Multiple pregnancy: the biggest risk factor of low birth weight in Central Java, Indonesia (2017 IDHS secondary data study)

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Abstract

Background: In Indonesia, 7% of babies are born with birth weights <2500 g. Several risk factors influence the incidence of low birth weight (LBW). The results of Basic Health Research 2018 show that 6.1% of babies are born with LBW in Central Java. Aim: To analyze the relationship of a mother’s socio-demographic factors, childbirth characteristics, and family economic status with the incidence of LBW in Central Java. Settings and Design: This research was an analytical study and used secondary data from the 2017 Indonesian Demographic and Health Survey. The sampling design used stratified two-stage sampling. Data collection by interview used four types of questionnaires related to the following: household, women of reproductive age, married men, and male adolescents. Methods and Material: The sample comprised 1059 of 17,848 babies born in Indonesia. The mother’s socio-demographic factors (age at childbirth, education level, place of residence, and employment status), childbirth characteristics (birth order number, birth spacing, sex of the baby, and multiple pregnancy status), and family economic status were independent variables, and the incidence of LBW was the dependent variable. Statistical Analysis Used: Data analysis was performed by univariate and bivariate analysis. Bivariate analysis used cross-table analysis and chi-square statistical analysis. Results: In all, 93.4% of babies born had normal birth weight. There was no relationship between age at delivery, education level, place of residence, employment status, birth order number, birth spacing, baby’s sex, and family economic status. Multiple pregnancy status was the single risk factor associated with the incidence of LBW in Central Java (p value = 0.0001; α = 0.05; PR = 16.952; 95% CI = 13.315–21.581). Conclusions: The incidence of LBW in Central Java was related to multiple pregnancies.

Keywords: incidence, risk factors, multiple pregnancy, Central Java
Key Messages:

Multiple pregnancies were statistically significant with the incidence of LBW in Central Java. The proportion of babies with LBW is 17-fold greater if a pregnant woman has a multiple pregnancy status (PR = 16.952).


Introduction

Birth weight is obtained by weighing the baby immediately after birth and is divided into two types: normal birth weight (NBW) and low birth weight (LBW) [1]. LBW is classified into three groups: ELBW (extremely low birth weight), which describes the birth weight of babies less than 1000 g; and VLBW (very low birth weight), which describes the birth weight of babies between 1000 and 1499 g. LBW is the condition when a baby is born weighing less than 2500 g [2]. LBW can define a group of babies born earlier (preterm/less than 37 weeks) or can describe the presence of intrauterine growth retardation, or is the result of these two conditions [3].

LBW can increase the risk of neonatal mortality, stunting in toddlers and children, and children having low intelligence levels [4]. Of neonatal deaths, 80% occur in LBW infants [5]. Toddlers with a history of LBW have a five times greater risk of stunting [6]. In all, 13.6% of children with a history of LBW had a total IQ below normal, and 17% of children with a history of LBW had a total IQ of less than 85 [7].

In Indonesia, 7% of babies are born with birth weights <2500 g. The highest prevalence was in the following group of children: mothers aged less than 20 years at delivery (8.7%); with no education (11.8%); lowest wealth quintile (8.5%); and is the first child (8.1%) [8]. The results of the Basic Health Research (Riskesdas) in 2018 showed that 6.1% of babies were born with LBW in Central Java [9].

Previous studies have shown that several risk factors influence the incidence of LBW. There is a significant relationship between pregnancy at risk age (<19 years or >35 years) and incidence of LBW (p = 0.025); if this condition is accompanied by LILA < 23.5 cm, it will increase the chances of giving birth to a baby with LBW to 68.2% [10]. Maternal anemia (p = 0.0001) and multiple pregnancy (p = 0.001) had a significant relationship with LBW cases. Mothers who experienced anemia during pregnancy had a four times greater risk (OR = 4.03) and multiple pregnancies had a two times greater risk (OR = 2.22) of delivering an LBW baby [11].

On the basis of the facts described above, this study aims to analyze the relationship of the mother's socio-demographic factors, childbirth characteristics, and family economic status with the incidence of LBW in Central Java.

