

# ANALYSIS OF DETERMINANTS OF THE DURATION OF CARE FOR LOW BIRTH WEIGHT INFANTS IN HOSPITALS

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## Abstract

Low birth weight infants (LBWI) remain a public health issue in Indonesia. The complexity of health issues in low birth weight infants requires special care with a duration or length of stay that may take longer to improve their quality of life. **Objective:** to analyze the factors affecting the length of hospital stay for low birth weight infants (LBW) from the perspective of infant factors (gestational age, history of infant infection status, nutritional status, and kangaroo care method) and maternal factors (maternal attitudes and knowledge regarding LBW care). **Method:** Quantitative research design with a cross-sectional approach. The sample size is 115 respondents who were selected through simple random sampling, with inclusion criteria: babies born alive and not using a ventilator. The exclusion criteria are mothers who refuse to participate in the study. **Results:** The majority of hospital stays lasted 7 days (quick) (61%), categorized as low birth weight (LBW) with a weight of 1500-< 2500 grams (90.4%), preterm gestational age (76.5%). The majority did not experience any infections during treatment (87.9%). The type of nutrition was breast milk (60%). The regularity in implementing the kangaroo care method was almost the same, with those who did it at least 2 times for 2 hours/day. (49,6). The results of the chi-square analysis test showed significant values with p-value<0.05, namely low birth weight (LBW) (p=0.000), gestational age (p=0.008), infection status (p=0.001), and implementation of KMC (p=0.005). **Conclusion:** The factors affecting the length of hospital stay for low birth weight infants are the birth weight of the infant, gestational age at birth, history of infection status, and the regularity of implementing neonatal care.

Keywords: determinants; low birth weight infant; length of stay; rehospitalization

## ABSTRAK

Bayi dengan berat badan lahir rendah (BBLR) masih menjadi masalah kesehatan masyarakat di Indonesia. Kompleksitas masalah kesehatan pada bayi BBLR membutuhkan perawatan khusus dengan durasi atau lama rawat inap yang mungkin lebih lama untuk meningkatkan kualitas hidupnya. Tujuan: menganalisis faktor-faktor yang mempengaruhi lama rawat inap bayi BBLR ditinjau dari faktor bayi (usia kehamilan, riwayat status infeksi bayi, status gizi, dan metode perawatan kanguru) dan faktor ibu (sikap dan pengetahuan ibu mengenai perawatan BBLR). Metode: Desain penelitian kuantitatif dengan pendekatan potong lintang. Jumlah sampel sebanyak 115 responden yang dipilih secara simple random sampling, dengan kriteria inklusi: bayi lahir hidup dan tidak menggunakan ventilator. Kriteria eksklusi adalah ibu yang menolak untuk berpartisipasi dalam penelitian. Hasil: Mayoritas rawat inap berlangsung selama 7 hari (cepat) (61%), dikategorikan sebagai bayi berat lahir rendah (BBLR) dengan berat badan 1500 - <2500 gram (90,4%), usia kehamilan prematur (76,5%). Mayoritas tidak mengalami infeksi selama perawatan (87,9%). Jenis nutrisi yang diberikan adalah ASI (60%). Keteraturan dalam melakukan metode perawatan kanguru hampir sama, yaitu sebanyak 49,6%

melakukannya minimal 2 kali selama 2 jam/hari (49,6). Hasil uji analisis chi-square menunjukkan nilai yang signifikan dengan  $p\text{-value} < 0,05$ , yaitu berat badan lahir rendah (BBLR) ( $p=0,000$ ), usia kehamilan ( $p=0,008$ ), status infeksi ( $p=0,001$ ), dan pelaksanaan KMC ( $p=0,005$ ). Kesimpulan: Faktor-faktor yang mempengaruhi lama rawat inap bayi BBLR adalah berat badan lahir bayi, usia kehamilan saat lahir, riwayat status infeksi, dan keteraturan pelaksanaan perawatan neonatal.

