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RELATIONSHIP BETWEEN AGE OF MOTHER AND HEMOGLOBIN LEVELS WITH EVENTS LOW BIRTH BABY WEIGHT

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Abstract

Low birth weight (LBW) infants have a mortality rate 20 times greater for infants weighing less than 2,500 grams compared to infants weighing more than 2,500 grams. Maternal age and hemoglobin levels may impact factors that contribute to LBW, such as medical disorders, impaired fetal development, and maternal health problems. This study aims to determine the relationship between maternal age and hemoglobin levels with low birth weight. The method used was analytic survey method through cross sectional approach with Quantitative research type. This study was conducted at RSUD Dr. Soetomo Surabaya from August to November 2023, using 198 maternal medical record data. Data analysis was performed using SPSS statistical software, including univariate tests, biraviat and chi-square tests, and multivariate tests. The results showed a significant association between maternal age and low birth weight, with a p value of 0.000 < 0.05. And hemoglobin levels also affect Low Birth Weight *p value* = 0.000 < 0.05. This study can be a reference in further research on LBW and its impact on neonatal mortality, disease, and disability.

INTRODUCTION

Population is the number of people living in a particular area at a particular time, as determined by demographic processes such as fertility, mortality, and migration. When the birth rate exceeds the mortality rate, population expansion occurs, which is impacted by migration. When the mortality rate surpasses the birth rate or when migration departs a region, the population declines. Demographic trends are often observed and evaluated to better understand resources, manage them, and design development plans.

In the last two years, Indonesia's population has continued to grow. In 2021, the total population in Indonesia was 272.68 million, in the middle of 2022 there was an increase of 275.77 million (Kin, et al., 2023). Indonesia's population currently reaches 278.69 million people (Data Box, 2023). According to the Ministry of Home Affairs Data Semester I Year 2022, Surabaya City has 2,972,801 residents. The total population in Surabaya City in 2023 was 2,997,547 people with a population growth rate of 0.89% (Population and Civil Registration Office, 2022). The increasing population in Surabaya is due to the large number of marriages that occur, especially in young children. Quoted in jawapos which states that there were 19 young children applying for Dispensation of Marriage (Diska) to the Surabaya Religious Court in January 2023.

Pregnancy and marriage at a young age have dangers, especially for the birth weight of the child. Teenage pregnancy and teenage pregnancy can also cause Low Birth Weight (LBW). Teenage pregnancy can have a significant impact on the health of the fetus and the pregnancy itself, making it the leading cause of LBW (Nurkholivah & Fatmawati, 2023). Not only young age, LBW is more common > 35 years old due to poor reproduction and prevalence of conditions such as benign tumors and hypertension. The baby's birth weight may be low, and age-related reproductive and health problems increase the likelihood of pregnancy. These elements increase the likelihood of LBW in mothers older than 35 years (Wahyuni, et al., 2021). Babies born at a weight of < 2,500 grams have a very large risk of experiencing LBW 20 times. Meanwhile, babies who weigh > 2,500 grams have a very low risk of experiencing LBW. This greater mortality rate can be caused by a variety of variables including maternal health, hospital location, and other factors. These dangers can be reduced with preventive measures and proper prenatal care. Reducing LBW and infant mortality also involves addressing maternal health concerns, providing access to health services, educating mothers about maternal health, and maintaining a healthy diet during pregnancy. If there are worries about the health of the LBW or the pregnant woman and unborn baby in being pregnant, consultation with a health professional is essential for proper planning and monitoring (Artini, et al., 2023). LBW babies are predisposed or highly susceptible to disease, as well as prenatal mortality. These babies are more prone to health problems, and in certain situations, they may even die during pregnancy, especially if they have difficulty adjusting to their new environment or have serious health problems. Therefore, to avoid difficulties, LBW newborns should be closely monitored and controlled (Nurrahma, et al., 2023). One of the leading causes of newborn illness, disorders and death is Low Birth Weight (LBW). This risk can be reduced by preventing LBW through proper prenatal care and health monitoring during pregnancy. The short- and long-term health impacts associated with LBW can also be reduced by providing appropriate medical care after birth (Nurjanah, et al., 2023). Maternal age is a very risky factor in birth weight, where maternal age has a positive and significant effect on birth weight (Peters, 2021); (Javadi, et al., 2023). LBW is one of the main indicators, especially of concern in lower-middle-income countries (Kundu, et al., 2023). Not only maternal age is a factor in infant birth weight, it can also be influenced by hemoglobin levels.

