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# THE EFFECT OF INFANT MASSAGE ON WEIGHT GAIN IN LOW BIRTH WEIGHT INFANT: A CASE STUDY

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***ABSTRACT***

Infant mortality rate remains a major public health issue in many countries, including Indonesia. One of the contributing factors to the high infant mortality rate is low birth weight, which can lead to various health complications. This study aims to analyze the effect of infant massage on weight gain in infant with low birth weight. A case study design was used, involving an infant diagnosed with low birth weight. The primary data collection methods included observation and weight measurement before and after the infant massage intervention. Data analysis was conducted by comparing weight changes before and after regular massage sessions. The results indicate that infant massage significantly contributes to weight gain in low birth weight infant. This is evidenced by a gradual increase in weight, from 1,265 grams on the first day to 1,420 grams on the seventh day, with an average weight gain of 155 grams per week. Therefore, infant massage can serve as an alternative approach to support the growth of infants born with low birth weight. The implications of this study suggest that infant massage can be incorporated into nursing practices as a strategy to enhance the health of low birth weight infants.

***Keywords : Lbw; Infant Massage; Low Birth Weight; Weight Gain; Pediatric Nursing***

## INTRODUCTION

Infant Mortality Rate (IMR) remains a major public health issue in many countries, including Indonesia (Sari et al., 2023). According to the Maternal Perinatal Death Notification (MPDN) report in Indonesia in 2021, the three leading causes of infant mortality were low birth weight (LBW) (29.21%), asphyxia (27.44%), and infections (5.4%) (Sari et al., 2023). These statistics highlight the critical role that LBW plays in infant mortality and underscore the need for targeted interventions to address this issue. The World Health Organization (WHO) defines Low Birth Weight (LBW) as a birth weight of less than 2500 grams, regardless of the gestational age at birth. LBW can result from two main factors: premature birth, where the infant is born before 37 weeks of gestation, or intrauterine growth restriction (IUGR), where the fetus does not grow adequately within the womb during pregnancy (Yuwanti et al., 2022). Both conditions lead to infants being born with insufficient nutritional reserves and physical immaturity, making them more susceptible to various health complications that can impact survival and long-term development. The prevalence of LBW remains a major concern in Indonesia, with the country recording a relatively high incidence of LBW in 2019, where

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approximately 15.5% of all annual births were classified as LBW (Nisa et al., 2023).

Infants with low birth weight (LBW) are at high risk of experiencing both short-term and long-term adverse outcomes, including growth retardation such as stunting, cognitive developmental disorders, and chronic diseases (Nisa et al., 2023; Sadarang, 2021). This condition results from insufficient nutritional and energy reserves, making infants vulnerable to nutritional deficiencies crucial for growth (Nisa et al., 2023). Contributing factor to growth impairment is metabolic dysfunction, which makes it difficult for LBW infants to regulate their body temperature. As a result, the energy that should be used for growth is instead allocated to maintaining body temperature stability (Yuwanti et al., 2022).

Weight gain is a primary focus of intervention for LBW infants to prevent growth and developmental disorders (Yuwanti et al., 2022). Interventions that are usually given to increase body weight in LBW infants are to provide adequate nutritional intake in the form of exclusive breastfeeding or collaboration in providing special formula for LBW infants (Sadarang, 2021; Yuwanti et al., 2022). Both of these have been widely proven to be effective in helping to promote baby's growth and prevent developmental delays in infants (Nisa et al., 2023).

In addition to other established interventions, infant massage has been increasingly recognized as an effective complementary method for promoting weight gain in low birth weight (LBW) infants (Fatmawati et al., 2021). Infant massage is a structured tactile stimulation applied to an infant's skin to support growth and development (Fatmawati et al., 2021). It stimulates the vagus nerve, which plays a role in enhancing digestive hormone secretion, accelerating nutrient absorption, and increasing an infant's appetite (Fatmawati et al., 2021). However, infant massage may also have minor side effects, such as skin irritation or discomfort, which underscores the need for proper massage techniques (Carolin et al., 2020).