**Kata kunci:** determinan; bayi berat lahir rendah; lama rawat inap; rawat inap ulang

## INTRODUCTION

Globally, BBLR continues to be a significant public health issue and is associated with various short-term and long-term consequences. It is estimated that 15% to 20% of all births worldwide are LBW, representing more than 20 million births per year. This number continues to increase every year. (UNICEF, 2023). In 2012, the World Health Assembly Resolution endorsed a comprehensive implementation plan on maternal, infant, and child nutrition, which set six global nutrition targets for 2025. This policy includes a target to reduce the number of low birth weight infants by 30% by 2023. (WHO, 2014). The birth of low birth weight infants often occurs in developing countries and is closely associated with poverty. The regional LBW rate is 28% in South Asia, 13% in Sub-Saharan Africa, and 9% in Latin America (WHO, 2014). The highest incidence of neonatal mortality occurs in South Asia, while premature babies are found in Sub-Saharan Africa. The results of the Basic Health Research (Riskesdas) (Ministry of Health of the Republic of Indonesia 2013) state that the percentage of low birth weight infants (LBW) is 10.2%, a slight decrease compared to 2007, which was 11.5%.

Premature LBW infants have complex issues and require more attention in their care, as physiological immaturity causes the baby to have difficulty adapting to the extrauterine environment. Findings from several studies identify the complications and risks faced by LBW infants, including respiratory distress syndrome (Behrman & Butler, 2007; Forsythe & Allen, 2013), hyperbilirubinemia (Escobar et al., 2005; Sarici et al., 2004), temperature instability (Engle et al., 2007), infections (Behrman & Butler, 2007; Forsythe & Allen, 2013; Stoll et al., 2004), feeding difficulties (Hurst et al., 2004; Meier & Engstrom, 2007; Sullivan et al., 2010), and growth and developmental disorders. BBLR needs special care in the hospital to sustain its life. (Behrman & Butler, 2007).

Optimal management of LBW infants has proven effective in reducing mortality and morbidity rates, but it involves quite complex procedures and will incur significant costs. Based on the 2018 National Riskesdas report, the management of LBW in Jakarta was mostly done in incubators at 60.4% compared to 43.0% in Indonesia, provided with kangaroo care at 14.8%

compared to 21.7% in Indonesia, and nothing was done at 22.2% compared to 30.1% in Indonesia, and other actions at 2.5% compared to 5.1% in Indonesia. (Kementerian Kesehatan RI, 2019). A research journal shows results where the length of hospital stay for LBW infants with anemia, which is more than 28 days, is 43.1% of LBW infants, and 85.1% of LBW infants were hospitalized for 8-14 days. Comorbid conditions usually result in a longer hospital stay for the baby because special care is needed. The baby can be allowed to go home from the hospital if the baby's growth is appropriate, especially in terms of weight, the baby's condition is stable, and there are no issues during breastfeeding. (Murti, Rundjan dan Pulungan, 2016).

The high number of hospitalization days is a burden for the family. The longer the patient's hospital stay, the higher the costs incurred. Various efforts for the baby to optimize their condition have begun to be developed to enhance the baby's growth and development, so that this can shorten the care period for LBW infants in the NICU, thereby reducing the length of hospital stay and lowering hospital care costs. Research conducted in England states that the most important factors influencing the length of hospital stay for LBW infants are the baby's birth weight and gestational age. (Seaton et al., 2016). Meanwhile, in Indonesia, especially in Jakarta, research related to the length of hospital stay for LBW infants (LBW) is still very rare. Based on this phenomenon, further research is needed on the factors influencing the length of hospital stay for LBW infants in hospitals in the Central Jakarta area. The aim of the research is to analyze the factors affecting the length of hospital stay for LBW infants in hospitals in the Central Jakarta area, considering baby factors (gestational age, history of infant infection status, nutritional status, and kangaroo care method) and maternal factors (the mother's attitude and knowledge towards the care of LBW infants).

