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Original Research

The effect of baby massage on weight gain in infants aged 2-12 months

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Abstract
Infant growth and development is an important aspect of the early phase of life. One of the main indicators of healthy growth is weight gain. Infant massage is believed to promote infant growth by stimulating blood circulation and the digestive system. However, its effectiveness on weight gain is still a matter of debate. This study used a pre-experiment design with a pretest-posttest approach to evaluate the effect of infant massage on weight gain of infants aged 2-12 months. The sample amounted to 30 infants who were selected using purposive sampling technique. Data were collected through weight observation sheets before and after treatment. Data were analyzed using Fisher Exact test. The majority of infants (80%) received regular infant massage, while the other 20% received irregular infant massage. A total of 73.3% of infants experienced weight gain, while 26.7% did not experience weight gain. Fisher Exact test results showed a p-value = 0.480 (p > 0.05), indicating that there was no significant association between the frequency of infant massage and weight gain. This result indicates that infant massage, whether done regularly or not, does not significantly affect the increase in infant weight. The difference in the results of previous studies can be caused by factors such as frequency, massage technique, nutritional intake, and the health condition of the baby. Although no significant association was found, education on proper infant massage techniques still needs to be improved so that parents can apply it optimally as part of infant care.

1. Introduction

Infant growth and development represent critical processes during the early stages of life, as they determine both immediate health outcomes and long-term physical and cognitive potential. One of the primary indicators of optimal infant growth is adequate weight gain, which reflects the balance between nutritional intake, metabolic processes, and overall health status. According to the World Health Organization, healthy infants typically gain approximately 150–200 grams per week during the first 2–6 months of life and around 100–150 grams per week between 6–12 months (WHO, 2020). Deviations from these patterns may indicate underlying nutritional or health problems.

Despite ongoing public health efforts, suboptimal infant growth remains a significant global and national concern. Data from the Indonesian Ministry of Health indicate that approximately 15% of infants in Indonesia experience malnutrition, which can adversely affect both physical and cognitive development (Kementerian Kesehatan RI, 2021). Furthermore, findings from the Riset Kesehatan Dasar (Riskesdas) 2018 report revealed that the national prevalence of underweight infants reached 19.6%, with 5.7% classified as severely undernourished and 13.9% moderately undernourished. This

prevalence has shown an increasing trend compared to previous years, highlighting the persistent challenges in achieving optimal infant nutrition and growth (Riskesdas, 2018).

The consequences of poor weight gain in infancy are substantial and long-lasting. According to UNICEF, malnutrition during early life is associated with impaired cognitive development, weakened immune function, and increased susceptibility to infectious diseases, which may persist into adulthood (UNICEF, 2021). Chronic undernutrition can also lead to stunting, reduced intellectual capacity, and decreased productivity later in life, thereby contributing to broader public health and socioeconomic burdens (Black et al., 2016; Victora et al., 2021).

Infant growth is influenced by a complex interplay of factors, including nutritional intake, health status, environmental conditions, and caregiver–infant interactions. While adequate nutrition, particularly exclusive breastfeeding, remains the cornerstone of optimal growth, non-nutritional interventions that promote physiological stability and psychosocial well-being are also increasingly recognized. One such intervention is infant massage, which has been widely practiced across different cultures and is believed to provide both physiological and emotional benefits (Underdown et al., 2016).

Infant massage is not merely a relaxation technique but is also associated with several physiological mechanisms that may support growth and development. Stimulation through massage is known to enhance blood circulation, improve gastrointestinal function, and increase vagal nerve activity, thereby facilitating more efficient digestion and nutrient absorption (Field, 2019). In addition, tactile stimulation has been shown to increase oxytocin levels while reducing cortisol levels, creating a more favorable hormonal environment that supports growth and emotional regulation (Badr et al., 2015; Underdown et al., 2016). These effects may indirectly contribute to improved feeding behavior, sleep quality, and overall infant well-being.

Several studies have reported positive effects of infant massage on weight gain, particularly among preterm or low-birth-weight infants, who are more physiologically vulnerable and responsive to external stimulation (Álvarez et al., 2017; Bennett et al., 2016). However, evidence among full-term infants remains inconsistent, with some studies reporting minimal or no significant effect on anthropometric outcomes. These inconsistencies may be attributed to variations in study design, intervention protocols, sample characteristics, and contextual factors such as nutritional intake and caregiving practices.

