

# Mother pregnancy age association with the incidence of low birth weight infants

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## ABSTRACT

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This analytical observational study aimed to determine the association between maternal age at childbirth and the incidence of low birth weight at Sultan Agung Islamic Hospital, Semarang, Indonesia. The study period was from January to December 2019. The research design used cross-sectional with total sampling on medical records. These data included those of 46 non-low birth weight (LBW) and 32 LBW infants and were analyzed using SPSS version 17. During the study period, six incidents of LBW babies were recorded compared to six incidents of non-LBW babies from mothers aged <20 and >35 years, while the incidence of LBW babies to parents aged 20–35 years was 26 births compared to 40 births for non-LBW babies. There was a very high incidence (41%) of LBW in this period compared with the global average, although Pearson's correlation coefficient exhibited no association between maternal age at childbirth and the prevalence of LBW (P-value = 0.498; odds ratio = 1.538; 95% confidence interval = 0.448–5.288).

**Keywords:** babies with low birth weight (LBW); age of pregnant women; association; Sultan Agung Islamic hospital

## 1. INTRODUCTION

Death due to low birth weight (LBW) accounts for more than 80% of neonatal deaths, and those who survive the neonatal period remains at risk of adverse effects (Koenraads et al., 2017). Birth weight refers to the weight of a newborn measured in the first hour after birth (Ministry of Health Republic Indonesia, 2013). It determines the newborn's chances of survival, growth, and development (Nair et al., 2018). Newborns can be classified into the following categories: low birth weight, where the infant's weight at nativity is <2500 g; medium birth weight (2500–3999 g), and overweight, with a baby's weight at birth of 4000 g (Ministry of Health Republic Indonesia, 2013).

One of the risk factors for a poor birth outcome is the advanced age of the mother at childbirth (Aradhya et al.,

2023). The causes of LBW are influenced by various factors, namely, anemia, hypertension, twin pregnancies (Gemelli), malnutrition, drug dependence, alcohol abuse, inadequate pregnancy care, socioeconomic status, ethnic background, and genetic factors (Nair et al., 2018). A previous study reported that anemia (low hemoglobin [Hb] levels) in pregnant women are not associated with the incidence of LBW in the Semampir District, Surabaya City (Fajriana and Buanasita, 2018). However, Eissa et al. (2017) concluded that maternal Hb levels were positively correlated with birth weight; newborns born to mothers with anemia had lower birth weights than those born to mothers who did not have anemia. Young maternal age was also found to be associated with LBW (Eissa et al., 2017). Severely LBW babies have a greater risk of death if they are born to young mothers, and the delivery needs to take place in a public hospital (Vilanova et al., 2019).

A mother's ability to efficiently get through pregnancy can come from her emotional intelligence. Intelligence is the power to adapt to new circumstances by thinking according to its purpose. Intelligence or cognition can be formed when the baby is in the womb; thus, the baby's growth and development must be considered from an early age (Sari et al., 2020). Emotional management includes self-consciousness/awareness, encouragement, self-ordinance/rule, sensitivity, and societal skills; it is influenced by the cognitive factors that shape them (Sari et al., 2019). Although the societal push to postpone child bearing is supported by scientific evidence, delaying birth can result in sterility and a wider generational gap. The ideal time to start a family should be selected independently by the couple, provided that it is a free and conscious decision rather than social influence (Bellieni, 2016).

The 2019 medical record of Sultan Agung Islamic Hospital, Semarang, has shown a significant difference in LBW cases in the last 3 years. In 2017, 79 cases of LBW were reported; in 2018, 31 cases; and in 2019, 58 cases. Similarly, the incidence of pregnant women with anemia in the last 3 years showed a significant difference: 56 cases in 2017, 35 cases in 2018, and 44 cases in 2019. The increasing incidence of LBW and anemia in pregnant women is one of the causes of neonatal death. Maternal age is predicted to be closely related to the factors that cause LBW; a primigravida and a multipara are both at risk of giving birth to a LBW infant (Wibowo et al., 2022). This study aimed to explore the association between maternal age at childbirth and the prevalence of LBW at Sultan Agung Islamic Hospital, Semarang, Indonesia.

## 2. MATERIALS AND METHODS

This quantitative analytical observational study with a cross-sectional design examined the association between maternal age at childbirth and the incidence of LBW. Data was collected using total sampling from medical records.

The study period was from January to December 2019. This study involved 78 newborns in medical records for this period, consisting of 32 LBW and 46 non-LBW.