The red blood cell protein hemoglobin is essential for the transfer of oxygen from the lungs to body tissues. Due to increased blood volume, fetal development, and higher iron requirements for the growth of the placenta and other tissues, pregnant women need 25% more iron than non-pregnant women. Pregnant women are recommended to increase their iron intake to meet these extra needs. These iron ion-based proteins are essential for oxygen binding and transport (Nurrahma, et al., 2023). Since iron is required for fetal growth in the womb and the mother's increased nutritional needs, iron stores are essential during pregnancy. Fetal development and maternal nutritional requirements are closely correlated with the availability of iron stores (Syari, et al., 2023). Red blood cells contain hemoglobin, which is essential for binding oxygen and distributing it throughout the body's tissues. Hemoglobin is composed of iron and protein, which allows it to attach to oxygen in the lungs and transport it throughout the body. Carbon dioxide is also transported by hemoglobin back to the lungs for removal. The capacity of hemoglobin to bind and transport oxygen depends on the iron contained in the heme molecule. For the best production and function of hemoglobin, there must be an adequate supply of iron, as any interruption can result in major health

problems, including anemia. Therefore, to maintain the health and proper functioning of red blood cells and hemoglobin, proper intake of minerals, including iron, is required (Kencana, et al., 2023). Hemoglobin levels are often used to evaluate anemia, a common problem during pregnancy. This disorder can be caused by iron, folic acid, vitamin B12, or red blood cell production deficiencies, which can have high morbidity and mortality rates, especially in poor countries like Indonesia. Fetal health and development are greatly affected by anemia, this raises the chance of miscarriage, early delivery, and LBW (Tampubolon & Widyatama, 2023). According to WHO recommendations, according to this study, pregnant women having low levels of hemoglobin are more likely to have low birth weight kids, bleeding during labor, and may even die during childbirth (Suroso & Yenni, 2023). Previous studies have explained that there is an association between maternal hemoglobin levels and low birth weight (Fitria, et al., 2023); (Iqbal, et al., 2023); (Nadhiroh, et al., 2023); (Song, et al., 2023). Whereas in another study stated that low hemoglobin is not the only factor causing low birth weight but high hemoglobin can also affect low birth weight (Liu, et al., 2022); (Liu, et al., 2022); (Sah, et al., 2022); (Weyori, et al., 2022).

Data from BPS East Java shows that in 2019 Surabaya reached 855 LBW births. LBW can be a sign of health problems that may take longer to manifest, and can have long-term consequences on a child's growth and development. As the child ages, LBW can also lead to delayed growth and make it more difficult to achieve appropriate height and weight (Levita & Langi, 2022). Mother's age and hemoglobin level have a significant influence on baby's birth weight, with many pregnant women under the average age, namely pregnant under 20 years of age and over 35 years of age (Wahyuni, et al., 2021). This is due to the condition of the mother's body which has not been able to reproduce optimally and is also due to the weakening of the contraction of the uterus at the age of 35 years and above. So, from these problems, the authors conducted this study which aims to determine the Relationship Between Age of Mother and Hemoglobin Levels With Events Low Birth Baby Weight.

METHOD

The research approach employed in the present investigation is quantitative research an analytical survey through an approach, namely *cross sectional*. This research included all moms who had an aterm pregnancy at Dr. Soetomo Surabaya Hospital for three months, namely 198 medical record data. This study was conducted at Dr. Soetomo Surabaya Hospital from August to November 2023.

The variables used were Maternal Age and Hemoglobin Level as independent variables and variable Low Birth Weight (LBW). The research instruments used were documents from RSUD Dr. Soetomo Surabaya related to the research conducted in the form of Health Medical Records of all babies born. A version of the Statistical Package for the Social Sciences (SPSS) software for statistical analysis was used to analyze the data, by performing statistical tests carried out univariate tests, biraviat tests and chi- square tests and multivariate tests (Damayanti & Sya'bin, 2023). The probability value (p value <0.05) was considered significant (Sedky, et al., 2023); (Youssif, et al., 2023).

