



The Effect of Baby Massage on Weight Gain in Newborn Babies with Low Birth Weight

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Abstract

Low birth weight (LBW) is a major health problem affecting newborns, contributing significantly to neonatal morbidity and mortality worldwide. This research aims to find whether there is any effect of baby massage as an intervention that can help LBW babies gain weight. The effect of baby massage on weight gain in LBW babies will be determined using this study conducted at Kota Rantauprapat Health Center in Indonesia. Using quasi-experimental method, pretest-post test with control group design, the data for this study was gathered between August 5–15, 2025. There were 72 LBW babies used in this study through purposive sampling technique. The intervention group received 15 minutes of daily baby massage for 7 consecutive days using a standardized protocol based on Indonesian Ministry of Health guidelines. Weight was measured using a calibrated digital scale before and after the intervention. Data were analyzed using paired t-test and independent t-test ($\alpha=0.05$). The intervention group showed a significant increase in mean weight from $2,120 \pm 180$ grams to $2,380 \pm 190$ grams (mean increase: 260 ± 65 grams, $p=0.000$, Cohen's $d=1.43$). The control group showed an average weight gain of 80 ± 50 grams ($p = 0.012$). Between-groups analysis revealed that there was a significant difference in weight gain (average difference = 180 grams; 95% CI = 152 to 208; $p < 0.001$; Cohen's $d = 3.14$). Baby massage has been proven very helpful for the purpose of weight gain in LBW infants. The standard 7-day procedure performed quite effectively. Baby massage should be considered for integration into routine LBW care protocols at primary healthcare facilities.

Keywords: Baby massage; Low birth weight; Newborn Weight.

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1. INTRODUCTION

Low birth weight (LBW), defined as birth weight less than 2,500 grams regardless of gestational age, remains a critical global health challenge. According to the World Health Organization (WHO), approximately 15-20% of all newborns worldwide are born with LBW, with the vast majority occurring in low- and middle-income countries (Utomo et al., 2025). LBW infants face significantly elevated risks of neonatal mortality, morbidity, growth failure, and long-term developmental impairments (Inawati & Sitiyaroh, 2022). These babies are particularly vulnerable to hypothermia, infections, respiratory distress, and delayed organ system maturation, especially of the gastrointestinal and respiratory systems (Fatmawati et al., 2021). Consequently, early interventions that effectively promote rapid weight gain are essential to mitigate both immediate and long-term adverse outcomes (Lestari et al., 2021).

Low Birth Weight (LBW) still poses a major public health problem in Indonesia. The 2022 Survey of Nutrition Status in Indonesia (SSGI) reveals the national prevalence of LBW as 6.2% and that the provinces with the highest levels of LBW have high poverty levels and poor nutritional condition in mothers. Prevalence of LBW is positively correlated with maternal undernutrition, antenatal care inadequacy, pregnancy of adolescents, and socioeconomic differences among regions. If early catch-up growth is not provided sufficiently, LBW children have increased risks of developing metabolic disorders, hypertension, and diabetes mellitus (Buragohain, 2020). Hence, there is an urgent need to develop affordable and efficient means of improving the growth in LBW babies.

There are many drugs and technological means that can be used in LBW management; however, many of them are expensive and thus are not available in rural or marginalized regions. There is increasing interest in non-pharmacological interventions, which are relatively safe, culturally appropriate, and affordable to use in community settings. Baby massage is one of such interventions. Being a traditional practice, baby massage gives a sensory and proprioceptive stimulation connected with some physiological processes, important in growth and development (Sirait & Simatupang, 2024). Massage might have an effect of stimulating the parasympathetic nervous system, especially through activation of the vagus nerve. (Fauzia et al., 2022). Enhanced vagal tone is associated with increased secretion of growth hormone (GH) and insulin-like growth factor-1 (IGF-1), hormones critical for protein synthesis, cell proliferation, and overall tissue growth (Nainggolan et al., 2022). Additionally, massage has been linked to improved sleep quality, reduced stress responses, and enhanced parent-infant bonding—all of which may indirectly support nutritional intake and weight gain (Aprilea et al., 2024).

