



The Effectiveness of Baby Massage in Stunting Prevention: Study Based on Body Length Gain in Infants aged 0–3 Months

Taqwin Taqwin^{1*}, Linda Linda¹, Sri Yanti Kusika¹, Kadar Ramadhan¹, Siti Radhiah², Bohari Bohari³

¹Department of Midwifery, Poltekkes Kemenkes Palu, City of Palu, Indonesia; ²Department of Public Health, Universitas Tadulako, City of Palu, Indonesia; ³Department of Nutrition, Universitas Sultan Ageng Tirtayasa, City of Serang, Indonesia

Abstract

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***Correspondence:** Taqwin Taqwin, Department of Midwifery, Poltekkes Kemenkes Palu, City of Palu, Indonesia. E-mail: taqwin.sahe78@gmail.com
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BACKGROUND: Baby massage is a gentle massage for infants aged 0–3 months that is believed to improve the baby's body length.

AIM: The purpose of this study was to determine the impact of baby massage on the increase in body length of infants aged 0–3 months.

METHODS: This type of research was quasi-experimental. The samples were mothers and infants 0–3 months, divided into the treatment and control groups. The number of samples was 70 respondents 35 for each group. Baby massage was carried out by the mother twice a day, in the morning and evening after bathing for 30 days. The enumerators collected data on length before and after 1 month in both groups and statistically tested by unpaired t-test. This research has Ethical Proof approval from the Ethics Commission for Poltekkes Kemenkes Palu number LB.02.01.1/KE/027/VII/2021.

RESULTS: There was a difference in the mean Z-Score HAZ between the treatment group (-0.548 ± 1.10) and the control group (-1.088 ± 1.03) after baby massage. The length of a baby's body is affected by baby massage ($p = 0.038$).

CONCLUSION: This indicates that baby massage can help children avoid becoming stunted. Every mother should be able to massage her baby to promote the baby's growth and attachment to the mother. Researchers recommend that pregnant mothers in their third trimester be trained in baby massage, and that babies be massaged as soon as possible to boost their body length gain to avoid stunting.

Introduction

The growth standards developed on the basis of this data and given in this study provide a technically sound instrument that best describes physiological growth in children under the age of five. The standards show typical early childhood development in ideal environmental settings and can be used to evaluate children of any ethnicity, socioeconomic level, or feeding method [1]. Environmental intestinal dysfunction's effect on limiting weight gain could have implications for linear growth [2]. In healthy children, there is no correlation between short-term weight gain and lower leg length gain [3]. A longer duration of exclusive breastfeeding has substantial impact on body mass index growth trajectories among children [4].

Indonesia is one of the countries with nutritional problems in the world. In Indonesia, health activities are presently focused on reducing and preventing stunting [5]. Stunting is induced by a variety of variables, with the most important intervention occurring within the first 1,000 days of life [6]. In 2018, the prevalence of stunting in Indonesia was 30.8%, 10.2% wasting, and 8% obese. Indonesia ranks 5th in

the prevalence of stunting globally, the countries with the highest prevalence are India, China, Nigeria, and Pakistan [7]. In Central Sulawesi, 14.5% of children under five are malnutrition, 25.2% are short, and 9% are underweight. In Donggala Regency, 20.1% of malnutrition toddlers and 13% underweight toddlers are the second-highest after Palu City, and 32.8% of short toddlers were the fourth-highest [8]. In 2021, the prevalence of stunting in Central Sulawesi was 29.7%. Meanwhile, the prevalence of stunting in Donggala Regency is the 4th highest (29.5%) of the districts/cities in Central Sulawesi [9]. In the working area of the Wani Health Center, there are 246 stunting toddlers spread in over ten villages. The highest stunting was found in Nupabomba, Wani I, and Wani Lumbupetigo villages. In children aged 10 years, the prevalence of stunting in Donggala Regency is 35.7% [10].

Many factors cause stunting. Beal *et al.*, (2018) research, suggest that the determinants of stunting in Indonesia are the first 6 months of babies not getting exclusive breastfeeding, low household socioeconomic status, premature babies, birth length less than normal, short baby mothers, and low education of the baby's mother [11]. Vaivada *et al.*, (2020) research, recommend that increasing parental education and knowledge

about stunting, use of family latrines according to health standards, improvement of sanitation infrastructure, delivery in health facilities, and health workers who assist in childbirth are factors that can increase child growth [12].

The government has tried to prevent and overcome triple-double nutrition in Indonesia. This effort involves various sectors, including the government, council members, social institutions, print media, professional organizations, and academics [7]. The role of academics is to provide additional knowledge and skills for pregnant women and mothers with babies 0–24 months to prevent and deal with nutritional problems together. One of the efforts made is baby massage. The finding of Gultom *et al.* (2019) on the effect of baby massage on the physical development of infants in rural Indonesia concluded that baby massage training for third-trimester pregnant women increased knowledge and skills about baby massage, thereby increasing significant physical development for infants [13].