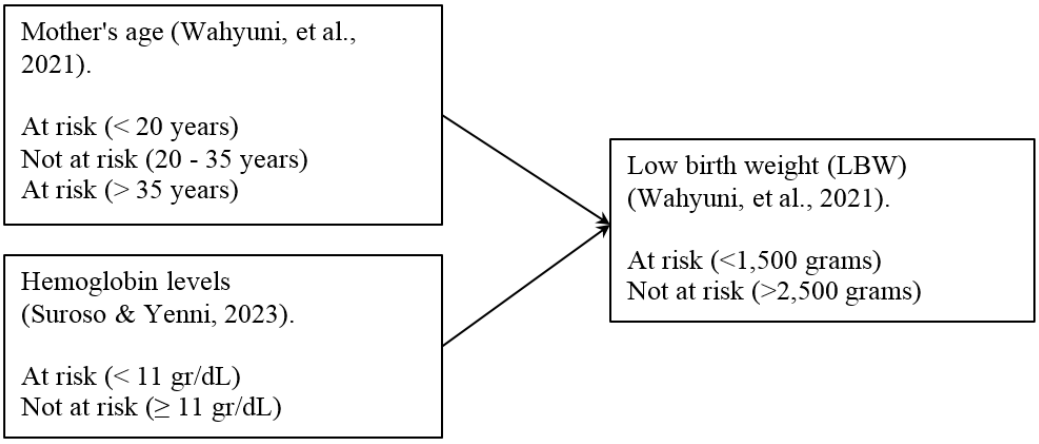

Figure 1: Framework

RESULT AND DISCUSSION

This study was conducted in Surabaya on 198 mothers giving birth at Dr. Soetomo Hospital Surabaya. Tests were conducted using Univariate, Bivariate and Multivariate Analysis between the variables of Maternal Age and Hemoglobin on Low Birth Weight.

Univariate Analysis

The statistical technique called univariate analysis aims to understand and characterize the distribution or features of a single variable. With this approach, each variable can be calculated and analyzed separately, unrelated to other variables. The calculation of mean, median and mode for univariate analysis is explained in this article. From the results of data processing, the frequency counts differentiated by age are shown in Table 1.

Table 1: Characteristics of Mothers Giving Birth based on age at RSUD Dr. Soetomo Surbaya year 2023

Category	Frequency	Percent (%)
At Risk (<20 Years)	48	24,2
Not at Risk (20 - 35 Years)	101	51,0
At Risk (> 35 Years)	49	24,7
Total	**198**	**100,0**

Table 1 shows that the average age of mothers who gave birth at Dr. Soemanto Surabaya Hospital was 20-35 years old, totaling 101 (51%), then more than 35 years old 49 (24.7%) and under 20 years old as many as 48 (24.2%). Mothers between the ages of 20 and 35 are considered to be at risk of having a baby with a low birth weight (Yulianti, et al., 2021); (Wahyuni, et al., 2021). LBW is are newborns born weight below 2,500 grams, and have greater health risks than children with normal birth weight.

This is because many people get married later in life - after graduating college or when they are over 20 years old. Stunted fetal growth, certain medical diseases that impact fetal development, and maternal health issues during pregnancy are some of the factors that contribute to low birth weight. To provide a safe and healthy delivery environment, it is imperative to address these difficulties. Furthermore, the characteristics of mothers based on the amount of hemoglobin in mothers giving birth are shown in Table 2.

Tabel 2: Characteristics of Mothers Giving Birth Based on Hemoglobin at Dr Soetomo Hospital, Surabaya in 2023

Category	Frequency	Percent
At risk (< 11 gr/dL)	97	49,0
Not at risk (> 11 gr/dL)	101	51,0
Total	**198**	**100,0**

Table 2 shows the characteristics of mothers based on hemoglobin levels, namely 101 (51%) have Hb more than 11 gr/dL where in this condition it is said that there is no risk of LBW (Suroso & Yenni, 2023). While 97 (49%) mothers had Hb less than 11 gr/dL which means there is a risk of LBW in babies born at RSUD Dr. Soetomo Surabaya.

Bivariate Analysis

Bivariate statistical analysis is used to investigate the relationship between two or more variables. This method is often used in research to evaluate hypotheses and provide answers to research questions. This analysis involves examining two variables (X and Y) to see how they relate empirically. *Chi-square* test to see the frequency comparison of the data obtained in the study so that it can be anticipated in determining between variables. To ensure that the p value is less than 0.05, the *chi-square* test is used. One of the basic types of quantitative analysis is called bivariate analysis. To investigate the link between mother's age and low birth weight at RSUD Dr. Soetomo Surabaya in 2023 in table 3.

Table 3: Relationship between Maternal Age and Low Birth Weight at RSUD Dr. Soetomo Surabaya Year 2023

	At Risk (< 20 Years)		Not at Risk (20 - 35 Years)		At Risk (>35 Years)		Total		*P Value*
BBLR (< 2500 gram)	44	40%	34	31%	32	29%	110	100%	0,000
No BBLR (> 2500 gram)	4	5%	67	76%	17	19%	88	100%	

Table 3 shows that out of 198 respondents, namely mothers giving birth at RSUD Dr. Soetomo Surabaya, there were 110 mothers giving birth who had a risk of LBW, consisting of 44 or 40% and 32 or 29% among moms between the ages of 20 and 35 years. Furthermore, 34 mothers gave birth at the age of 20 - 35 years as much as 31%. There were 88 mothers who did not experience LBW, consisting of 67 or 76% at the age of 20 - 35 years, 17 or 19% of mothers aged more than 35 years and 4 or 5% aged less than 20 years. The results of the analysis showed a p-value = 0.000, the value obtained is smaller than 0.05, which means that the age of the mother giving birth has a significant influence on the incidence of LBW. Furthermore, to investigate the link between maternal hemoglobin and low birth weight at RSUD Dr. Soetomo Surabaya in 2023 which is shown in table 4.

