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Toddler Massage as a Supplementary Intervention in Overcoming Stunting in Children: Research from Stunting Locus Area in Gorontalo City

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Abstract

Stunting, defined as impaired linear growth resulting in a child's height falling below the age-appropriate standard, remains a pressing global health concern due to its long-term implications on development and increased risk of mortality. In Gorontalo Province, Indonesia, the prevalence of stunting exceeds the national target of 23.8%, with North Gorontalo Regency reporting the highest rate at 29.3%. This study aimed to examine the effect of toddler massage on weight gain among stunted children. A quasi-experimental design with a pretest-posttest control group approach was employed, involving 32 stunted toddlers selected through purposive sampling. Participants were equally allocated into an intervention group (n=16), which received toddler massage based on standard operating procedures, and a control group (n=16), which did not receive the intervention. Body weight was measured using digital scales. The results of the paired t-test revealed a statistically significant weight gain in the intervention group ($p = 0.00$), whereas no significant difference was observed in the control group ($p = 0.164$). The findings indicate that toddler massage may contribute to weight improvement in stunted children and could be considered a supportive non-pharmacological intervention in stunting management programs.

Keywords: Stunting; Toddler Massage; Weight Gain; Child Growth.

INTRODUCTION

Stunting is a condition characterized by a child's height or body length being significantly below the standard, which indicates chronic malnutrition over an extended period (Beal et al., 2018). Stunting is not merely a physical growth disorder, it also increases toddlers' susceptibility to disease and poses a serious threat to the human resources quality (Dewey & Begum, 2011). It impacts not only physical development but also brain development and cognitive intelligence (Soliman et al., 2021). Thus, stunting has far-reaching effects not only on individual health but also on national economic growth and equity.

According to the World Health Organization (WHO), the global prevalence of stunting in children under five in 2024 was 22%, or approximately 149.2 million children (Wold Health Organization, 2024). In Indonesia, data from the Indonesian Nutrition Status Survey (SSGI) 2024 indicated a stunting prevalence of 24.4%, equivalent to 5.33 million cases (Kementerian Kesehatan, 2024) In Gorontalo Province, the rate was still above the target at 23.8%, with North Gorontalo Regency exceeding that at 29.3% (Kementerian Kesehatan, 2024). As of preliminary data from the Tolangohula Health Center recorded 111 stunted toddlers, representing 14.6% of children in the area (Puskesmas Tolangohula, 2024).

Stunting is affected by multiple factors, including environmental conditions such as poor hygiene practices (PHBS), socioeconomic status, and maternal health and nutrition before, during, and after pregnancy. Low birth weight and poor postnatal nutrition also contribute significantly (McGovern et al., 2017). Choi et al. identified key determinants in descending order of influence: family economic status, exclusive breastfeeding, family size, father's education level and occupation, maternal nutritional knowledge, food security, maternal education, carbohydrate and fat intake, complementary feeding practices, child illness history, sociocultural factors, protein intake, maternal employment, nutrition-conscious behavior, energy intake, and immunization completeness (Choi et al., 2016).

To address this issue, the Indonesian government has implemented several programs, including the distribution of iron supplements to adolescent girls, regular antenatal care, and the provision of nutritional supplements for pregnant women (Kementerian Kesehatan, 2023). Additional feeding programs for children aged 6–24 months emphasize animal protein sources such as eggs, fish, poultry, meat, and milk (Pham et al., 2021). The Ministry of Health also promotes specific interventions through community health centers and integrated service posts, as part of the "First 1,000 Days of Life" (HPK) movement. These programs support early breastfeeding initiation, exclusive breastfeeding for infants under six months, and appropriate complementary feeding practices until the age of 23 months (Aurelia, 2024).

To accelerate stunting reduction, integrated and responsive interventions are essential. One strategy that health professionals can employ to improve weight gain and reduce stunting is to provide education, information, and communication (EIC) about infant massage to mothers. Massage is recognized as an effective form of stimulation to promote growth and development in children (Lestari et al., 2021). It works by stimulating the soft tissues of the child's body through techniques such as rubbing, kneading, and pressing, which activate sensory receptors in the skin and promote both physical and emotional well-being (Erçelik & Yılmaz, 2023).

