for the success of development in the health sector (Aditianti & Djaiman, 2020). The infant mortality rate for children under five years of age (toddlers) in Indonesia reached 28,158 in 2020, according to the Indonesian Demographic and Health Survey (SDKI). Of that number, 20,266 children (71.97%) died at the age of 0-28 days (neonatal). In the age range of 29 days to 11 months, 5,386 children under five years of age died (19.13%) (post-neonatal) (Kesehatan et al., n.d.). Low birth weight (LBW) is a predictor of infant mortality, stunting and disease in adulthood (Permana & Wijaya, 2019). According to WHO, low birth weight causes neonatal deaths 20 times greater than normal birth weight (WHO, 2019). Low Birth Weight (LBW) babies, which are less than 2,500 grams, are a health problem that contributes to infant mortality. Every year, out of 20 million births worldwide, an estimated 15-20% of babies are born with LBW (Sadarang, 2021). These babies are not only at risk of death in the first months of life, but are also at risk of experiencing other

health problems, such as growth problems, low IQ, and chronic health problems as adults (Meikawati et al., 2021)

According to Mitao's research conducted in Northern Tanzania, maternal height, time of first antenatal care (ANC) visit, Antenatal care visits, iron supplements, calcium supplements, maternal education, all disorders during pregnancy, and hypertension are factors associated with the incidence of LBW (Mitao et al, 2015). The prevalence of anemia in pregnant women in the 2013 Riskesdas was 37 percent, but increased to 48.9 percent in the Riskesdas (Basic Health Research (Riskesdas), 2018). According to the results of previous research by Jumhati and Novianti in 2020, it showed that as many as 50.9% of pregnant women experienced anemia. The underlying causes of nutritional anemia include inadequate intake, inadequate absorption, increased nutrient loss, and excessive needs (Prawirohardjo Sarwono, 2016). Anemia in pregnancy is defined by The World Health Organization (WHO, 2019) defines hemoglobin levels as less than 11 grams or less than 33% at any stage during pregnancy, with normal hemodilution occurring in pregnancy if the hemoglobin level is less than 11 grams in the first trimester of pregnancy (Proverawati, 2013). Anemia during pregnancy can be dangerous for both the mother and the unborn baby(Agustin et al., 2019). Due to the lack of hemoglobin levels to bind oxygen, anemia can reduce the oxygen supply for the mother's metabolism (Yenni & S, 2007), causing indirect effects on the mother and baby such as infant death, increased maternal susceptibility to infection, and the possibility of premature birth (Lestari, 2021).

According to previous research results by Jumhati & Dian Novianti., 2018 it was shown that 50.9% of pregnant women experience anemia. The prevalence of anemia in pregnant women in Riskesdas 2013 was 37 percent, but increased to 48.9 percent in Basic Health Research (Riskesdas), 2018. The high frequency of anemia in pregnant women is mostly caused by a lack of iron which is needed for hemoglobin synthesis (Izhar & Ruwayda, 2018). Two maternal variables that influence fetal growth in the womb determine birth weight: internal and external factors of the pregnant mother. Internal factors for pregnant women include hemoglobin levels (Wahyuni et al., 2021). Nutrition is needed for maternal health and the growth and development of the fetus in the womb (Bustami et al., 2021). If the mother's nutritional condition during pregnancy is poor, there is a chance of giving birth to a baby with a low birth weight (LBW) (Setyawati & Arifin, 2022).

The prevalence of low birth weight (LBW) in Indonesia has decreased, while the risk factors for anemia in pregnant women have increased, thereby potentially increasing the incidence of LBW. Based on the background above, researchers are interested in conducting research with the title "The Association Between Low-birthweight Incidence and Hemoglobin Levels in Pregnant Women at Community Health Centers Demangan, Ngegong, Mangunharjo Madiun City in 2022."

MATERIALS AND METHODS

Research design

This research on "The Association Between Low-birthweight Incidence and Hemoglobin Levels in Pregnant Women at Community Health Centers Demangan, Ngegong, Mangunharjo Madiun City in 2022" is a quantitative study using analytical observational research methods with *cross-sectional research using Chi-Square* analysis. The approach taken in this research is observational by provide a picture or model the activities that become the project.

Population and Sample

The population in this study were mothers who gave birth at the Demangan, Ngegong and Mangunharjo Health Centers in January-December 2022. The number of respondents in this study was 49 respondents. The selection of the number of respondents was based on the number of maternity samples available at Demangan, Ngegong, and Mangunharjo Health Centers in the January-December 2022 period. From the total number of respondents who gave birth, 49 respondents were obtained in the three health centers. The selection of the three health centers represented the number of women who gave birth in the Madiun City sample. Therefore, further studies in other areas can be continued to support public health in Madiun City.

Data analysis

Data obtained from secondary data by looking at medical records. The technique used is *Simple Random Sampling*.