## **METHOD**

The research was conducted in three hospitals in the Central Jakarta area in 2017, using a cross-sectional approach. The population used in this study consists of mothers who gave birth to LBW infants and were treated in three hospitals in the Central Jakarta area, with a total population of 159 mothers with LBW infants. The research sample includes mothers who gave birth to LBW infants in three hospitals in the Central Jakarta area with the inclusion criteria: infants born alive and not using a ventilator. The exclusion criteria are mothers who refuse to participate in the study. The sample size in the study was calculated based on previous research with a proportion value of 41.50% of BBLR receiving treatment, resulting in a sample of 115 BBLR using single population estimation calculations. The sampling was conducted using the

simple random sampling technique, where each member of the population had an equal chance of being selected or not selected as a research sample.

The independent variables are the birth weight of LBW infants, gestational age, history of infant infection status, nutritional status given to the infant, kangaroo care, maternal attitude towards LBW care, and maternal knowledge about LBW care. The dependent variable is the length of hospital stay for LBW infants. Data collection was conducted on LBW infants who had been declared by a doctor to be ready for discharge because their condition had stabilized. The research team will collect data through interviews with mothers of LBW infants and the completion of questionnaires. Before the data collection is carried out, an explanation is provided to obtain research approval and the signing of informed consent. The ethics certificate was obtained from FKM UI with No. 332/UN2.F10/PPM.00.02/2016. The instruments used in the interviews have undergone validity and reliability testing. The variable of maternal knowledge about the care of LBW infants from the 24 questions formulated, there are 15 valid questions and 9 invalid questions. The Cronbach's alpha value > r table means that the 15 valid questions are also declared reliable. However, out of the 9 invalid questions, 5 questions were deemed important, so those 5 questions were reused and revised. Thus, the total number of questions used is 20 out of the 24 questions tested. The variable of maternal attitudes towards the care of LBW infants was assessed with 18 attitude questions, which were declared valid and reliable with a Cronbach's Alpha of (0.651) > r table. (0,349). Invalid questions were decided to be removed from the questionnaire.

## RESULTS AND DISCUSSION

### 1. Research Results

#### 1.1. Description of Maternal Factor Characteristics

A total of 115 respondents who met the inclusion and exclusion criteria participated in this study. The characteristics of the sample in this study include the mother's age, mother's education level, mother's employment status, number of parity, and pregnancy interval of mothers who gave birth to LBW infants in hospitals in the Central Jakarta area in 2017. This data is presented in the form of frequency distribution and percentages, which can be seen in Table 1

Table 1. Characteristics of Mothers based on Mother's Age, Education Level, Parity, Pregnancy Interval, Mother;s Knowledge and Mother.s Attitude

| Characteristics | Frequency (n) | Presentase (%) |
|-----------------|---------------|----------------|
| Mother's Age    |               |                |

|                                      |    |      |
|--------------------------------------|----|------|
| Age Not at Risk (20-35 years old)    | 76 | 66,1 |
| Risky Age (<20 and >35 years old)    | 39 | 33,9 |
| <b>Mother's Education Level</b>      |    |      |
| Graduated from elementary school     | 14 | 12,2 |
| Graduated from junior high school    | 26 | 22,6 |
| Graduated from high school           | 61 | 53,0 |
| Graduated from University            | 14 | 12,2 |
| <b>Parity</b>                        |    |      |
| Primipara                            | 53 | 46,1 |
| Not First-time Mother                | 62 | 53,9 |
| <b>Pregnancy interval</b>            |    |      |
| No-Risk Distance ( $\geq 24$ months) | 59 | 51,3 |
| Risk Distance (<24 months))          | 56 | 48,7 |
| <b>Mother's Knowledge</b>            |    |      |
| Good (score $\geq 75$ )              | 52 | 45,2 |
| Sufficient (score < 75)              | 63 | 54,8 |
| <b>Mother's Attitude</b>             |    |      |
| Positive (score $\geq 58$ )          | 23 | 20   |
| Negative (score < 58)                | 92 | 80   |

Table 1 shows that the majority of mothers (66.1%) gave birth at the age of 20 to 35 years, which is a non-risky age for pregnant mothers. Most mothers (53.9%) reported having given birth to more than one child, with a non-risky pregnancy interval (51.3%). The majority of education is high school (53%). Most of the knowledge level is sufficient (54.8%), and the mothers have a negative attitude towards the care of LBW infants during their hospital stay (80%).