Previous studies support the effectiveness of infant massage in increasing weight among malnourished children. Muliastiti et al. reported a significant improvement in weight gain following massage intervention using paired t-test analysis ($p < 0.05$) (Sukamti et al., 2024). Similarly, Junita et al. found that the average infant weight increased from 4.86 kg before massage to 5.72 kg after intervention ($p = 0.000$) (Junita et al., 2022). While these publications emphasize of the benefits of the message, a literature from Priyadarshi et al. confirmed that there still a need to evaluate about these benefits for its short-and-long-term (Priyadarshi et al., 2022). Remain to provide support the findings, this study aimed to give intervention of baby message to the stunted children.

MATERIALS AND METHODS

Research Design

This study employed a quasi-experimental research design using a pre-test and post-test control group approach. The research was conducted over the course of one month, from December 2023 to January 2024, in the working area of Tolangohula Health Center. Each group consisted of 16 respondents, with the sample size determined using a power of 90% and a confidence interval of 95%. The sampling technique used was purposive sampling, in which participants were selected based on predefined inclusion and exclusion criteria.

In accordance with the ethical guidelines of the Helsinki Declaration, this study received ethical approval from the Research Ethics Committee of Gorontalo State University (Protocol No. 00902275712212420250106000007). Written informed consent was obtained from each participant's parent or guardian prior to participation.

Sampling Method

Out of 111 stunted toddlers identified in the Tolangohula Health Center service area, 32 toddlers aged between 12 and 24 months met the inclusion and exclusion criteria and were selected as respondents. These were equally divided into an intervention group ($n = 16$) and a control group ($n = 16$).

Intervention

The instruments used in this study included a massage observation sheet based on a standard operating procedure (SOP) and a digital weighing scale. Before the intervention, body weight measurements were taken in both the intervention and control groups. The intervention group received baby massage once per week for four weeks (total of one month), while the control group did not receive any massage intervention. After the four-week period, both groups underwent another body weight measurement.

Procedure

Researchers provided written informed consent to parents as approval for their toddlers to participate in the massage intervention. Second, initial weight measurements were taken in both the intervention and control groups. Following the four-week massage intervention in the experimental group, body weight was measured again using a digital weighing scale in both groups.

Data Processing and Analysis

Data were analyzed using two statistical tests: the paired t-test and the independent t-test. Both tests require the assumption of normal data distribution. Therefore, the Kolmogorov-Smirnov test was used to assess data normality. The hypothesis was evaluated using a significance level of $\alpha = 0.05$, with p-values < 0.05 indicating rejection of the null hypothesis. Results were presented in tabular form with a 95% confidence interval.

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondents Characteristics.

Characteristics	Intervention Group (n=16)		Control Group (n=16)	
	n	%	n	%
Age				
12 -24 months	13	81,25	12	75
> 24 months	3	18,75	4	25
Mother's Education				
Tall	0	0	0	0
Low	16	100	16	100
Paritas				
Primipara	1	6,25	2	12,5
Multipara	14	87,5	14	87,5
Largemultipara	1	6,25	0	0
IMD				
Yes	14	87,5	15	93,75
No	2	12,5	1	6,25
Exclusive Breast Milk				
Yes	12	75	15	93,75
No	4	25	1	6,25

Based on the table 1, the majority of children in both the intervention and control groups were aged 12–24 months, accounting for 81.25% and 75%, respectively. This indicates that most participants were in early toddlerhood, a critical period for growth and development. All mothers in both groups had a low level of education (100%), which may influence their health knowledge and caregiving practices, including child feeding. In terms of parity, most mothers were multiparous (87.5%) in both groups, suggesting they had prior childbirth experience. A high proportion of mothers practiced early initiation of breastfeeding (EIBF), with 87.5% in the intervention group and 93.75% in the control group, reflecting favorable breastfeeding practices from birth. Additionally, the proportion of exclusive breastfeeding was higher in the control group (93.75%) compared to the intervention group (75%).

Table 2. Distribution of Pre and Post Weight Frequencies in the Intervention Group and Control Group.

Weight	n	Pretest		Posttest	
		Mean	Min-Max	Mean	Min-Max
Intervention	16	10,40	8-12,2	10,85	8,5-13
Control	16	10,12	7,2-14	10,15	7,2-14

The result shows the comparison of mean body weight in the intervention and control groups before and after the intervention. In the intervention group, the mean weight increased from 10.40 kg (range: 8–12.2 kg) at pretest to 10.85 kg (range: 8.5–13 kg) at posttest. In contrast, the control group showed only a slight increase in mean weight from 10.12 kg (range: 7.2–14 kg) at pretest to 10.15 kg (range: 7.2–14 kg) at posttest. These findings suggest that the intervention may have had a positive effect on weight gain in children, while minimal change was observed in the control group (Table 2).