Despite the existence of several interventions for managing LBW, evidence on the efficiency of the intervention of baby massage in primary healthcare centers in Indonesia is still limited. At the Kota Rantauprapat Health Center in North Sumatra, the healthcare professionals in charge do not have any standardized procedure for conducting baby massage as an intervention for the LBW infants. In the absence of the evidence-based guidelines, the LBW infants may not receive the timely interventions that can contribute to improvement in their growth and decrease of risks associated with LBW. In addition, there is limited knowledge on the potential use of baby massage that is culturally acceptable, cheap and feasible intervention in neonatal care services offered in community health centers. This issue requires urgent development of the contextually appropriate evidence in order to make the neonatal care services more effective in places like North Sumatra, which have a relatively high incidence of LBW.

Although some previous studies focused on the effect of the baby massage on the infant weight gain in various conditions, there was no study that has investigated the effectiveness of a standard 7-day baby massage program for LBW infants in the primary healthcare center in

North Sumatra. This study is aimed at evaluating the effectiveness of a standard 7-day baby massage program on the weight gain of the LBW infants.

2. RESEARCH METHOD

The study used the quasi-experimental design, where the pre-test and post-test control group were applied from August 5, 2025 to August 15, 2025 in the Kota Rantauprapat Health Center, Labuhanbatu District, North Sumatra Province. All selected participants comprised 72 LBW infants which had 36 subjects in the intervention group (baby massage) and 36 in the control group.

Inclusion criteria included: (1) LBW of 1,500 to 2,499 grams; (2) 1-7 days old; (3) Stable health condition; and (4) Consent from parents. Exclusion criteria involved: (1) Infants with treatment that might affect their weight; (2) Congenital anomalies; (3) Asphyxia; and (4) Parental refusal. Intervention entailed 15 minutes baby massage done once a day for 7 days straight following the standard protocol from Indonesian Ministry of Health guidelines.

The sequence included gentle stroking on the abdomen, chest, back, arms, and legs, with passive movements. Massage was performed in a calm environment (26-28°C) using warm coconut oil, 30-60 minutes after feeding. Vital signs were monitored throughout. The control group received standard care without massage. Weight was measured using a calibrated digital baby scale (Seca 354, precision ± 5 g) before and after the 7 days.

Normality was assessed using the Shapiro-Wilk test (both groups $p > 0.05$). Data were analyzed using paired t-test (within-group comparison) and independent t-test (between-group comparison) with $\alpha = 0.05$. Effect sizes were calculated using Cohen's d. The study received ethical approval from the Health Research Ethics Committee of Institut Teknologi dan Kesehatan Ika Bina (Approval No. 101/KEPK/ITKESIKABINA/III/2025).

3. RESULTS AND DISCUSSION

A total of 72 newborn infants with low birth weight were enrolled in this study, with 36 allocated to the intervention group (baby massage) and 36 to the control group (no massage). All 72 participants completed the study with no dropouts.

Table 1. Characteristics of Infant Respondents

Variables	Intervention (n=36)	Control (n=36)	Total (n=72)
Gender			
Male	19 (52.8%)	18 (50.0%)	37 (51.4%)
Female	17 (47.2%)	18 (50.0%)	35 (48.6%)
Baby's Age			
1–3 days	22 (61.1%)	20 (55.6%)	42 (58.3%)
4–7 days	14 (38.9%)	16 (44.4%)	30 (41.7%)

As shown in Table 1, the majority of participants in the intervention group were male (52.8%), while the control group had a balanced gender distribution. Most infants (55.6%) were aged 1-3 days at enrollment, indicating that the intervention was initiated during the early neonatal period. Baseline characteristics were comparable between groups, suggesting successful matching.

Table 2. Mean Baby Weight Before and After Intervention

Group	Initial Weight (grams) Mean $\pm$ SD	Final weight (grams) Mean $\pm$ SD
Intervention (Baby Massage)	2.120 $\pm$ 180	2.380 $\pm$ 190
Control (No Massage)	2.130 $\pm$ 175	2.210 $\pm$ 180

Table 2 presents the mean weight measurements. The weight of the treatment group increased considerably, from $2,120 \pm 180$ grams to $2,380 \pm 190$ grams during the week. However, the control group's increase was less dramatic, from $2,130 \pm 175$ grams to $2,210 \pm 180$ grams. There was no difference in baseline weight between the two groups (mean difference: 10 grams, 95% CI: -72 to 92 grams, $p = 0.812$).