Several studies have demonstrated the effectiveness of infant massage in promoting weight gain, particularly in preterm and LBW infants (Carolin et al., 2020; Fatmawati et al., 2021; Herawati & Trisiani, 2023). However, most research has been conducted on large sample sizes, and the effectiveness of infant massage on an individual basis remains underexplored. Therefore, this study aims to investigate the efficacy of infant massage in promoting weight gain in low birth weight (LBW) infant through a case study approach, which focuses on a single subject to assess the effectiveness of the intervention.

## METHODS

This study employed a descriptive quantitative case study design to assess the effectiveness of infant massage in promoting weight gain in a low birth weight (LBW) infant. Infant massage was used as the independent variable, while the infant's weight served as the dependent variable. The research was conducted from November 9 to November 16, 2024, in the PICU-NICU at PKU Muhammadiyah Yogyakarta Hospital. The subject was an infant diagnosed with LBW, selected through purposive sampling based on the need for a weight gain intervention. Calibrated baby scales were used to measure the infant's weight before and after each intervention, and baby oil was applied during massage sessions to minimize skin friction and improve comfort. Prior to the administration of the intervention, written informed consent was obtained from the infant's parents after a clear explanation of the purpose, procedures and potential benefits of the study. The intervention was non-invasive and conducted under the supervision of licensed nurses and faculty supervisors to ensure the safety and well-being of the infants. Ethical principles such as respect for the individual, beneficence, fairness, and confidentiality were upheld at every stage of the study.

This study implemented tactile and kinesthetic stimulation techniques using an A-B-A pattern, where pattern A involved tactile stimulation movements, and pattern B focused on kinesthetic movements. The infant massage

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intervention began with positioning the infant in a supine position, applying a small amount of baby oil, and performing gentle massage on specific body parts such as the face, abdomen, hands, and legs. Each session lasted 5–10 minutes, starting with pattern A, where gentle circular strokes were applied to the abdomen in a clockwise direction using fingertips. This was followed by the "I Love U" technique, involving strokes forming the letters "I," "L," and "U." Pattern B aimed to provide movement stimulation to the hands and legs, involving gentle flexion and extension of the elbows and knees towards the abdomen. The massage then continued with circular strokes on the forehead, cheeks, and chin. The second pattern A phase involved a full-body massage, starting from the face with gentle circular movements, then the hands with strokes from the shoulders to the wrists, followed by abdominal massage using circular strokes and the "I Love U" technique. The massage concluded with strokes on the legs, from the thighs to the feet. Each movement was repeated five times to ensure optimal stimulation benefits.

Weight measurements were systematically recorded on a daily basis at the same time each day over a consecutive seven-day period. This consistent approach was critical to ensure accuracy and reliability in tracking the infant's weight fluctuations over the course of the intervention. The measurements were carefully documented using a weight recording sheet, which allowed for precise tracking of the infant's body weight after the massage intervention. In order to evaluate the impact of the intervention, the data collected was subjected to a descriptive analysis. This analysis involved comparing the body weight of the infant before the commencement of the massage sessions with the weight measurements taken at the conclusion of the intervention. To facilitate this comparison, Microsoft Excel was utilized as the primary tool for data analysis. Using Excel's built-in functions, weight differences were calculated, providing a clear numerical representation of the changes in the infant's weight over time. Additionally, the software was employed to generate tables and graphs that visually represented these changes, which helped to identify trends and patterns in the infant's weight gain throughout the seven-day period. This approach allowed for an effective and comprehensive assessment of the intervention's success, offering valuable insights into its potential effectiveness in promoting weight gain in infants. Through the use of this methodical and data-driven approach, the study was able to provide a clear, evidence-based evaluation of the massage intervention's impact on the infant's weight progression.