Table 3. Differences in Average Weight of Toddlers in the Intervention Group and Control Group

Weight	Pretest Mean (SD)	Posttest Mean (SD)	Mean Difference (CI 95%)	T test	ρ value
Intervention	10,40 (1,3466)	10,65 (1,4601)	0.25 kg (0,3684-0,1316)	4,502	0,00
Control	10,11 (1,761)	10,12 (1,7523)	0.011 kg (0,0307-0,0057)	1,464	0,164

The paired t-test analysis showed a statistically significant difference in mean weight before and after the intervention in the intervention group. The mean weight increased from 10.40 kg (SD = 1.35) to 10.65 kg (SD = 1.46), with a mean difference of 0.25 kg (95% CI: 0.3684–0.1316; $t = 4.502$; $p < 0.001$). In contrast, the control group showed a minimal and statistically non-significant increase in mean weight from 10.11 kg (SD = 1.76) to 10.12 kg (SD = 1.75), with a mean difference of 0.011 kg (95% CI: 0.0307–0.0057; $t = 1.464$; $p = 0.164$). These findings suggest that the intervention had a significant effect on weight gain compared to the control group.

Discussion

Infant massage is broadly recognized as a non-pharmacological method of stimulating an infant's body through gentle, rhythmic touch and a series of structured techniques. It typically involves the application of moderate pressure to specific parts or the entirety of the infant's body and is often integrated into caregiving routines. The benefits of infant massage have been explored in several studies, particularly in the context of improving digestion, enhancing physical development, and supporting overall well-being (Chen et al., 2024). Paymaneh et al. noted that baby massage might promote gastrointestinal motility and bowel function, which can indirectly influence nutritional status and physical growth (Taheri et al., 2018).

Although the underlying mechanisms are still under investigation, some evidence suggests that massage may stimulate the vagus nerve, leading to improved parasympathetic activity that affects digestion, nutrient absorption, and post massage sleep (Agarwal et al., 2000). Studies have even indicated that tactile stimulation could influence bone development (Choi et al., 2016). In clinical settings, massage has been associated with positive outcomes among infants and toddlers, particularly those facing nutritional challenges such as stunting. A randomize controlled trial by Lu et al. showed that infants who received massage experienced weight gains that, in some cases, exceeded the expected averages for their age groups (Lu et al., 2020).

While such findings are promising, it is important to interpret them in the broader context of child development. Weight gain is influenced by multiple variables, including genetic predisposition, feeding practices, health status, and environmental factors (Frosch et al., 2019; Putra et al., 2025). Thus, although massage may support weight gain by enhancing appetite, nutrient utilization, and emotional bonding, it is not a substitute for adequate nutrition, medical care, and responsive parenting. Rather, it should be seen as a complementary practice within a holistic framework of early childhood care.

The sensory and emotional benefits of massage are also noteworthy. Physical contact during massage-such as stroking, eye contact, and vocal interaction-can foster emotional bonding between caregiver or the mother and child, which is essential for psychological development (Jethava et al., 2022). This interaction may contribute to reduced infant stress levels, which, according to some theories, could help regulate hunger cues and feeding behavior (Gürol & Polat, 2012). Hormonal responses to massage, such as the release of endorphins and reduction in cortisol, may further enhance infants' comfort and potentially improve feeding outcomes.

On a physiological level, massage is thought to promote circulation, stimulate the endocrine system, and facilitate the release of growth-related hormones, including those produced by the pituitary gland (Field et al., 2005). However, the extent to which these effects are generalizable remains a topic for continued research.

Considering the current study's findings, the application of baby massage four times a month was associated with modest yet observable improvements in weight among toddlers in the intervention group. Although these results do not establish causality, they contribute to a growing body of literature suggesting that regular, structured massage may offer developmental advantages, particularly for children at risk of undernutrition. Further longitudinal studies with larger samples are recommended to explore the long-term benefits and establish clearer clinical guidelines.

CONCLUSIONS

The average weight of stunted toddlers in the respondents who received massage was 2500 grams while the average weight of stunted toddlers in the control group was 1100 grams so it can be concluded that there is a significant influence of toddler massage on weight gain for stunted toddlers with a p-value of 0.000 <0.05.

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