Subjects and Methods

This research was an analytical study and used secondary data from the 2017 Indonesian Demographic and Health Survey (IDHS) conducted by the Central Statistics Agency, the National...
Population and Family Planning Agency, and the Ministry of Health. The 2017 IDHS provides a comprehensive picture of the population and health of mothers and children in Indonesia. The sampling design used in the 2017 IDHS is a stratified two-stage sampling: the stage for selecting a number of census blocks in a probability proportional to size and the stage for selecting 25 ordinary households in each selected census block systematically. This survey uses four types of questionnaires related to the following: household, women of reproductive age, married men, and male adolescents.

The respondents of this study were women of childbearing age who gave birth to children in 2012–2017. The sample used was 1059 babies who met the research criteria from a population of 17,848 babies born in Indonesia. Research criteria are used to obtain samples that support the achievement of the research objectives. These criteria include inclusion and exclusion criteria. The inclusion criteria for this study were babies born in 2012–2017 and living de facto in Central Java. Infants whose birth weight was not recorded in the 2017 IDHS data were excluded from the sample list as exclusion criteria in this study.

The research variables consisted of the mother’s socio-demographic factors (age at childbirth, education level, place of residence, and employment status), childbirth characteristics (birth serial number, birth spacing, sex of the baby, and multiple pregnancy status), and family economic status as independent variables and the incidence of LBW as the dependent variable. LBW incidence can be seen from the category of birth weight of the baby. The birth weight of babies born less than 2500 g is categorized as LBW, and the birth weight of babies that are more than or equal to 2500 g is categorized as LBW.

Data analysis was performed by univariate and bivariate analysis. Univariate analysis (see table 1) was performed to describe the condition of each research variable used as a frequency distribution. Bivariate analysis was performed using cross-table analysis and chi-square statistical analysis to determine the relationship between the independent variables and the dependent variable.

Results

Most of the 989 (93.4%) babies born in Central Java in 2012–2017 had NBW (≥2500 g). The highest frequency was found in babies born in the respondents’ age range of 25–29 years (28.1%), with an average age of 28.63 years. Categorical data show that 69% of babies were born to respondents in the no risk group. The highest frequency was found in babies born to respondents with the last education completing junior high school. In all, 58.7% of babies were born to mothers with low levels of education (junior high school graduates and no school). The distribution of the residence for babies is almost the same between the number of babies who live in rural and urban areas. Most (56.9%) babies were born to mothers who did not work. Not working means not having a job other than being a housewife. Most (98.6%) babies were born in birth order number without risk (around 1–4), and most (94.9%) babies were born to women of childbearing age with no risk birth spacing (the distance between the birth of the baby and the previous child ≥ 3 years). The sample of infants used in this study has a distribution based on sex that is almost the same between female and male babies.
Most (99.2%) babies were born without multiple gestation or single birth. Most (68.3%) babies were born to families with middle to upper economic status.

Table 1: Univariate analysis results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td><strong>Birth Weight</strong></td>
<td></td>
</tr>
<tr>
<td>BBLN</td>
<td>989</td>
</tr>
<tr>
<td>BBLR</td>
<td>70</td>
</tr>
<tr>
<td><strong>Socio-Demographic Factors of Respondents</strong></td>
<td></td>
</tr>
<tr>
<td>1. Age of Respondents</td>
<td></td>
</tr>
<tr>
<td>Risky</td>
<td>328</td>
</tr>
<tr>
<td>No Risk</td>
<td>731</td>
</tr>
<tr>
<td>2. Education Level</td>
<td></td>
</tr>
<tr>
<td>No School and Primary Education</td>
<td>622</td>
</tr>
<tr>
<td>Further Education</td>
<td>437</td>
</tr>
<tr>
<td>3. Residence</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>537</td>
</tr>
<tr>
<td>Urban</td>
<td>522</td>
</tr>
<tr>
<td>4. Employment Status</td>
<td></td>
</tr>
<tr>
<td>Do not work</td>
<td>603</td>
</tr>
<tr>
<td>Work</td>
<td>456</td>
</tr>
<tr>
<td><strong>Characteristics of the Baby’s Birth</strong></td>
<td></td>
</tr>
<tr>
<td>1. BORD</td>
<td></td>
</tr>
<tr>
<td>Risky</td>
<td>15</td>
</tr>
<tr>
<td>No Risk</td>
<td>1044</td>
</tr>
<tr>
<td>2. Birth Distance</td>
<td></td>
</tr>
<tr>
<td>Risky</td>
<td>54</td>
</tr>
<tr>
<td>No Risk</td>
<td>1005</td>
</tr>
<tr>
<td>3. Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>516</td>
</tr>
<tr>
<td>Male</td>
<td>543</td>
</tr>
<tr>
<td>4. Multiple Pregnancy *)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8</td>
</tr>
<tr>
<td>No</td>
<td>1051</td>
</tr>
<tr>
<td><strong>Economic Status</strong></td>
<td></td>
</tr>
<tr>
<td>Lower Quintile</td>
<td>336</td>
</tr>
<tr>
<td>Intermediate–Upper Quintile</td>
<td>723</td>
</tr>
</tbody>
</table>

