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The effect of massage education on low birth weight (LBW) babies on the stimulation of their growth and development

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Abstract

Background: Low Birth Weight (LBW) babies are babies weighing less than 2,500 grams at birth and are at high risk for health problems and developmental delays. One intervention that can be provided is infant massage education as a form of early stimulation to promote growth and development. However, the application of infant massage to LBW babies is still not optimal in independent midwifery practices.

Purpose: to determine the effect of massage education on LBW babies on stimulating infant growth and development.

Method: This study used a quantitative approach with a quasi-experimental design (nonequivalent control group design). The sample consisted of all 14 low birth weight (LBW) infants registered in the Jayusniar PMB register. Data collection was conducted through the stages of midwifery care, including assessment, diagnosis, planning, implementation, and evaluation. Data analysis used the nonparametric Wilcoxon Signed Rank Test to assess the effect of baby massage on infant growth and development.

Results: The majority of respondents were female (64.3%), second-born (57.1%), and born by cesarean section (78.6%). After the intervention, 7 babies (50.0%) in the control group experienced optimal improvement, while 12 babies (85.7%) in the experimental group experienced optimal improvement. The statistical test results showed a significant effect of baby massage on stimulating infant growth and development with a p-value of 0.021 ($p < 0.05$).

Conclusion: Education and baby massage significantly influence the growth and development of LBW infants. This intervention can be recommended as part of midwifery care to improve the growth quality of LBW infants.

Keywords: Collaborative Care; Growth and Development; Infant Massage; Low Birth Weight.

INTRODUCTION

Low Birth Weight (LBW) babies are babies born weighing less than 2,500 grams regardless of gestational age and remain a major health problem due to the increased risk of neonatal morbidity and mortality, including hypothermia, infection, growth retardation, and death in the first year of life (Bintang & Salafas, 2022). LBW generally occurs due to premature birth, intrauterine growth restriction (IUGR), or a combination of both. Globally, an estimated 15–20% of births per year are LBW, with the greatest burden in developing countries such as Indonesia (Silaban, Masniar, Masna, & Marwani, 2024). Various maternal risk factors contribute to the

incidence of LBW, including maternal age that is too young or too old, high parity, short pregnancy intervals, poor nutritional status, anemia, hypertension and preeclampsia, infections during pregnancy, low socioeconomic status, lack of antenatal visits, and exposure to cigarettes, alcohol, and strenuous physical activity (Grbić, Terzić, & Janković, 2025).

Physiologically, low birth weight babies have immature organ systems, particularly the lungs, central nervous system, thermoregulatory mechanisms, and immune system, making them susceptible to respiratory distress, difficulty

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maintaining body temperature, cardiovascular problems, feeding and nutritional disorders, hypoglycemia, and even severe infections such as sepsis. This immaturity also contributes to various other complications, including jaundice, bronchopulmonary dysplasia, retinopathy of prematurity, and endocrine-metabolic disorders that can affect brain development (AP, 2024). In the long term, low birth weight babies have a higher risk of developmental disorders, particularly physical growth retardation, motor and cognitive delays, learning disabilities, and neuropsychiatric problems such as attention deficit disorder and autism, with the risk increasing with decreasing birth weight and gestational age (Kim, Cho, Ahn, Hong, Oh, & Kim, 2024).

According to joint estimates by UNICEF and the World Health Organization, approximately 14-15% of live births worldwide, or nearly 20 million babies each year, are born with low birth weight, with the majority of cases occurring in low- and middle-income countries. The most critical period for survival is the first month of life, when 2.4 million neonatal deaths occur annually, with approximately 60–80% of these deaths related to prematurity and low birth weight (Okwaraji, Krasevec, Bradley, Conkle, Stevens, Gatica-Domínguez, & Hayashi, 2024). To reduce morbidity and mortality, the WHO emphasizes a comprehensive care package consisting of essential newborn care, early initiation of breastfeeding, exclusive breastfeeding, infection prevention, and widespread implementation of Kangaroo Mother Care (KMC), both in health facilities and communities. This has been shown to reduce mortality, infection, hypothermia, and increase breastfeeding success in low-birth-weight infants (Darmstadt, Al Jaifi, Arif, Bahl, Blennow, Cavallera, & Yunis, 2023).