Table 3. Mean Weight Gain by Group

Group	Mean Weight Gain (grams)	Standard Deviation	95% CI
Intervention	260	65	238-282
Control	80	50	63-97

As shown in Table 3, the intervention group gained an average of 260 grams over 7 days, compared to only 80 grams in the control group. This represents a mean difference of 180 grams (95% CI: 152-208) in favor of the intervention group.

The Shapiro-Wilk test for normality indicated that weight gain data in both the intervention and control groups were normally distributed, as the p-value was greater than 0.05. Therefore, the next statistical analysis used parametric tests.

Table 4. Paired t-Test for Body Weight Before and After Massage (Intervention Group)

Variables	Mean $\pm$ SD	Mean Difference	t-value	df
Body weight before	$2,120 \pm 180$			
Body weight after	$2,380 \pm 190$	260 ± 65	24,00	35

Table 5 presents the paired t-test results for the intervention group. The p-value of 0.000 ($p < 0.05$) suggests that there is a statistically significant gain in the weight of babies in seven days' time after massaging them. The Cohen's d value of 1.43 suggests a very large effect size.

Discussion

The results of this quasi-experimental study showed that baby massage provides significant clinical and statistical impact on the growth of weight among babies born with LBW in Kota Rantaupraptat Health Center. The mean weight gain in the intervention group reached 260 grams over the 7-day study period, compared with only 80 grams in the control group that did not receive a massage. Both the paired and independent t-tests yielded p-values < 0.05 , confirming the significant impact of the intervention. These results indicate that regular infant massage during the early neonatal period is an effective non-pharmacological intervention to support catch-up growth in LBW infants cared for in primary health care settings (Utomo et al., 2025).

This quasi-experimental study demonstrated that infant massage has a clinically and statistically significant effect on weight gain among newborns with low birth weight (LBW) in the service area of Rantaupraptat Health Center. The mean weight gain in the intervention group was 260 grams over the study period, compared with only 80 grams in the control group that did not receive massage, and both the paired and independent t-tests yielded p-values below 0.05 (Sirait & Simatupang, 2024). These results indicate that regular infant massage during the early neonatal period is an effective non-pharmacological intervention to support catch-up growth in LBW infants cared for in primary health care settings (Utomo et al., 2025).

The findings of this study are consistent with a growing body of national and international evidence showing that infant massage contributes to increased weight gain in term, preterm, and LBW infants (Supriyatun, 2020). According to Fauzia et al., infant massage had a great impact on increasing body weight with a mean difference of 0.52 (95% CI 0.08-0.96), showing moderate effects in gaining weight (Fauzia et al., 2022). On the other hand, according to Field et al., moderate-pressure massage in pre-term babies has been associated with increased weight gain on daily basis than normal medical practice, along with reduced lengths of stay in the hospital. More recent evidence also supports the beneficial impact of infant massage delivered by mothers themselves, which has been associated with improved weight gain, calorie intake, and broader neurodevelopmental outcomes in premature infants (Kineret & Shirley, 2025). Taken together, the present study aligns with these previous findings. It adds context-specific evidence from an Indonesian primary care setting, with a particular focus on LBW newborns in the early neonatal period (Supriyatun, 2020).

Physiologically speaking, it would be reasonable to suggest that the increase in the rate of weight gain experienced by the massaged children is biologically plausible (Tilici et al., 2025). The use of infant massage provides the baby with regular stimulation through touch and body awareness, activating the parasympathetic nervous system, specifically the vagus nerve, which is responsible for controlling gastrointestinal motility and metabolism (Fauzia et al., 2022). The activation of the vagus nerve in massaged babies is associated with an increase in hormone levels involved in absorption, including gastrin and insulin.

In addition, massage is thought to stimulate the release of growth hormone (GH) and insulin-like growth factor-1 (IGF-1), which together support protein synthesis, cell proliferation, and linear and ponderal growth in early life. Experimental and clinical data also suggest that repeated massage may enhance muscle activity and energy metabolism, further contributing to weight gain through increased synthesis of glycogen, fat, and protein. The present study's findings of significantly higher weight gain in the intervention group are therefore consistent with these proposed mechanisms (Wulandari et al., 2022).