In addition to physiological considerations, the effectiveness of infant massage is also influenced by caregiver knowledge and skill. In Indonesia, awareness and practice of proper infant massage techniques remain limited. Data from the Badan Pusat Statistik indicate that only a minority of parents are familiar with appropriate infant massage practices (BPS, 2022). Lack of knowledge, limited access to training, and concerns about safety may hinder parents from adopting this intervention. Moreover, inconsistent or incorrect application of massage techniques may reduce its potential benefits.

It is important to emphasize that infant massage should not be considered a substitute for adequate nutrition and proper healthcare. Optimal growth can only be achieved through a comprehensive approach that integrates nutritional, medical, and psychosocial interventions. Therefore, understanding the actual contribution of infant massage to growth outcomes, particularly weight gain, remains essential.

Given the inconsistent evidence and contextual factors influencing infant growth, this study aims to evaluate the effect of baby massage on weight gain in infants aged 2–12 months in the working area of the Upau Public Health Center. The findings of this study are expected to contribute to the existing body of knowledge and provide practical implications for midwifery care, particularly in promoting evidence-based, family-centered interventions to support infant growth and development.

2. Research Method

This study employed a pre-experimental design using a one-group pretest–posttest approach to evaluate the effect of baby massage on weight gain in infants aged 2–12 months. This design was selected to assess changes in infant weight before and after the intervention within the same group of participants, although it does not involve a control group for comparison.

The study was conducted at the Upau Public Health Center. The study population consisted of infants aged 2–12 months who visited the health center during the study period. A total of 30 infants were included in the study, with the sample size determined based on the availability of eligible participants. The sampling technique used was purposive sampling, whereby participants were

selected according to specific inclusion criteria, including infants aged 2–12 months, being in stable health condition, and having parental consent to participate in the study. Infants with severe illnesses or medical conditions that could affect growth were excluded in order to minimize potential confounding factors.

The variables in this study consisted of the frequency of baby massage as the independent variable and infant weight gain as the dependent variable. Data were collected using two main instruments. First, an observation sheet was used to record infant weight before and after the intervention. Weight measurements were carried out using a calibrated digital scale to ensure accuracy and consistency, with results recorded in grams. Second, a baby massage implementation guide was provided to caregivers to standardize the intervention procedure. The guide included basic massage techniques such as gentle stroking, rhythmic touch stimulation, and relaxation movements, which were applied consistently to ensure safety and uniformity during the intervention.

Data collection was conducted in three stages. In the pretest phase, infant weight was measured prior to the intervention. This was followed by the intervention phase, during which caregivers performed baby massage according to the standardized guidelines within a specified period. In the posttest phase, infant weight was measured again after the intervention to assess any changes.

The collected data were analyzed using statistical software such as SPSS. Descriptive statistics were used to summarize participant characteristics and weight changes. A normality test was conducted to determine the distribution of the data, and Fisher's Exact test was applied to examine the relationship between the frequency of baby massage and infant weight gain. Statistical significance was determined at a p-value of less than 0.05.

Variable		n	Frequency (%)
Education			
	Uneducated	0	
	Elementary school	3	10.0
	Junior High School	1	3.3
	Senior High School	17	56.7
	College	9	30.0
Delivery method			
	Normal	20	66.6
	Sectio Cesária	10	33.3
Baby massage frequency			
	Irregular	6	20
	Regular	24	80
Weight gain			
	No	8	26.7
	Yes	22	73.3
Total		**30**	**100**

3. Results and Discussion

Tabel 1 Analisis Univariat

The majority of mothers in this study had attained a high school level of education (56.7%), followed by those with a college education (30.0%). A smaller proportion had only elementary (10.0%) or junior high school education (3.3%), and none were categorized as having no formal education. This distribution indicates that most participants had at least a basic level of education, which may influence their understanding and implementation of infant care practices, including baby massage.

Regarding delivery characteristics, most mothers delivered vaginally (66.6%), while the remaining 33.3% underwent cesarean section. Mode of delivery may have indirect implications for early infant care practices and maternal involvement, although it was not directly analyzed in relation to the study outcomes.

In terms of the intervention, the majority of infants (80%) received baby massage regularly, while 20% received it irregularly. This suggests a relatively high level of adherence to the intervention

among participants. With respect to outcomes, 73.3% of infants experienced weight gain during the study period, whereas 26.7% did not show an increase in weight.