## 1.2. Description of Infant Factor Characteristics

Table 2 Infant Characteristics based on Length of Hospital Stay, Infection Status History, Type of Nutrition, and Implementation of Kangaroo Care Method

| Characteristics   | Frequency | Percentage (%) |
|---|-----------|----------------|
| <b>Length of Hospitalization Days</b>   |           |                |
| Fast (< 7 days)   | 71        | 61,7           |
| Long ( $\geq 7$ days)   | 44        | 38,3           |
| <b>Birth Weight</b>   |           |                |
| LBW (1500 - <2500 grams)  | 104       | 90,4           |
| LBW (< 1500 grams)  | 11        | 9,6            |
| <b>Gestational Age</b>  |           |                |
| Full Term Infant  | 27        | 23,5           |
| Preterm Infant  | 88        | 76,5           |
| <b>History of Infection Status (abnormal temperature: &lt; 36 C or &gt; 37.5)</b> |           |                |
| Never   | 100       | 87,0           |
| Yes   | 15        | 13,0           |

|                                      |    |      |
|--------------------------------------|----|------|
| Types of Nutrition                   |    |      |
| Breast Milk                          | 69 | 60,0 |
| Formula Milk                         | 46 | 40,0 |
| Implementation of KMC                |    |      |
| Regularly (at least 2x/day @2 hours) | 57 | 49,6 |
| Irregular                            | 58 | 50,4 |

Based on table 2. Most of the BBLR who answered had a treatment period of less than 7 days (61.7%). The frequency of LBW birth weight was most often seen in the category of babies with a birth weight of 1000 to 1500 grams (90.4%). The type of nutrition given most often was breast milk (60.0%). The distribution of the frequency of KMC implementation was almost the same between those who regularly implemented KMC (49.6%) and those who were irregular (50.4%). Furthermore, an analysis was carried out to see the factors that influenced the length of days of LBW hospitalization.

### 1.3. Relationship between Infant Factors and Length of LBW Hospitalization

Table 3 Relationship between Infant Factors and Length of LBW Hospitalization

| Variable                    |                          | Length of Hospitalization Days |       |                 |       | Total |     | OR (95%CI)               | P     |
|-----------------------------|--------------------------|--------------------------------|-------|-----------------|-------|-------|-----|--------------------------|-------|
|                             |                          | Fast (< 7 days)                |       | Long (≥ 7 days) |       | F     | %   |                          |       |
|                             |                          | F                              | %     | F               | %     |       |     |                          |       |
| Birth Weight                | LBW (1500 - <2500 grams) | 71                             | 68,3  | 33              | 31,7  | 104   | 100 | 1,317                    | 0,000 |
|                             | LBW (< 1500 grams)       | 2                              | 18,18 | 9               | 81,82 | 11    | 100 |                          |       |
| Gestational Age             | Full Term                | 23                             | 85,2  | 4               | 14,8  | 27    | 100 | 4,792<br>(1,530-15.008)  | 0,008 |
|                             | Preterm                  | 48                             | 54,5  | 40              | 45,5  | 88    | 100 |                          |       |
| History of Infection Status | Never                    | 68                             | 68    | 32              | 32    | 100   | 100 | 8,500<br>(2.241- 32,239) | 0.001 |
|                             | Yes                      | 3                              | 20    | 12              | 80    | 15    | 100 |                          |       |
| Types of Nutrition          | Breast Milk              | 42                             | 60,9  | 27              | 39,1  | 69    | 100 | 0,917<br>(0,618-1,360)   | 0,534 |
|                             | Formula Milk             | 29                             | 63,04 | 17              | 36,96 | 46    | 100 |                          |       |
| Implementation of KMC       | Regularly                | 43                             | 75,4  | 14              | 24,6  | 57    | 100 | 3,291<br>(1,489-7,273)   | 0,005 |
|                             | Irregular                | 28                             | 48,3  | 30              | 51,7  | 58    | 100 |                          |       |