The bivariate analysis shows that multiple pregnancy status has a significant incidence of LBW with (p value = 0.0001; α = 0.05; 95% CI = 16.952; 13.315–21.581). Relationship of education level, residence, age at childbirth, gender, employment status, birth sequence, and family economic status with incidence of LBW.
Table 2: Relationship Between Independent Variables and Dependent Variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Birth Weight (%)</th>
<th>Total</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LBW</td>
<td>NBW</td>
<td>f</td>
</tr>
</tbody>
</table>

**Socio-Demographic Factors of Respondents**

1. **Age of Respondents**
   - Risky: 7.0 | 93.0 | 328 | 100
   - No Risk: 6.4 | 93.6 | 731 | 100
   - **Prevalence Ratio (PR)**: 1.091 | 0.994

2. **Education Level**
   - No School and Primary Education: 5.8 | 94.2 | 622 | 100
   - Further Education: 7.8 | 92.2 | 437 | 100
   - **Prevalence Ratio (PR)**: 0.744 | 1.022

3. **Residence**
   - Rural: 5.6 | 94.4 | 537 | 100
   - Urban: 7.7 | 92.3 | 522 | 100
   - **Prevalence Ratio (PR)**: 0.729 | 1.022

4. **Employment Status**
   - Do not work: 7.0 | 93.0 | 603 | 100
   - Work: 6.1 | 93.9 | 456 | 100
   - **Prevalence Ratio (PR)**: 1.134 | 0.991

**Characteristics of the Baby's Birth**

1. **Birth sequence Number**
   - Risky: 6.7 | 93.3 | 15 | 100
   - No Risk: 6.6 | 93.4 | 1044 | 100
   - **Prevalence Ratio (PR)**: 1.009 | 0.999

2. **Birth Distance**
   - Risky: 5.6 | 94.4 | 54 | 100
   - No Risk: 6.7 | 93.3 | 1005 | 100
   - **Prevalence Ratio (PR)**: 0.833 | 1.012

3. **Gender**
   - Female: 6.4 | 93.6 | 516 | 100
   - Male: 6.8 | 93.2 | 543 | 100
   - **Prevalence Ratio (PR)**: 0.939 | 1.004

4. **Multiple Pregnancy * )**
   - Yes: 100.0 | 0.0 | 8 | 100
   - No: 5.9 | 94.1 | 1051 | 100
   - **Prevalence Ratio (PR)**: 16.952 | 0.0001

**Economic Status**

- **Prevalence Ratio (PR)**: 0.394

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Discussion

Pregnancy and childbirth at risky ages (<20 years old and ≥35 years old) have a risk of antepartum bleeding, pre-eclampsia and eclampsia, anemia, fetal growth disorders, miscarriage, preterm birth, and LBW [12][13]. Rini (2015) states that maternal age is the most dominant factor influencing the incidence of LBW [14]. In contrast to the results of this study, which found that mothers in the risky age group who gave birth to babies with LBW were 7% whereas mothers in the non-risk age group who gave birth to babies with LBW were 6.4%, there was no proven statistically significant relationship between mothers’ ages and LBW incidence in Central Java (p value = 0.724). The results of this study are in line with the results of research by Nuryani (2015), which proved that there was no relationship between maternal age and LBW incidence (p value = 0.731) [15]. Similar results were also found in Mahayana’s (2015) study, where there was no significant relationship between maternal age and LBW incidence in Padang, as indicated by p value = 0.713, α = 0.05 [16]. However, the results of this study were not supported by several studies, including research by Sholiha (2015), which proved that maternal age at pregnancy had a significant relationship with LBW incidence (p value = 0.030) [17]. Rahfuluddin’s research (2018) states that there was a relationship between gestational age at risk and LBW incidence in Temanggung, Central Java (p value = 0.025) [10].