## RESULT

The study was conducted on Baby Y, a 39-day-old female infant diagnosed with low birth weight (LBW). Baby Y was born prematurely at 29 weeks of gestation via cesarean section, which placed her at a heightened risk for various health complications commonly associated with preterm birth. Upon delivery, the infant's anthropometric measurements indicated a weight of 1010 grams, a body length of 35 cm, a head circumference of 24 cm, an upper arm circumference of 6.5 cm, and a chest circumference of 23 cm. These measurements, reflective of her low birth weight and premature status, underscore the significant challenges faced by LBW infants, particularly in their early days of life. At the time of the assessment, Baby Y was in a stable condition, appearing calm and alert, though still requiring medical support to ensure her ongoing health and development. She was being assisted by a nasal cannula, delivering 1 liter per minute of supplemental oxygen, to maintain her oxygen levels within a safe range. In addition, an Orogastric Tube (OGT) was being used to provide necessary nutrition, as the infant's ability to coordinate suckling and swallowing remained underdeveloped due to her premature birth. The vital sign measurements at the time of the assessment indicated a weight of 1265 grams, reflecting a moderate increase from her birth weight, a heart rate of 174 beats per minute, which is within the normal range for an infant of her age, a body temperature of 36.6°C, indicating adequate thermoregulation, a respiratory rate of 43 breaths per minute, and an

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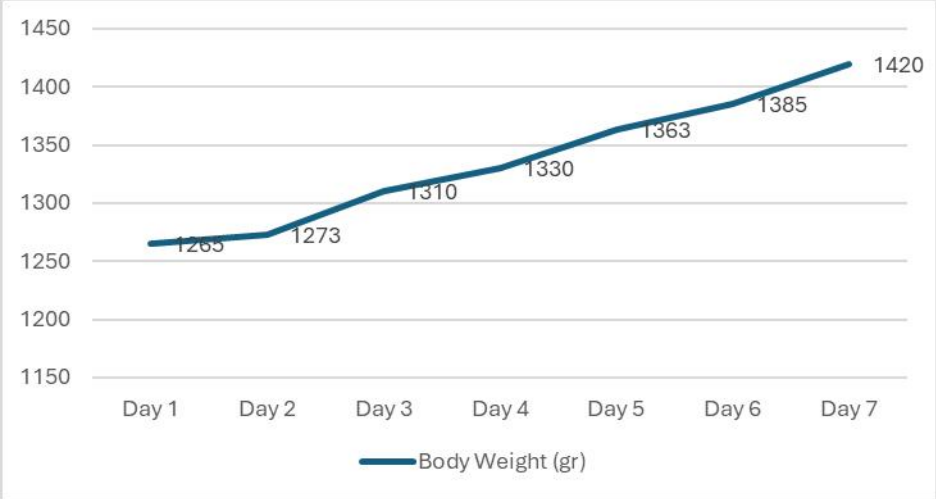
oxygen saturation ($SpO_2$) level of 98%, suggesting that her oxygenation was well-maintained with the support provided. These readings collectively suggest that while Baby Y remained in a fragile state due to her premature birth and LBW, her vital signs were stable, and she was receiving appropriate medical interventions to support her growth and recovery during this critical period.

Based on the seven-day study, the daily weight gain was recorded as follows:




**Figures 1.** Baby weight gain

The results of the seven-day intervention provided compelling evidence of the effectiveness of infant massage in promoting weight gain in low birth weight (LBW) infants. Throughout the intervention period, the infant's weight demonstrated a consistent and progressive increase, which is visually represented in Figure 1. On the first day, the infant's weight was recorded at 1265 grams, and by the second day, it had increased slightly to 1273 grams. This upward trend continued on the third day, with the infant's weight reaching 1310 grams, followed by 1330 grams on the fourth day. On the fifth day, the weight increased further to 1363 grams, and by the sixth day, the infant's weight was recorded at 1385 grams. By the seventh and final day of the intervention, the infant's weight had reached 1420 grams. This progressive weight gain represents a total increase of 155 grams over the seven-day period, with an average daily weight gain of 22.14 grams. These findings strongly suggest that the application of infant massage has a positive impact on weight gain in LBW infants, highlighting its potential as an effective intervention for improving growth outcomes in this vulnerable population. The data clearly illustrate the cumulative and sustained effect of the massage intervention, indicating that regular and structured massage can contribute significantly to enhancing the nutritional status and overall health of LBW infants. This progressive increase in body weight demonstrates not only the immediate benefits of the intervention but also reinforces the importance of early, non-invasive interventions in promoting optimal growth and development during the critical early stages of life.