Based on Table 3, there are four variables from the infant factors that show a significant relationship with the length of BBLR care in the hospital, namely the baby's birth weight (p;

0.000), the gestational age of the baby at birth (p: 0.008), the history of suffering from infections during the care period (p: 0.001), and the implementation of KMC in the hospital. (p:0,005). From the analysis results, the OR value for Birth Weight is 1.317 (CI: 0.239-0.421), which means that LBW infants have a 1.317 times higher chance of being hospitalized longer compared to VLBW infants. Preterm infants have a 4.792 times higher chance of receiving longer care compared to VLBW infants born at full-term gestation. VLBW infants with a history of infection have an 8.500 times higher chance of being hospitalized longer. Mothers who do not perform KMC regularly have a 3.291 times higher chance of being hospitalized longer compared to mothers who perform KMC regularly.

#### 1.4. The Relationship between Maternal Factors and the Length of Stay of LBW Infants in the Hospital

Table 4 The Relationship between Maternal Factors and the Length of Stay of LBW Infants in the Hospital

| Variabel           |            | Length of Hospitalization Days |       |                          |       | Total |     | OR<br>(95%CI)          | P     |
|--------------------|------------|--------------------------------|-------|--------------------------|-------|-------|-----|------------------------|-------|
|                    |            | Fast<br>( $< 7$ days)          |       | Long<br>( $\geq 7$ days) |       | F     | %   |                        |       |
|                    |            | F                              | %     | F                        | %     |       |     |                        |       |
| Mother's Knowledge | Good       | 30                             | 57,69 | 22                       | 42,30 | 52    | 100 | 0,618<br>(0,428-1,611) | 0,547 |
|                    | Sufficient | 41                             | 65,10 | 22                       | 34,9  | 63    | 100 |                        |       |
| Mother's Attitude  | Positive   | 17                             | 73,90 | 6                        | 26,10 | 23    | 100 | 1,994<br>(0,720-5,524) | 0,270 |
|                    | Negative   | 54                             | 58,70 | 38                       | 41,30 | 92    | 100 |                        |       |

Based on Table 4, maternal factors consisting of maternal knowledge and attitudes towards the care of LBW infants do not have a significant relationship with the duration of LBW infant care in the hospital. Based on the above results, it can be concluded that infant factors are related to the incidence of the duration of infant hospitalization.

## 2. Discussion

The research results show that LBW infants have a greater chance of being hospitalized longer compared to VLBW infants. This is in line with the study by Lee et al. (2016), which indicates that gestational age and birth weight of VLBW infants are very important components in determining the length of hospitalization for newborns. The condition of VLBW infants, which is not as good as that of normal infants, will lead to a longer hospitalization period for

VLBW infants. Birth weight of VLBW infants is one of the indicators for when a baby can be discharged from the hospital. If the baby has an appropriate weight, then the baby will be able to maintain its body temperature, allowing the baby to metabolize well, and the baby's growth and development will proceed optimally. Therefore, proper management of LBW infants (LBW) care is needed to increase the baby's weight.

Gestational age affects the proper or improper development of the baby's organs and weight. Gestational age also affects organ function, which is generally poorer and has worse outcomes with younger gestational ages. According to Ricci, Kyle, and Carman (2013), gestational age is the amount of time the fetus spends in the womb from the First Day of the Last Menstrual Period (FDLMP) until the day of birth. (Ricci, Kyle, and Carman, 2013). The appropriate gestational age is 38-42 weeks, and a gestational age of less than 37 weeks can cause the baby to have a lower birth weight. This is due to the fact that the baby's weight biologically increases with gestational age. A baby in the womb for more than 37 weeks grows well and has a normal weight. However, not all LBW babies are preterm. A term baby can experience LBW due to intrauterine growth restriction, which causes them to be small during pregnancy.