In this study, maternal age at childbirth was used as an independent variable and LBW as a dependent variable. A significant difference in maternal age at childbirth was observed in the past several decades due to a wide variety of social and cultural factors (Londero et al., 2019). The data used in this study were obtained from patients who were at a high-risk age (<20 years old and >35 years old) and low-risk age (20–35 years old) for pregnancy (Glick et al., 2021). Maternal age at childbirth was determined from the patient's identity cards or confirmed from the patient's or her family's information. A frequent gauge of birth outcomes is LBW, defined as birth weight below 2500 g, and non-LBW babies are babies born with a weight of 2500 g and above. In this study, the neonatal weight was recorded as the weight of the baby measured by the staff at the Sultan Agung Islamic Hospital 1–2 days after birth (Cutland et al., 2017). Although LBW is a general indication of birth outcomes, it is preferred in this study over less precise options to preserve sufficient statistical power for analysis.

SPSS Statistics version 17 was used to statistically analyze the data obtained. Pearson's correlation coefficient was used according to the data distribution to determine the association between maternal age at childbirth and the incidence of LBW—determination of the trend of LBW babies from the age of pregnant women used odds ratio (OR) analysis. The medical/health research bioethics commission, Faculty of Medicine, Sultan Agung Islamic University, Semarang, granted ethical approval for this study in letter number 136/III/2023/Bioethics Commission.

## 3. RESULTS AND DISCUSSION

Of the 78 cases included in this study, 6 and 26 were LBW infants born to mothers at a high- and low-risk age for pregnancy, respectively. Patient data is presented in Table 1.

**Table 1.** Age of mothers at a high-risk and low-risk age for pregnancy and incidence of LBW and non-LBW

Age groups	LBW			Non-LBW		
	n (%)	Mean (g)	SD	n (%)	Mean (g)	SD
High-risk	6 (50%)	2041.667	261.566	6 (50%)	3375.000	289.396
Low-risk	26 (39.4%)	2160.385	258.526	40 (60.6%)	3057.500	312.055
Overall	32 (41%)	2138.125	259.136	46 (59%)	3098.913	324.635

Cases of LBW and non-LBW in pregnant women of high- (HR) and low-risk (LR) age were recorded in six patients each. Meanwhile, there were 26 and 40 patients of productive age, respectively. In this study, a very high incidence of LBW (41%) was observed during the study period (January to December 2019), exceeding the average incidence in Asia (17.3%) (Blencowe et al., 2019; United Nations Children's Fund [UNICEF] and World Health Organization [WHO], 2019). However, the latest incidence reported in Indonesia was 7%, indicating a significant reduction from that previously reported (Oktriyanto et al., 2022).

During the study period, the percentage of LBW babies born to mothers at an HR age for pregnancy was recorded

to be higher (50%) than that of LBW babies born to mothers at a LR age for pregnancy (39.4%). This finding suggests that the age of the mother significantly affects her pregnancy condition. Biologically, women are recommended to get pregnant during their peak reproductive years (20–35 years) because during these years, their reproductive organs are mature enough to accept the pregnancy, they have sufficient energy, and they are psychologically prepared. Women's HR ages for pregnancy are <20 and >35 years. Pregnancy at a very young age is unsafe due to the mother's immaturity and unstable psychological conditions, as well as the immaturity of the reproductive organs (the endometrium is not yet fully formed), putting these mothers at risk of experiencing shock that can result

in a lack of attention to the nutritional needs of the fetus during pregnancy (Monita et al., 2016). Pregnant women between the ages of 15 and 19 were found to have an increased risk of developing severe preeclampsia, eclampsia, postpartum hemorrhage, poor fetal growth, and fetal distress (Cavazos-Rehg et al., 2015).

Advanced maternal age is also associated with an increased risk of LBW and preterm birth (Aradhya et al., 2023). However, older mothers who have given birth to at least two live children do not have a higher risk of giving birth to underweight or premature babies (Goisis et al., 2017). Pregnant women aged >35 years have decreased endometrial elasticity and weakened immune systems, putting them at an increased risk for various diseases and congenital abnormalities, which will affect the growth and development of the fetus inside the womb (Monita et al.,

2016). A maternal age of 36 years or more is the age limit for the chance of low birth weight, as is the possibility of macrosomia as the mother ages (Wang et al., 2020).

The incidence of LBW can be influenced by factors such as the mother's condition (presence of anemia, pregnancy spacing, or nutritional status), the fetus's condition (placental, Gemelli), and the mother's environment (health facility and service, exposure to cigarette smoke, social economics) (Haryanti et al., 2019). In addition, various socio-economic, current behavioral, and cultural dynamics mean that the risk of LBW does not occur consistently across racial/ethnic groups or maternal age (Dennis and Mollborn, 2013).