Many benefits can be obtained through baby massage. Research by Farida *et al.* (2018) states that baby massage increases breastfeeding frequency, although it does not impact the length of time breastfeeding [14]. In addition, Harahap's research (2019) suggests that baby massage at the age of 0–6 months can increase body weight [15]. Research by Kulkarni *et al.* (2010) also suggest that the benefits of baby massage lead to better weight gain and neuromotor development [16]. The research of Taheri *et al.* (2018) stated that baby massage with sunflower oil increased the speed of weight gain and the length of stay of premature babies in the NICU [17]. Research by Chan *et al.* (2015) shows that massaged babies are directly proportional to the weight gain of premature babies due to increased vagus nerve stimulation and gastric movement [18].

Many research results show a significant relationship between baby massage and infant weight gain, both premature, and normal babies. However, research that looks at the effect of baby massage on a baby's body length is still lacking, even not many have been published. In addition, there is a lack of confidence and even a fear of parents doing baby massage. The purpose of the study was to analyze the effect of baby massage on infant length in the working area of the Wani Health Center, Donggala Regency.

Materials and Methods

This type of research was quasi-experimental. The research site was in the working area of the Wani Health Center, Donggala Regency, Central Sulawesi, from July to December 2021. The samples were mothers and their babies aged 0–3 months, divided into

treatment and control groups, 35 persons each. The treatment group was measured in length and weight and then given a baby massage intervention for 1 month and remeasured after. Control group infants were not massaged, but length and weight were measured before and after 1 month. Because the number of infants was limited, the purposive sampling technique was used in this study. Before the study began, pregnant women in the third trimester and health cadres were trained in baby massage for 3 days. After the baby was born, the mother carried a baby massage accompanied by a cadre. Massage is carried out by the baby's mother with previous supervision by a cadre. The cadre supervises the baby's mother every morning, 2 times a week. Baby massage was done twice a day, in the morning and evening after bathing, and is carried out for one month. Baby massage was conducted using Cheers Nutrimoist oil, a combination of virgin coconut oil, olive EVO, and white flower extract. Enumerators collected data on length and weight before and after in both groups. Measuring body length using a length board measuring according to the WHO Antro 2005. Children are categorized as Stunting if they have Z-Score HAZ < -2 SD WHO Antro 2005, and normal if Z-Score HAZ > -2 SD WHO Antro 2005 [1]. Data were analyzed using an unpaired t-test. This research has Ethical Proof approval from the Ethics Commission for Poltekkes Kemenkes Palu number LB.02.01.1/KE/027/VII/2021.

Results

This study used 70 respondents of mothers and infants 0–3 months divided into two groups, 35 massaged infants and 35 controls. The sociodemographic characteristics of the respondents indicated that the most maternal age was 20–35 years in both the treatment group (74.3%) and the control group (85.7%). Meanwhile, all respondents were housewives (not working). The husband's occupation in the treatment group mainly was farmers (41.7%), and the control group was primarily self-employed (52.8%). Father's income was about $<$ Rp.1 million, in the treatment group (57.1%) and the control group (54.3%). The gender of the infants in the treatment group (74.3%) and the control group (61.1%) was female. The birth order of infants in the treatment group was mostly 3–5 (57.1%), and the control group was mostly 1–2 (77.1%). More detailed information is shown in Table 1.

Most infants received breast milk, the treatment group (57.1%) and control (62.9%). The quality of infants' sleep in the treatment and control groups was mainly well and deep (91.4%). Infant morbidity, the control group, suffered more illness (22.9%) than the treatment group (8.6%). More detailed information is shown in Table 2.

Table 1: The sociodemographic characteristics of the respondents (infants 0–3 months) in the treatment group (n=35) and the control group (n=35) in the working area of the Wani Health Center, Donggala Regency

Characteristics	Treatment group		Control group	
	Frequency (n)	Percentage	Frequency (n)	Percentage
Mother's age (years old)				
20–35	26	74.3	30	85.7
>35	9	25.7	5	14.3
Mother's work				
Working	-	-	-	-
Not working	35	100.0	35	100.0
Father's job				
Teacher	0	0.0	3	8.3
Sailor	3	8.3	3	8.3
Farmer	14	41.7	3	8.3
Laborer	6	16.7	8	22.2
Entrepreneur	12	33.3	18	52.8
Father's income (Rupiah)				
<1 million	20	57.1	19	54.3
1–2 Million	12	34.3	13	37.1
>2 million	3	8.6	3	8.6
Baby gender				
Male	9	25.7	14	38.9
Female	26	74.3	21	61.1
Birth order				
1–2	9	25.7	27	77.1
3–5	20	57.1	8	22.8

The baseline data showed no difference in the mean Z-Score HAZ between the treatment group (-1.256 ± 1.13) and the control group (-0.765 ± 1.29) with $p = 0.096$. After baby massage treatment for 30 consecutive days, data analysis showed that there was a difference in the mean Z-Score HAZ between the treatment group (-0.548 ± 1.10) and the control group (-1.088 ± 1.03) with $p = 0.038$. More detailed data are shown in table 3.