Overall, these findings indicate that although most infants experienced weight gain, this improvement occurred across both groups (regular and irregular massage), which may partly explain the absence of a statistically significant association between massage frequency and weight gain. This pattern suggests that other factors beyond massage frequency, such as nutritional intake and general health status, may have played a more dominant role in influencing infant weight outcomes

Tabel 2

Var	n	mean	Sd	CI 95%	
Age (month)	30	5.36	2.43	4.46	6.27
Born weight	30	3003.33	450.65	2835.05	3171.61

The mean age of infants included in this study was 5.36 months (SD = 2.43), with a 95% confidence interval (CI) ranging from 4.46 to 6.27 months. This indicates that the study population predominantly consisted of infants in the early infancy period, which represents a critical phase of rapid growth and development.

In terms of birth characteristics, the mean birth weight was 3003.33 grams (SD = 450.65), with a 95% CI of 2835.05 to 3171.61 grams. These values fall within the normal range for birth weight, suggesting that the majority of infants in this study were born under healthy conditions and did not belong to high-risk groups such as low birth weight infants.

The relatively moderate standard deviations and narrow confidence intervals for both age and birth weight indicate a fairly homogeneous sample. This homogeneity may reduce variability in baseline characteristics; however, it may also limit the ability to detect significant differences in outcomes, particularly in response to interventions such as infant massage. Furthermore, as the sample largely represents healthy, full-term infants with normal birth weight, the potential impact of massage on weight gain may be less pronounced compared to populations with greater physiological vulnerability.

Tabel 3

Var 1	**N**	**P value**	**Var 2**
Baby massage frequency	30	0.480	Weight gain
		Fisher exact	

**significant*

The analysis of the relationship between baby massage frequency and infant weight gain in this study was conducted using Fisher's Exact test with a total sample of 30 infants. The statistical results showed a p-value of 0.480, which exceeds the predetermined significance level of 0.05 ($p > 0.05$). These findings indicate that there is no statistically significant association between the frequency of baby massage and weight gain among infants aged 2–12 months. In other words, the data suggest that whether baby massage is performed regularly or irregularly does not result in a meaningful difference in influencing infant weight gain within the context of this study.

Despite the absence of a significant relationship, the potential benefits of infant massage should not be overlooked. Previous studies have demonstrated that infant massage may contribute to improved growth and development through several physiological mechanisms. For instance, massage stimulation is known to activate the parasympathetic nervous system, particularly by enhancing vagal tone, which in turn increases gastrointestinal motility and promotes more efficient digestion and nutrient absorption (Field, 2019). Furthermore, tactile stimulation through massage has been reported to increase oxytocin levels while reducing cortisol, the primary stress hormone, thereby creating a more favorable physiological and emotional environment that supports infant growth and well-being (Underdown et al., 2016).

However, inconsistencies in research findings regarding the effect of infant massage on weight gain are common and may be explained by several influencing factors. Variations in the frequency, duration, and technique of massage play a critical role in determining its effectiveness. Studies suggest that massage interventions yield optimal results when performed in a structured and

consistent manner, typically for 10–15 minutes per session and several times per week. Inadequate standardization of these parameters may lead to reduced intervention efficacy. Additionally, infant-related factors such as baseline health status, gestational age, and birth weight may influence responsiveness to massage stimulation, with stronger effects often observed in preterm or low-birth-weight infants.

Moreover, nutritional intake and feeding patterns are key determinants of infant weight gain and may overshadow the effects of non-nutritional interventions such as massage. Adequate breastfeeding practices, dietary intake, and overall health status are critical contributors to optimal growth, and failure to control these variables may confound study results. Environmental and caregiving factors, including parental knowledge, consistency in caregiving practices, and emotional bonding, may also indirectly influence infant growth outcomes.

Therefore, the lack of a significant relationship observed in this study may reflect the multifactorial nature of infant growth rather than the ineffectiveness of infant massage itself. As highlighted by Diego et al. (2014), variations in intervention protocols, infant conditions, and contextual factors can lead to differing outcomes across studies. These findings underscore the importance of considering multiple interacting variables when evaluating the impact of infant massage on growth indicators such as weight gain.

DISCUSSION

The findings of this study indicate that there is no statistically significant relationship between the frequency of infant massage and weight gain ($p = 0.480$; $p > 0.05$). This suggests that, within the context of this study, infant massage—whether performed regularly or irregularly—has not been proven to significantly influence weight gain in infants aged 2–12 months. These results highlight the complexity of factors influencing infant growth, suggesting that a single intervention such as massage may not be sufficient to produce measurable changes in anthropometric outcomes.