Table 4: Relationship between Maternal Hemoglobin and Low Birth Weight at RSUD Dr. Soetomo Surabaya Year 2023

	At risk (< 11 gr/dL)		Not at Risk (> 11 gr/dL)		Total		*P Value*
BBLR (< 2500 gram)	80	73%	30	27%	110	100%	0,000
No BBLR (> 2500 gram)	17	19%	71	81%	88	100%	

Based on Table 4, it is known that out of 110 mothers giving birth at RSUD Dr. Soetomo Surabaya with Hb levels less than risky or less than 11 gr/dL and experienced LBW as many as 80 or 73% and 30 or 27% of mothers giving birth with Hb levels not at risk or more than 11 gr/dL and did not experience LBW. Furthermore,

88 mothers giving birth at RSUD Dr. Soetomo Surabaya in the condition of Hb levels do not have a risk of 71 or 81% and do not experience LBW and 17 or 19% with Hb levels can be at risk and not LBW. The results of the analysis obtained a p-value of 0.000 smaller than 0.05. Furthermore, multivariate analysis was conducted which is shown in Table 5.

Multivariate Analysis

Before conducting multivariate analysis, a conventional statistical process, this study used bivariate analysis to identify variables. If the *p-value* in the Bivariate analysis test obtained is smaller than 0.05, it means that multivariate testing can proceed. The technique of analyzing several factors at once to determine the simultaneous impact of each factor on an item is known as multivariate analysis. This analysis makes it possible to analyze the effect of several variables on other variables at once. The results of the multivariate test can be seen in Table 5.

Tabel 5: Relationship between Maternal Age and Hemoglobin Level with Low Birth Weight at RSUD Dr. Soetomo Surabaya Year 2023

	Sig.	Exp(B)	95% CI	
			Lower	Upper
Age	0,016	1,927	1,129	3,287
Hemoglobin	0,000	11,733	5,817	23,666

Table 5 above presents the fact that maternal age has a significant relationship with LBW as evidenced by the value (p = 0.016 and 95% CI 1.129 - 3.287). Conversely, there is a significant relationship between hemoglobin and LBW as evidenced by the value (p = 0.000 and 95% CI 5.817 - 23.666).

Relationship between Maternal Age and Low Birth Weight

Based on the bivariate test conducted using the *chi-square* method, a p value of 0.000 < 0.05 was obtained, so it can be interpreted that there is a positive and significant relationship between maternal age and low birth weight at RSUD Dr. Soetomo Surabaya. Similarly, Multivariate testing was carried out where the p value = 0.016 < 0.05 and the 95% CI value did not cross the number 1 (1.12 - 3.287) said that Age affects Low Birth Weight. Maternal age is a very risky factor in birth weight, where maternal age has a significant effect on birth weight (Peters, 2021); (Javadi, et al., 2023). Maternal variables that can cause preterm labor include chronic diseases, age, pregnancy-delivery interval, poor nutrition, and overwork, all of which can lead to low birth weight (LBW) babies (Asma, et al., 2023). The ideal age range for LBW is above 20 years and below 35 years, while the high-risk age range is below 20 years and above 35 years. Due to emotional instability and immature mental state, pregnancy before the age of 20 is physiologically unfavorable and may result in inattention to dietary needs. After the age of 35, the process of transferring nutrients from the mother to the fetus is affected by illness and decreased endurance (Liznindya, 2023).

Relationship between Hemoglobin Level and Low Birth Weight

From the bivariate test analysis conducted on the variable of Hb Level with Low Birth Weight, the p value = 0.000 (p < 0.05) means that there is a relationship between Hb Level with Low Birth Weight at Dr. Soetomo Surabaya Hospital. Similarly, Multivariate testing was carried out where the p value = 0.000 (p < 0.05) 95% CI value did not cross the number 1 (5.817 - 23.666) which means that Hb levels affect Low Birth Weight (Fitria, et al., 2023); (Iqbal, et al., 2023); (Nadhiroh, et al., 2023); (Song, et al.,

2023). Hb is a controllable risk indicator for miscarriage. Several studies have found a link between Hb levels and LBW, which can lead to perinatal mortality in infants (Burden, et al., 2023).

CONCLUSIONS

This study discovered a link between mother age and LBW, as indicated by a p-value of 0.000 < 0.05. Multivariate testing also showed a significant effect between maternal age and LBW, with a p-value of 0.016 < 0.05 and a 95% CI of 1.12 - 3.287. In addition, the p-value of 0.000 < 0.05 shows that hemoglobin levels also affect the incidence of LBW, with a p value of 0.000 (p < 0.05) and a 95% CI value that does not cross the number 1 (5,817 - 23,666). So that the research conducted can be used as a further reference.

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