## DISSCUSSION

According to the research findings, the infant subject had a history of preterm birth at 29 weeks of gestation. Infants born prematurely are at a significantly higher risk of experiencing low birth weight (LBW), a condition that can

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profoundly impact their ability to achieve optimal growth and weight gain. This is primarily due to the incomplete maturation of essential organ systems, particularly the digestive system, metabolism, and thermoregulation (Sirait & Simatupang, 2024). The immaturity of the digestive system in preterm infants leads to inefficiencies in nutrient absorption. As a result, these infants may struggle to achieve the adequate nutritional intake required for proper growth and development, which can severely hinder their ability to gain weight (Hartati et al., 2020). The underdevelopment of the digestive tract also makes feeding more challenging, as preterm infants may exhibit weak sucking reflexes and difficulty coordinating swallowing, further exacerbating their nutritional deficiencies (Arabzadeh et al., 2024). Furthermore, an underdeveloped metabolism in preterm infants impairs their ability to efficiently convert nutrients into energy. This metabolic immaturity means that even if nutrients are available, the infant's body is less effective at using them for growth, cellular repair, and the general energy demands of daily life. This inefficiency in nutrient conversion is especially critical in LBW infants, as their bodies have limited energy stores and rely heavily on external nutritional support to meet their growth requirements (Hartati et al., 2020). In addition to these metabolic challenges, LBW infants typically possess limited fat reserves, which are essential not only for energy storage but also for regulating body temperature. These infants are particularly vulnerable to hypothermia due to their limited fat stores, which prevent them from maintaining a stable internal temperature. As a result, the body expends more energy to regulate temperature, leaving less energy available for other critical processes, such as growth and weight gain. This increased energy expenditure further complicates the ability of low birth weight (LBW) infants to achieve optimal weight gain and growth during the early stages of life, thereby exacerbating the challenges they face in their development (Fauzia et al., 2022).

The seven-day study demonstrated that infant massage is an effective intervention for promoting weight gain in low birth weight (LBW) infants. This conclusion was supported by a measurable overall weight increase of 155 grams over the seven-day period, with consistent daily incremental gains observed throughout the intervention. These results are in alignment with the findings of Hartati et al. (2020), which reported that infant massage significantly enhances weight gain in LBW infants. In a study involving 20 infants, 10 infants who received the massage intervention exhibited superior weight gain, ranging from 180 to 380 grams. This improvement can be attributed to the mechanism through which infant massage stimulates the vagus nerve, which in turn leads to the increased secretion of digestive hormones, such as insulin and gastrin. The elevation of these hormones plays a vital role in promoting more efficient digestion and nutrient absorption, thus enhancing appetite and facilitating greater food intake (Fitriyanti et al., 2019).

Additionally, research by Mrljak et al. (2022), which involved a sample size of 244 infants, further corroborated the effectiveness of infant massage in promoting weight gain. The study highlighted that infant massage not only facilitates weight gain but also plays a significant role in improving various physiological functions that are essential for the optimal growth and development of infants. One of the primary mechanisms through which infant massage exerts its beneficial effects is by improving blood circulation. Proper blood circulation is crucial as it ensures the efficient distribution of oxygen and nutrients throughout

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the body, which are vital for cellular growth, tissue repair, and overall development. Enhanced circulation, in turn, supports more efficient metabolic processes, allowing the energy derived from food to be utilized effectively for growth and weight gain. This improved efficiency in metabolic functioning is particularly important for infants, whose growing bodies require substantial energy to meet the demands of rapid development. Furthermore, the benefits of infant massage extend to the enhancement of thermoregulation, a critical function for maintaining homeostasis in the body. Improved blood flow aids in better regulation of body temperature, which is especially important for infants, as their ability to regulate temperature can be compromised. By enhancing thermoregulation, infant massage enables the infant to maintain a normal body temperature without expending excessive energy, thereby conserving energy for other vital processes, including growth and weight gain. Thus, the findings of the study underscore the multi-faceted benefits of infant massage, which not only promote weight gain but also support the overall physiological well-being of infants, contributing to their healthy development (Mrljak et al., 2022).

## CONCLUSION

Infant massage is a promising non-pharmacological intervention that may support the growth, development, and weight gain of low birth weight (LBW) infants. Its integration into neonatal nursing care can contribute to improved weight gain outcomes. Educating families on proper massage techniques can enhance the safe and effective implementation of this practice at home. Further research is needed to examine its long-term effects on weight gain and to establish standardized clinical guidelines.

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