UNICEF emphasizes that the incidence of low-birth-weight babies is strongly influenced by socioeconomic factors, such as poverty, low maternal education, and limited insurance or access to quality health facilities, which impact maternal nutritional status and the adequacy of prenatal care. Various studies show that women with poor nutritional status, anemia, chronic energy deficiency, and inadequate access to antenatal care have a higher risk of giving birth to LBW babies. Therefore, interventions need to begin before and during pregnancy through improving

maternal nutrition, increasing the coverage and quality of antenatal care, safe delivery, and preventing and managing infections during pregnancy to reduce the risk of LBW (Arisanti & Rifalman, 2025).

In Indonesia, low birth weight (LBW) is a leading cause of neonatal death and contributes significantly to the high infant mortality rate, with LBW recorded as the leading cause of infant deaths, accounting for approximately 34–35% in national reports in recent years. Analysis of the 2017 Indonesian Demographic and Health Survey (SDKI) data shows that LBW is consistently closely associated with neonatal mortality, with LBW infants having a risk of death approximately 7–12 times higher than infants with normal birth weight. Nationally, the prevalence of LBW is estimated at approximately 6–10% of all live births, with variations between provinces and some regions reporting LBW as the leading cause of local neonatal mortality (Sampurna, Handayani, Utomo, Angelika, Etika, Harianto, & Permana, 2023).

Parents of low birth weight (LBW) and premature infants often experience anxiety, stress, and uncertainty about their ability to care for vulnerable infants. Therefore, health education is an essential part of midwifery care to improve parental knowledge, preparedness, and confidence. A family-centered care approach and active family involvement in care in the ward and at home have been shown to reduce parental anxiety, increase feelings of competence, and improve infant clinical outcomes, including increased weight gain, successful breastfeeding, and improved home care. Families are encouraged to participate in nutritional support, monitoring for danger signs, kangaroo care practices, and early stimulation according to the infant's abilities and condition (Hurt, Odd, Mann, Beetham, Dorgeat, Isaac, & Wood, 2023).

RESEARCH METHOD

This study employed a quantitative design with a quasi-experimental method and a nonequivalent control group design. The subjects were all LBW infants registered at the Jayusniar Child Health Center (PMB) using a total sampling technique, resulting in a sample size of 10 LBW infants. The sample was divided into two groups: an experimental group that received baby massage intervention and a control group that received no intervention.

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The research design was conducted with pre- and post-intervention measurements in both groups. The experimental group (K1) was given a pretest (O1), then given an intervention in the form of baby massage, and then a posttest (O2). In the control group (K2) a pretest (O3) was given, no baby massage intervention was given, then a posttest (O4)

was given. The data obtained were analyzed using a nonparametric paired group comparative statistical test, namely the Wilcoxon Signed Rank Test to determine the effect of baby massage education on the stimulation of growth and development of LBW babies. This analysis was used because the sample size was small and the data were ordinal scaled.

RESEARCH RESULTS

Table 1. Characteristics of Respondent (N=28)

Variables	Control Group (n=14)	Experimental Group (n=14)	P-Value
Gender (n/%)			
Male	6/43.0	5/35.7	
Female	8/57.0	9/64.3	
Number of Childred (n/%)			
1	3/21.4	5/35.7	
2	7/50.0	8/57.1	
3	4/28.0	1/7.1	
Childbirth (n/%)			
Cesarean	8/57.0	11/78.6	
Normal	6/43.0	3/21.4	
Stimulation of Low-Birth-Weight Infant Growth and Development (n/%)			
Optimal	7/50.0	12/85.7	
Insufficient	7/50.0	2/14.3	
Effect of Baby Massage on Baby Weight Gain (n/%)			0.021
Optimal	7/50.0	12/85.7	
Insufficient	7/50.0	2/14.3	

The majority of babies were female, 8 babies (57.1%), with the highest birth order being the second child, 7 babies (50.0%). Most respondents were also born by cesarean section, 8 babies (57.1%). After the intervention, in the control group, 7 babies (50.0%) experienced an increase in optimal growth and development stimulation, while in the experimental group, who were given baby massage, there was a higher optimal increase, 12 babies (85.7%), and only 2 babies (14.3%) experienced a less optimal increase. These results indicate that providing baby massage provides a more optimal increase in infant growth and development stimulation. Based on the Mann-Whitney test, a p-value of $0.021 < 0.05$ was obtained, indicating a difference in the growth and development of LBW babies between the experimental group that received baby massage and the group that did not receive baby massage. Because there was a significant difference, it can be said that baby massage has an effect on the growth and development of LBW babies.