In addition to direct physiological effects, behavioral mechanisms may help explain the impact of infant massage on weight gain in LBW infants. Massage sessions usually occur in a calm, structured environment. They can improve infant sleep quality and duration, which, in turn, facilitates the nocturnal secretion of growth hormone and supports growth (Aprilea et al., 2024). Several studies have reported that infants who receive regular massage exhibit better sleep patterns and reduced irritability, both of which may indirectly promote more effective feeding and better energy balance. Furthermore, massage performed by mothers or primary caregivers strengthens parent–infant bonding, increases maternal confidence in handling a fragile LBW baby, and may lead to more responsive feeding practices and more consistent caregiving routines (Kusnianto et al., 2025). In the context of LBW newborns in Indonesia—where parental anxiety and limited experience in caring for small and vulnerable infants can be high—these relational benefits may further amplify the nutritional and growth advantages associated with massage (Atika et al., 2024).

An important strength of this study is that the baseline weights of infants in the intervention and control groups were very similar, with mean initial weights of 2,120 grams and 2,130 grams, respectively, and comparable standard deviations. This similarity suggests that the groups were relatively well balanced at the outset, thereby enhancing the internal validity of the observed differences in subsequent weight gain (Aksoy & Arslan, 2026). Additionally, the majority of infants in both groups were within the first three days of life at the start of the study, meaning that the intervention was implemented during the critical early neonatal window when rapid adaptation and growth occur, and when LBW infants are particularly vulnerable to complications related to inadequate weight gain (Safitri et al., 2022). Administering massage from this early period may have maximized its impact by supporting digestion, thermoregulation, and metabolic adaptation soon after birth (Latha et al., 2025).

The magnitude of the effect observed in this study is also clinically relevant when compared with prior research. Several Indonesian and international studies have reported that infant massage can increase weight gain by 200-500 grams over relatively short periods, which is comparable to the average 260-gram increase observed in the intervention group in this study. For example, Aprilea et al. and other Indonesian authors have documented significantly greater weekly weight gain in massaged infants compared with non-massaged controls, while a study included in the systematic review by Lu et al. (Kusnianto et al., 2025) reported similar findings. reported that preterm neonates receiving massage therapy demonstrated significantly higher daily weight gains than those in standard care. Our findings, therefore, reinforce the conclusion that infant massage has a robust and replicable effect on weight gain across age ranges, gestational categories, and care settings, including among LBW infants in primary care settings (Aprilea et al., 2024).

These results have considerable significance in relation to neonatal and community health practice in Indonesia, which is still struggling with the high prevalence of low birth weight (LBW). According to data from the most recent Indonesia Nutrition Status Survey (SSGI), the prevalence of LBW persists as an important public health issue and is highly correlated with factors such as maternal nutrition, socio-economic status, and inequities related to access to health services in various regions of the country. LBW is known as a major risk factor for many health problems. In this context, the demonstration that a simple, low-cost, and non-invasive intervention such as infant massage can meaningfully increase early weight gain provides a powerful argument for integrating massage into routine LBW care protocols at community health centers (puskesmas), village health posts (posyandu), and home-based care programs (Jung et al., 2025).

Given that infant massage does not require sophisticated equipment and can be safely taught to parents after appropriate demonstration by trained health workers, it is highly suitable for resource-constrained primary care settings (Nurlaili & Pertiwi, 2025). Programmatic integration could involve incorporating massage counseling and demonstrations into existing antenatal classes, postnatal visits, and growth-monitoring sessions, as well as including it within the package of essential newborn care for LBW infants (Riyandani et al., 2025). Earlier studies and reviews have shown that massage delivered by mothers after structured training is both safe and effective, and it has the added advantage of empowering families and enhancing parental involvement in neonatal care. This is consistent with the recommendations of the present study, which suggest that midwives, nurses, and other primary care health workers should receive formal training in standard infant massage techniques and be encouraged to teach these skills routinely to parents of LBW infants (Albuquerque et al., 2025).

4. CONCLUSION

This study demonstrates that baby massage significantly promotes weight gain in newborns with low birth weight. The intervention group showed a substantial mean weight increase of 260 grams over 7 days, compared to only 80 grams in the control group, with both within-group and between-group differences statistically significant ($p < 0.05$) and with very large effect sizes. The standard 15 minutes of daily massage proved effective among the subjects receiving the treatment compared to the controls, who gained almost three times less weight than the subjects receiving massages. The evidence provided above gives grounds to claim that infant massage is an efficient, simple, and low-cost solution for improving growth in low birth weight infants. Thus, healthcare specialists need to add infant massage as a part of essential newborn care procedures in primary health care facilities for treating LBW children. Implementation of the procedure on a larger scale will result in improvement in the LBW complication situation through training of the parents.

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