From a physiological perspective, infant massage is believed to stimulate the parasympathetic nervous system, particularly through increased vagal activity, which plays a role in enhancing gastrointestinal motility and improving the secretion of digestive hormones. This mechanism theoretically contributes to improved nutrient absorption and metabolic efficiency (Field, 2019). Additionally, tactile stimulation during massage has been shown to increase oxytocin levels and reduce cortisol levels, thereby creating a more stable physiological and emotional environment conducive to growth (Underdown et al., 2016). These mechanisms support the hypothesis that infant massage could positively influence growth outcomes.

However, empirical evidence regarding the effect of infant massage on weight gain in full-term infants remains inconsistent. Systematic reviews and meta-analyses suggest that the benefits of massage on weight gain are more pronounced in preterm or low-birth-weight infants, who are physiologically more vulnerable and responsive to external stimulation (Álvarez et al., 2017; Badr et al., 2015). In contrast, infants with normal birth weight, such as those in this study (mean birth weight 3003 grams), may already have optimal physiological regulation, thereby reducing the observable impact of additional interventions such as massage. This may explain why no significant association was found in this study.

Another important factor influencing infant weight gain is nutritional adequacy, particularly breastfeeding practices. According to the World Health Organization, optimal growth in infants, especially within the first six months of life, is highly dependent on exclusive breastfeeding and adequate nutritional intake (WHO, 2020). Previous studies have demonstrated that feeding patterns, frequency of breastfeeding, and maternal nutritional status have a stronger and more direct impact on infant weight gain than non-nutritional interventions (Victora et al., 2016; Rollins et al., 2016). Therefore, when infants already receive adequate nutrition, the incremental effect of massage on weight gain may become negligible.

Furthermore, methodological and technical factors related to the intervention itself may also contribute to the findings. The effectiveness of infant massage is influenced by factors such as frequency, duration, consistency, and technique standardization. Research suggests that optimal results are achieved when massage is performed regularly (at least 3–5 times per week) for a minimum duration of 10–15 minutes per session using standardized procedures (Álvarez et al., 2017; Diego et al., 2014). Variability in caregiver adherence, differences in technique, and lack of supervision during implementation may reduce the overall effectiveness of the intervention and contribute to non-significant findings.

In addition, environmental and psychosocial factors, including maternal-infant bonding, parental knowledge, and caregiving practices, may indirectly influence growth outcomes. Although this study did not demonstrate a significant effect on weight gain, previous research indicates that infant massage provides several important non-anthropometric benefits, such as improving sleep quality, enhancing mother–infant interaction, and reducing maternal stress (Onozawa et al., 2019; Bennett et al., 2016). These psychosocial benefits are highly relevant within the framework of women-centered midwifery care, as they contribute to overall infant well-being and development beyond physical growth parameters.

The findings of this study should also be interpreted in light of several limitations. The use of a pre-experimental design without a control group limits the ability to establish causal relationships. The relatively small sample size (n = 30) may reduce statistical power, and the use of purposive sampling may limit generalizability. Additionally, this study did not control for important confounding variables such as nutritional intake, breastfeeding patterns, or frequency and duration of massage, which may influence the outcomes.

Therefore, the absence of a statistically significant association in this study does not negate the potential benefits of infant massage. Instead, it suggests that the effect of infant massage on weight gain is context-dependent and influenced by multiple interacting factors, particularly nutritional status, infant health condition, and the quality of intervention implementation. Future studies are recommended to use more rigorous designs, such as randomized controlled trials, with larger sample sizes and better control of confounding variables to further clarify the role of infant massage in promoting infant growth.

4. Conclusion

This study found no statistically significant relationship between the frequency of baby massage and weight gain in infants aged 2–12 months. These findings suggest that infant massage alone may not be a determining factor in influencing weight gain, particularly in infants with normal birth weight and adequate nutritional intake.

However, infant growth is a multifactorial process influenced by various determinants, including nutritional adequacy, feeding patterns, overall health status, and caregiving practices. Therefore, the absence of a significant association in this study does not diminish the potential benefits of infant massage, especially in terms of psychosocial outcomes such as improved parent–infant bonding, sleep quality, and maternal well-being.

From a practical perspective, strengthening education and outreach regarding proper infant massage techniques remains essential. Providing clear, evidence-based information and structured training for both parents and healthcare professionals can enhance the safe and effective implementation of infant massage as part of comprehensive infant care.

Future research is recommended to employ more rigorous study designs, larger sample sizes, and better control of confounding variables, particularly nutritional factors and intervention standardization, in order to further clarify the role of infant massage in supporting infant growth and development..

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