In the study by Aljohani et al. (2020), it was stated that infants with a gestational age of 30-31 weeks have a shorter length of stay compared to infants with a gestational age of 26-28 weeks. The age of pregnancy will affect the proper or improper development of the baby's organs, and this will also influence the baby's weight. The impaired function of body organs and its prognosis generally become worse as the gestational age decreases. (Bender et al., 2013) Respiratory distress, temperature instability, gastrointestinal and nutritional disorders, liver immaturity, kidney issues, immune disorders, cardiovascular abnormalities, hematological disorders, metabolic disorders, and neurological disorders are common problems experienced by preterm infants (Gaffari et al., 2021). A study conducted by Yeh et al. (2021) found that preterm infants have a relationship between infection and infant mortality. Babies with a gestational age of less than 37 weeks have a 31 times higher risk of infection. Therefore, the gestational age greatly affects the duration of care because the baby's organ functions become increasingly ineffective at adapting to the extrauterine environment. Babies will experience health problems if they cannot adapt. Therefore, gestational age significantly affects the length of hospital stay because the fewer months of gestational age, the less optimal the baby's organ functions are in adapting to the extrauterine environment. If the baby cannot adapt, health problems will arise, which will result in a longer hospital stay for the baby.



The findings show that the history of infectious diseases suffered by LBW infants (LBW) significantly impacts the length of their hospital stay.

The length of hospitalization can increase due to nosocomial infections in LBW infants; nosocomial bloodstream infections can extend the length of hospitalization for LBW infants by 13 to 17 days (Goudie et al. 2014) and also state that bloodstream infections can increase the length of hospitalization by 19 days. LBW infants have an immature immune system, they have little to no resistance to infections, making them very susceptible to infections. LBW infants have lower immunoglobulin levels compared to normal-weight infants, the immaturity of LBW infants' skin can also weaken their immune defense, and the imperfect secretory IgA function in mucus serves as a protective layer against bacterial invasion in the intestines. Therefore, BBLR will be more susceptible to infections (Riskawa, Hilmanto & Chairulfatah, 2012). Therefore, if the LBW infant (BBLR) experiences an infection, the length of their hospital stay will increase because they have not yet met the criteria for discharge from the hospital, which is the infant's competency. The baby's competence must be optimal at the time of discharge; if a baby is infected, the baby's competence decreases, so care needs to be provided. (Hanum, Hasanah and Elita, 2014).

Based on the research findings, there is a relationship between the implementation of PMK and the length of hospital stay. This is in line with the research by Suryadi & Fitri (2019) which states that the implementation of kangaroo care can shorten the length of hospital stay ( $p=0.001 < 0.05$ ). LBW infants who do not regularly receive kangaroo care are at an 8.3 times higher risk of being hospitalized longer compared to LBW infants who regularly receive kangaroo care. The skin-to-skin contact method through PMK is one of the effective methods to enhance the growth of LBW infants, reduce morbidity rates, and prevent infections in stable LBW infants. Various studies conducted have found the influence of PMK on the growth of BBLR, particularly in weight gain, facilitating the baby's nutritional intake (breast milk), and enhancing the bond of affection between mother and baby. A cohort study in Colombia on the impact of PMK implementation on breastfeeding patterns and the growth of premature infants found that PMK implementation increased breastfeeding activity, boosted confidence, and accelerated the baby's weight gain. A meta-analysis also found that PMK implementation significantly increased the duration of breastfeeding, the baby's weight, and the body temperature of newborns. (Charpak and Ruiz-pela, 2000). Another study, a randomized controlled trial that (Mustikawati, 2019).

## CONCLUSION

In general, the duration of treatment is less than 7 days. Birth weight between 1500 and <2500 grams with a gestational age majority of less than 37 weeks. Most did not experience infections during treatment and the baby received breast milk. Demographically, the majority of mothers are aged 20-35, have a high school education, have more than one child, and have a birth interval of more than two years with their previous child. Generally, knowledge is sufficient and good knowledge is balanced, but the mothers' attitudes towards the therapy and care provided to their children during their hospital stay are not optimal. The factors significantly affecting the length of stay of LBW infants in the hospital are the baby's birth weight, gestational age at birth, history of infectious diseases during the baby's care, and the implementation of kangaroo care.

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