Level of education is believed to be able to describe a person’s knowledge and has a positive correlation: namely, the higher the education, the better the knowledge and awareness of the importance of access to health services, including antenatal care [18]. This opinion was supported by the theory of Human Capital Theory and Status Attainment Model by Gary S. Becker (1964), which states that a higher school level can develop the capacity for life that will affect health [19]. This mechanism is not seen in this study; statistics show that as many as 7.8% of respondents with further education gave birth to LBW babies, and most of the respondents who did not go to school or only took basic education (94.2%) were able to give birth to babies with normal weight. The chi-square result does not prove a significant relationship between level of education and incidence of LBW in Central Java (p value = 0.199). The results of this study are not in line with Sholiha’s (2015) research, which proves that there was a significant relationship between level of education and incidence of LBW (p value = 0.023) [17]. Rini’s research (2015) states the same fact (p value = 0.0001), where mothers with low education have a 19 times greater risk of giving birth to a baby with LBW compared with highly educated mothers [14].

Residential status is a de facto residence consisting of urban and rural areas based on the classification in the 2017 IDHS report. Sohibien (2019) states that mothers who live in urban areas have an easier time accessing health care facilities in order to carry out antenatal care so that they can minimize the birth of babies with LBW [20]. This theory is contrary to the results of this study,
which shows that the incidence of LBW is more found in the group of respondents who live in urban areas (7.7%) than in rural areas (5.6%). The results of statistical relationship testing showed that there was no significant relationship between residence and incidence of LBW in Central Java (p value = 0.174). The results of this study are in line with Pramono’s (2011) study using secondary data from Basic Health Research 2010 and gave statistical test results where there is no significant relationship between area of residence and incidence of LBW in Indonesia [21]. The results of this study were supported by one of the studies in developing countries, India, the Taywade Research (2016), which also did not find a significant relationship between residence status and incidence of LBW (p value = 0.49) [22].

Type and workload can cause stress in pregnant women, which affects behavior during pregnancy. Stress during pregnancy can reduce appetite, which affects nutritional intake for the mother and the fetus, causing disruption of the mother’s blood circulation to the fetus through the placenta. This mechanism can affect the condition of the baby’s birth weight, indicated by the difference in the lower mean birth weight of babies in the group of working mothers (3.041 g) compared with the group of mothers who do not work (3.153 g) [23]. This is unlike the results of this study, which showed that the incidence of LBW was more found in the group of mothers who did not work (7.0%) than in the group of working mothers (6.1%). It was proved statistically that there was no relationship between respondents’ employment status and incidence of LBW in Central Java (p value = 0.593). These results received support from several studies. Permana’s research (2019) showed the same results where there was no evidence of a significant relationship between maternal employment status and incidence of LBW in Gianyar City (p value = 0.954) [24]. Research by Kumalasari (2018) and Purwanto (2016) found no significant relationship between maternal employment status and incidence of LBW; p value = 0.890 and 0.738, respectively [25][11].

Parity is a classification of women of childbearing age based on the number of live or still babies born at gestational age >20 weeks [26]. It can be assumed that parity describes the last serial number of a mother’s birth. The higher a person’s parity, the higher the risk of complications in pregnancy [27]. Birth order number is risky when the baby is born at birth sequence number ≥5 because grande multipara (>4) has a >50% risk of delivering an LBW baby [14]. The results of this study indicate that the incidence of LBW is more found in babies born in a risky serial number (6.7%) than those born in a non-risky serial number (6.6%), and statistically there is no proven relationship between birth order numbers and incidence of LBW (p value = 1.000). This study is in line with the research of Makbruri (2015) and Mahayana (2015), which states that there was no relationship between parity and incidence of LBW in a bivariate manner [28][16]. However, in a multivariate manner, Mahayana (2015) concluded that there was a relationship between parity and incidence of LBW (p value = 0.022) [16]. Research by Rini (2015) and Wahyuningrum (2015) proved the same notion—that parity has a significant relationship with incidence of LBW; p value = 0.0001 and 0.001, respectively [14][29].