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DISCUSSION

The results showed that in the control group of LBW infants, 7 (50.0%) experienced optimal growth and development, while the other 7 (50.0%) experienced less than optimal growth. In the experimental group given baby massage intervention, optimal growth occurred in 12 infants (85.7%), and only 2 infants (14.3%) experienced less than optimal growth. These findings indicate that baby massage has a positive impact on stimulating the growth and development of LBW infants. The greater improvement in the experimental group indicates that stimulation through touch plays an important role in supporting the growth of high-risk infants.

Infant massage is a form of comfortable tactile stimulation that serves as a means of nonverbal communication between mother and baby, helping the baby feel safe and protected. Gentle, regular touch through massage strengthens emotional closeness and bonding behavior between mother and baby, thereby improving the quality of their interaction (Nikmah & Yanuaringsih, 2020). Various studies have shown that infant massage can strengthen the mother-infant bond, increase the mother's sensitivity to the baby's signals, and support the baby's emotional and physiological regulation, for example by reducing stress and improving sleep patterns. The emotional closeness formed through this loving touch is important for supporting the baby's social-emotional development and long-term health (Valori, Merkel, Furlan, Grossmann, & Fairhurst, 2025).

Infant massage physiologically stimulates the nervous system, particularly increasing vagus nerve activity, which plays a role in accelerating gastric emptying, increasing intestinal peristalsis, and stimulating the release of hormones and digestive enzymes such as gastrin and insulin, resulting in better nutrient absorption and optimal metabolism (Wintoro & Wahyuningsih, 2022). Tactile stimulation can increase a baby's immune system and improve digestive function, making it easier for babies to gain weight. This is especially important for low-birth-weight babies, who have limited energy reserves and require stimulation support to accelerate growth (Lestari, Nurbadlina, Wagijo, & Jauhar, 2021).

Statistical analysis using the Mann-Whitney test showed a p-value of 0.021 ($p < 0.05$), indicating a significant effect between baby massage and the

stimulation of the growth and development of low-birth-weight infants. The difference between the experimental and control groups indicates that the baby massage intervention was able to improve infant development more optimally than without intervention. These findings reinforce the fact that touch stimulation is an effective non-pharmacological intervention in midwifery care for high-risk infants.

The results of this study are in line with other research conducted which showed an increase in the sucking reflex in LBW infants after tactile stimulation was also seen in oral motor stimulation interventions, where stimulation of the lips, jaw, tongue, and oral cavity was shown to significantly improve sucking and swallowing abilities in low birth weight infants. Before the intervention, most infants showed a weak or immature sucking reflex, but after regular therapy for several days, the majority of infants appeared to be able to suck strongly and more coordinated. This reflex improvement reflects the maturation of the nervous system and better oral motor coordination in response to targeted stimulation in the mouth and surrounding areas. This supports the results of research that baby massage can improve the overall developmental function of infants (Tirtawati, 2024).

Meta-analyses and systematic reviews show that regular infant massage several times per week can improve sleep quality and support weight gain in infants aged 0-12 months (Fauzia, Budihastuti, & Adriani, 2022). Massaged infants are more relaxed, sleep more soundly, and wake up less frequently, thus optimizing cell recovery and growth. Furthermore, a other study reported that infant massage also plays a role in improving immune function and nutritional status, including through increased weight gain, improved nutritional status, and reduced stress hormone levels. This reinforces the idea that baby massage affects not only physical growth but also the neurological development of infants (Sutarmi, Sianturi, Warijan, & Indrayana, 2025).

Improved infant growth and development after massage is associated with increased levels of digestive enzymes and insulin, which optimize nutrient absorption and support weight gain and nutritional status. Rhythmic skin contact stimulates the vagus nerve and parasympathetic nervous system, thereby stimulating the secretion of digestive

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hormones (such as gastrin) and facilitating gastric and intestinal motility, ultimately increasing metabolism and energy availability for growth (Yulisetiyaningsih & Isro'aini, 2024). Furthermore, kinesthetic and sensory tactile stimulation through massage has been shown to improve motor development, muscle tone, and motor behavior in low-birth-weight infants, improving motor coordination and physical activity (Sadiman, Islamiyati, Aprilyadi, & Wibowo, 2025).

CONCLUSION

Providing baby massage significantly increased the stimulation of growth and development of LBW infants at PMB Jayusnihar Medan in 2026, with a statistical test result of $p = 0.021$ ($p < 0.05$). The majority of respondents were female, second children, and born by cesarean section. After the intervention, the group of infants who received baby massage showed more optimal growth and development compared to the group without intervention. This confirms that baby massage is an effective form of early stimulation in supporting the growth and development of LBW infants.

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