RESULT

Table 1. Based on Age Characteristics of Pregnant Women

Age Parameters	Frequency	Percentage
<20 years	2	4.1
20-35 years	45	91.8
>35 years	2	4.1
Total	49	100.0

Table 1 shows that the characteristics of the research results based on age are divided into 3 groups, namely the age category < 20 years as much as 4.1% (2 respondents), Age 20-35 years as much as 91.8% or 45 respondents. Age > 35 years was 4% (1 respondent). Based on the sampling methods used, there are total 49 respondent that will accountible on the research from the age below 20 years until more than 35 years. Later, all of the sample are measured by their haemoglobin content and the association of their low birth weight. We including the normal Hb also as the meassurement, so there are low Hb and Hb normal in the meassurement table (Table 2).

Table 2. Based on Age on the Incidence Rate of Low Birth Weight

Age on Haemoglobin Levels of Pregnant Women Sample				
Age	**Respondent**	**Low Hb**	**Respondent**	**Hb Normal**
<20 years	2	8.33%	0	0%
20-35 years	21	87.5%	24	96%
>35 years	1	4.1%	1	4%
Total	24	100%	25	100%

Table 2 Based on the number of respondents of 100% (49 respondents), it was found that 91.8% (45 respondents) were pregnant at the age of 20-35 years, where respondents who experienced low hemoglobin levels were 87.5% (21 respondents) and 96% (25 respondents) with normal hemoglobin. In this data, it can be seen that pregnant women in the age interval of 20-35 years tend to have a reduced risk of haemoglobin levels compared to other ages with a percentage of up to 87.5%. This is associated with many influencing factors, such as education, health, and hygiene. As research conducted by (Nurwasilah N et al., 2024) which states that the education level of the Madiun community has the following percentages: primary school graduates (12.87%), junior high school graduates (14.05%), senior high school graduates (19.93%), vocational school graduates (26.31%), and university graduates (5.23%) (Nurwasilah N et al., 2024). This shows that the level of education in Madiun City tends to be moderate when compared to other cities and that education can be used as educational advice on the importance of maintaining good health for a mother.

Table 3. Based on Low Birth Weight

Baby's Weight	Frequency	Percentage
Low birth weight (LBW)	30	61,2%
Not low birth weight (not LBW)	19	38,8%
Total	49	100%

Table 4. Based on Hemoglobin Levels

Haemoglobin Levels		
Hb Content	**Frequency**	**Percentage**
Low	24	49%
Normal	25	51%
Total	49	100%

Table 4 explains that the characteristics of the research results are based on hemoglobin levels at Demangan Community Health Center, Ngegong Community Health Center and Mangunharjo Community Health Center, Madiun City which are divided into 2 groups, namely mothers with low hemoglobin levels as many as 49% (24 respondents) while mothers who do not experience low hemoglobin levels are as many as 25 (51%). Continuing with the data provided in Table 2, testing of haemoglobin levels in mothers who had given birth showed that the majority of the sample had normal haemoglobin with a percentage of 51%. However, the percentage of mothers who have low haemoglobin values is still relatively high, with a percentage of up to 49%. This should be used as an evaluation for the government and health sector of Madiun City to improve health checks and education on the importance of maintaining haemoglobin levels for mothers.

Table 5. Association Between Haemoglobin Levels of Pregnant Women and The Incidence of Lowbirth Weight

Crosstabulation of Haemoglobin with Low Birth Weight						
Haemoglobin Content	**Baby's Weight**				**Total**	
	LBW		**Not LBW**			
	Respondent	**Percentage**	**Respondent**	**Percentage**	**Respondent**	**Percentage**
Low	20	40.8%	4	8.16%	24	49%
Normal	10	20.4%	15	30.6%	25	51%
Total	30	61.2%	19	38.77%	49	100%

Table 6. Based on Haemoglobin Levels on The Incidence Rate of Low Birth Weight

	Low Birth Weight			
Haemoglobin	Baby's Weight			
Content	LBW	Percentage	Not LBW	Percentage
Low	20	66.6%	4	21%
Normal	10	33.3%	15	78.9%
Total	30	100%	19	100%

Table 7. *Chi Square* Calculation

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.685 [a]	1	0.002		
Continuity Correction [b]	7.946	1	0.005		
Likelihood Ratio	10.160	1	0.001		
Fisher's Exact Test				,003	,002
Linear-by-Linear Association	9.488	1	0.002		
N of Valid Cases	49				

Table 8. Calculation of Odd Ratio and Correlation Coefficient

No	**Test results**	**Results**
1.	Odds Ratio	0.75
2.	Correlation Coefficient	0.445

Based on table 3, it was found that 100% of the total respondents (49 respondents), 61.2% (30 respondents) had low birth weight. Table 6 shows that of the total respondents who experienced low birth weight, 66.6% (20 respondents) were born to mothers who experienced low hemoglobin.