According to the results of the WHO technical consultation on birth spacing, it was agreed that the minimum distance between live births and subsequent attempts at pregnancy is 2 years (24 months). It can be interpreted that the ideal distance between births in terms of health is 3 years [30]. Pregnancy at a risk distance (<3 years) can cause growth problems in the conception and can lead to
the birth of LBW babies. This can be due to a lack of nutrient supply, which affects the function of the placenta in fetal growth and development [16]. The incidence of LBW was more found in the group of babies with birth spacing without risk (6.7%) compared with the risk birth spacing group (5.6%). The statistical results show that there is no statistically significant relationship between birth spacing and incidence of LBW (p value = 1.000). The results of this study are in line with Permana’s research (2019), where there was no significant relationship between pregnancy distance and incidence of LBW (p value = 0.647) [24]. Research by Purwanto (2016) and Mahayana (2015) also states the same fact: there is no relationship between birth spacing and incidence of LBW [11][16].

The World Health Organization (2006) states that men tend to have heavier and taller bodies than women. The optimal birth weight for boys is 3.3 kg, and for girls it is 3.2 kg [31]. The incidence of LBW was more prevalent in male infants (6.8%) than in female infants (6.4%). The statistical results of this study indicate that there is no relationship between sex of the baby and incidence of LBW (p value = 0.784). This study is in line with Mahayana’s (2015) research, where statistics show that there is no significant relationship between fetal sex and incidence of premature LBW and immaturity (p value = 0.591) [16]. Kumalasari (2018) also proved the same fact—that there was no significant relationship between sex of the baby and incidence of LBW (p value = 0.284) [25]. The results of this study are not supported by the research of Makbruri (2015), which states that sex of the baby has a relationship with incidence of LBW in Palembang City (p value = 0.040) [28].

Multiple pregnancies is a term that describes pregnancies with more than one fetus. The fetal weight in multiple pregnancies is an average of 1000 g less than that of a single pregnancy fetus and generally weighs less than 2500 g [28]. This study shows that the incidence of LBW is more found in the group of babies born with multiple pregnancy status (100.0%) than with single pregnancy status (5.9%). The statistical results prove that there is a significant relationship between multiple pregnancy status and incidence of LBW (p value = 0.0001). The proportion of babies with LBW is 17-fold greater if a pregnant woman has a multiple pregnancy status (PR = 16.952). This study is in line with Permana’s (2019) study, which also showed a significant relationship between multiple pregnancy and LBW incidence (p value = 0.0001), where mothers with multiple pregnancies had a 15 times higher risk of delivering LBW babies than mothers without multiple pregnancies [24]. Kumalasari (2018) proves the same fact and states that the risk of giving birth to LBW babies in mothers with multiple pregnancies is 21 times greater [25].

Wealth quintile was calculated based on the number and types of goods owned as well as the characteristics of the housing. The existence of durable goods in the household, such as radio, television, refrigerator, motorbike, and private car, is a useful indicator to measure the socioeconomic status of a household [8]. In this study, the incidence of LBW was more in the group of respondents with the middle–upper wealth quintile (7.1%) than the lower wealth quintile (5.7%), and there was no significant relationship between economic status of the family and incidence of LBW in Java: middle (p value = 0.394). The results of this study are in line with the research of Makbruri (2015), which concluded that there was no relationship between economic status and incidence of LBW in Palembang City (p value = 0.904) [28]. The same result was also found in Pramono’s (2011) research: p value = 0.300 [21]. However, economic status cannot be ignored because economic status affects a
person’s ability and willingness to access health care facilities, where families with the lower wealth quintile are two times more likely to not access health services (OR = 2.316) [32].

Statistically, there was no significant relationship of age at delivery, education level, place of residence, employment status, birth sequence number, birth spacing, gender, and family economic status with incidence of LBW. Multiple pregnancy status is the single risk factor associated with LBW incidence in Central Java (p value = 0.0001; α = 0.05; OR = 16.952; 95% CI = 13.315–21.581). This is due to sharing nutrition between fetuses in multiple pregnancies. This statement is supported by the existence of a theory, which suggests that the risk to a baby in multiple pregnancy depends on the chorionicity and amniotic fluid of the pregnancy [33]. Monochorionic twins cause a shared placenta and have associated circulating nutrients. These conditions lead to feto-fetal transfusion syndrome or twin-to-twin transfusion syndrome [33]. In addition, multiple pregnancy increases the rate of preterm birth as a contributing factor to LBW [34]. It is also related to the occurrence of sharing nutrition. One study showed that there was a significant reduction in preterm birth and the risk of LBW birth in a group of women with multiple pregnancies who received nutrition advice during ANC [33]. This indicates a poor quality nutritional intake in multiple pregnancies as a result of multiple placenta conditions, although low nutrient intake is also found in single pregnancies.

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