A correlation test was conducted to investigate the association between maternal age at childbirth and the incidence of LBW (Table 2).

**Table 2.** Pearson's correlation test of newborn weight from mothers with high-risk and low-risk pregnant ages

	LBW		SD	Pearson's correlation	p-value
	n	Mean (g)			
Ages	78	2704.743	561.132	0.078	0.498

Based on this analysis, the incidence of newborns born with LBW was weakly correlated with maternal age at childbirth. This suggests that changes in the range of high-risk and low-risk ages for pregnancy are weak causal factors for the incidence of LBW. This finding is consistent with those of other studies, which also demonstrated a weak correlation between maternal age at childbirth and infant birth weight. Age 35, as the conventional limit for birth with abnormal weight, does not correlate with LBW (Wang et al., 2020). Generally, the incidence of LBW between young and older mothers is closely related to economic backgrounds such as ability and status, bad behavior and habits such as smoking (Dennis and Mollborn, 2013), low body mass index (BMI), presence of anemia, or ill health (Banerjee et al., 2022), and sociocultural and maternal risk factors such as afternoon naps and nutrient intake during pregnancy as well as gestational period (Bansal et al., 2018). Nevertheless, it should also be noted that the risk of cesarean sections, the prevalence of gestational diabetes mellitus, hypertensive diseases, preterm delivery, and postpartum hemorrhage

are all increased with greater maternal age, although the risk for maternal anemia decreases (Zhang et al., 2020). Escalation chances of unconstrained miscarriage, premature labor, gestational diabetes mellitus, pre-eclampsia, stillbirth, chromosomal abnormalities, and cesarean delivery are among the potential maternal problems of pregnancy at 35 y.o. or older (Cavazos-Rehg et al., 2015; Glick et al., 2021). Infants that are undersized for gestational age and have intrauterine development constraints, a poor Apgar score, admission to the newborn intensive care unit, and an autism spectrum disorder are all possible prejudicial fetal outcomes (Glick et al., 2021).

The OR confidence interval (CI) limit exhibited no association between maternal age at childbirth and LBW, with lower and upper limits of 0.448 and 5.288, respectively; however, the OR was 1.538 times higher at maternal age <20 years old and >35 years old than at maternal age ranging from 20 to 25 years old LBW babies with the mother's age also show no relationship, where the range of the lower and upper limits of relative risk is 1. The trend and risks of having an LBW baby are presented in Table 3.

**Table 3.** Risk of maternal ages with the incidence of LBW and non-LBW babies

	95% Confidence interval		
	Value	Lower	Upper
The odds ratio for mothers ages	1.538	0.448	5.288
LBW cohort	1.269	0.669	2.407
Non-LBW cohort	0.825	0.454	1.501
Number of valid cases	78		

The results of this study are consistent with those of the study conducted by Purwanto and Wahyuni, in which Fisher's exact test showed no association between maternal age at childbirth and the incidence of LBW at RSIA Kendangsari Surabaya (Purwanto and Wahyuni, 2016). Likewise, research conducted at the Juweni Maternity Home in Pandes Wedi Village, Klaten, in 2016, based on the chi-squared test, showed that there was no

relationship between maternal age and the incidence of LBW babies, namely a  $p$ -value of 0.734 ( $p > 0.05$ ) (Supiati, 2016). Pregnant women aged <35 had a risk of LBW babies (OR values) ranging from 0.86–0.91 times compared to those aged >35 years old, whereas young women aged <20 years old have a risk of LBW babies (OR value) of 1.31 times higher than >35 years old (Dong et al., 2019). When mothers aged 16–35 years were compared with those aged

25–29, the ORs for having an LBW baby were 1.48 (95% CI 1.00–2.20) and 1.66 (95% CI 1.36–2.02), respectively (Restrepo-Méndez et al., 2015). The incidence of LBW tended to be associated with a pre-pregnancy BMI of <18.5 kg/m<sup>2</sup> with an OR of 1.91 (Feng et al., 2021).

The total sampling used in this study demonstrated the actual incidence of LBW at Sultan Agung Islamic Hospital, Semarang, during the study period. However, the cause of the high incidence of LBW could not be determined because no other factors could be the cause, even though several discussions have mentioned the many factors that cause LBW. Thus, future studies should be able to examine the various variables associated with the incidence of LBW.

#### 4. CONCLUSION

During the study period, a very high incidence of LBW was reported (41%) at Sultan Agung Islamic Hospital. However, the incidence of LBW was not found to be correlated with maternal age at childbirth if it is grouped in the HR age range (<20 and >35 years old) and the LR age (20–35 years old) with a *p*-value of 0.498 and an OR of 1.538 with a CI range of 0.448–5.288.

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