Based on table 7, it can be seen that the results of the *Chi-square test* are 0.02, which is less than (<0.05), so that H0 is accepted, meaning that there is a relationship between the hemoglobin levels of pregnant women and the incidence of low birth weight at the Demangan Health Center, Ngegong Community Health Center and Mangunharjo Health Center, Madiun City.

In this study, the *Odd Ratio calculation result* was 0.75, which means that respondents who had low hemoglobin had a risk of having a baby with a low birth weight of 0.75 times compared to mothers who had normal hemoglobin. This is also confirmed by the test results The correlation coefficient of maternal hemoglobin levels during pregnancy on the incidence of babies with low birth weight is 0.445, where there is a fairly strong relationship between mothers who experience low hemoglobin and the incidence of low birth weight.

DISCUSSION

In this study, based on 100% (49 respondents), it was found that 91.8% (45 respondents) were pregnant at the age of 20-35 years, of which 87.5% or 21 respondents experienced low hemoglobin levels and 96% had normal hemoglobin. From these results, it was found that the majority of pregnant women at the Demangan Community Health Center, Ngegong Community Health Center and Mangunharjo Community Health Center, Madiun City had normal hemoglobin levels of 96% or 25 respondents. This is in contrast to the statement from the research results of Tanziha et al., n.d. which states that pregnant women aged less than 20 years and more than 35 years are at risk for pregnancy which can cause anemia which will have maternal and perinatal impacts. This was also conveyed by Desafauza, 2016 that pregnant women aged <20 years and >35 years have the potential to cause anemia in pregnancy 1.5 times higher than pregnant women aged 20-35 years.

The Chi-square test result in this study was 0.02, which is less than (<0.05), so H0 was accepted, meaning that there was a relationship between the hemoglobin levels of pregnant women and the incidence of low birth weight in the Demangan Health Center, Ngegong Community Health Center and Mangunharjo Community Health Center. Madiun City. In this study, the Odd Ratio calculation result was 0.75, which means that respondents who had low hemoglobin had a risk of having a baby with a low birth weight of 0.75 times compared to mothers who had normal hemoglobin. This is also confirmed by the results of the correlation test between maternal hemoglobin levels during pregnancy and the incidence of babies with low birth weight, namely 0.445, where there is a fairly strong relationship between mothers who experience low hemoglobin and the incidence of low birth weight .

Hb levels are a risk factor for LBW, the results obtained from this study are in line with research conducted by Saragih et al., 2020that there is a significant relationship between maternal Hb levels and the incidence of LBW (p= 0.032). The results of research conducted by Saragih et al., 2020 showed that mothers who had Hb levels <11g/dL (anemia) had a 4.3 times higher risk of giving birth to babies with low birth weight compared to mothers who had Hb ≥11g/dL (not anemic). This is also supported by research from Yordian et al., 2021 where there is a significant relationship between hemoglobin levels and the incidence of LBW (p = 0.0023 < 0.05).

Based on research results, the difference in birth weight between pregnant women with low hemoglobin and normal hemoglobin was significant because in pregnant women with low hemoglobin, uteroplacental oxygenation was disrupted so that it was not sufficient to support optimal growth and development of the intrauterine fetus (Albert Lusi, 2017).If oxygen in the blood decreases, the fetus will experience hypoxia which will result in impaired fetal growth which will affect birth weight (Albert Lusi, 2017).

Based on the results of the research and discussion that have been described, the following conclusions can be drawn:

1. The number of pregnant women at the Demangan Community Health Center, Ngegong Community Health Center and Mangunharjo Community Health Center, Madiun City is aged 20-35 years.
2. The majority of mothers giving birth at the Demangan Community Health Center, Ngegong Community Health Center and Mangunharjo Community Health Center, Madiun City have normal hemoglobin levels.
3. The majority of respondents who experienced low hemoglobin levels gave birth to babies with low birth weight.

4. There is a relationship between hemoglobin levels in pregnant women and the incidence of low birth weight in the Demangan Community Health Center, Ngegong Community Health Center and Mangunharjo Community Health Center, Madiun City.

The implementation of this research was carried out as closely as possible in accordance with the aims and objectives of the research. However, there are still limitations and weaknesses that cannot be avoided, including data collection in this research which is only based on secondary data, thus allowing data discrepancies to occur in the collection process due to the absence of re-examination of respondents. Apart from that, the limited number of respondents who met the inclusion criteria was also considered insufficient to represent the entire population.

CONCLUSION

The results of research on the relationship between hemoglobin levels in pregnant women and the incidence of low birth weight , it can be concluded that there is a relationship between hemoglobin levels in pregnant women and the incidence of low birth weight in health centers . Madiun City is proven by the chi-square p value test results of 0.02<0.05 and the Odd Ratio test is 0.75 .

CONFLICT OF INTEREST

There are no conflict of interest.

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