The percentage of stunting in infants 0–3 months is 20%. The treatment group was 31.4%, and the control group was 20.0%. After treatment, stunting in the group decreased by 22.8%, while the control group decreased by 8.6%. Bivariate analysis showed no significant difference in stunting reduction in the two groups before treatment ($\rho = 0.274$) and after treatment ($\rho = 1.000$). More detailed data are shown in table 4.

Tables 3 and 4 present different information, Table 3 focuses on HAZ which changed after the intervention in both the treatment and control groups, while Table 4 presents that information regarding children's nutritional status was measured by indicators of HAZ and divided into stunted (< -2 SD) and normal (≥ -2 SD) [19]. Thus, the change in HAZ in Table 3 increased after the

Table 2: Baseline practice breastfeeding, baby sleep quality, and morbidity respondent in the working area of the Wani Health Center, Donggala Regency

Practice	Treatment group		Control group		p
	Frequency (n)	Percentage	Frequency (n)	Percentage	
breastfeeding, baby sleep quality and morbidity					
Breastfeeding					
Not	15	42.9	13	37.1	0.060*
Yes	20	57.1	22	62.9	
Baby sleep quality					
Sleeping well	32	91.4	32	91.4	0.198*
Not sleeping well	3	8.6	3	8.6	
Morbidity					
Sick	3	8.6	8	22.9	0.614*
Healthy	32	91.4	27	77.1	

*Homogen.

Table 3: Compare mean Z-score of infants 0–3 months in the treatment and control groups

Body length	n	Mean Z-score HAZ	SD	T-test	Mean difference	95 CI of the difference
Baseline						
Treatment group	35	-1.256	1.13	0.096	-0.491	-1.073
Control group	35	-0.765	1.29			0.090
Intervention						
Treatment group	35	-0.548	1.10	0.038*	0.540	-0.030
Control group	35	-1.088	1.03			1.050

*Significance $p < 0.05$. HAZ: Height-for-age-Z score, SD: Standard deviation, CI: Confidence interval.

intervention and the difference was significant between the two groups, but it was not necessarily significant in the category of nutritional status (stunting or normal) if the increase in HAZ had not reached the HAZ score for the normal category, namely, ≥ -2 SD. The intervention given in this study can increase the HAZ score but is not significant for preventing stunting in children.

Discussion

The results showed that the body length of infants 0–3 months in the working area of the Wani Health Center, Donggala Regency, was influenced by a baby massage with $\alpha = 0.038$ ($\alpha < 0.05$). There was a difference in the mean Z-Score HAZ between the treatment group (-0.548 ± 1.10) and the control group (-1.088 ± 1.03) after baby massage. The research of Gultom *et al.* (2019) suggests a significant difference in the body length of babies who are massaged compared to babies who are not massaged [13]. The research of Bennett *et al.* (2013) showed that baby massage had a significant impact on the body length of infants under 6 months of age [20]. Thus, baby massage increases the growth of infants under 6 months of age.

The results research also showed a difference in the average weight gain of 122.86 g between the treatment and control groups. The weight gain of the treatment group was better than the control. Research by Fatmawati *et al.* (2021) concluded that baby massage significantly affects infant weight [21]. Research by Ulfa *et al.* (2020) suggests that baby massage is 3–20% effective in increasing the weight of low birth weight babies [22]. Similarly, research by Nasrah *et al.* (2018) shows that baby massage has a positive effect on growth (weight and length gain) and development of infants aged 4–6 months [23].

Table 4: Analysis of height-for-age-Z score according to age in the treatment group (n=35) and the control group (n=35) in the working area of the Wani Health Center, Donggala Regency

Nutritional status (HAZ)	Group		Group		χ^2
	Treatment (n)	Percentage (%)	Control (n)	Percentage (%)	
Normal pre	24	68.6	28	80.0	0.274
Stunting pre	11	31.4	7	20.0	
Total	35	100.0	35	100.0	
Normal post	32	91.4	31	88.6	1.000
Stunting post	3	8.6	4	11.4	
Total	35	100.0	35	100.0	

HAZ: Height-for-age-Z score.

Baby massage is one of the efforts to prevent stunting. The results showed that babies who were massaged increased their body length better than babies who were not massaged. Similarly, the percentage of stunting in infants who were massaged was decreased compared to infants who were not massaged. The research of Munjidah *et al.* (2018) stated that baby massage increased toddlers' growth [24].

Baby massage causes a balance of the endocrine system. The massaged baby will receive greater hormonal support. The baby's vital organs only begin to learn outside the womb. Therefore, gentle stimulation will increase the baby's vital organs [25]. Baby massage can also affect the brain's electrical activity [26]. Because the golden period for growth and development is between the ages of 0 and 3 months, if this period is disrupted, the loss will not be made up in the next period, significantly compromising the quality of the next generation. Non-pharmacological treatment is required to assist improve the baby's height and prevent stunting. Baby massage is a type of touch therapy that is performed on a newborn to provide sustained physical contact, instill a sense of security in the child, and reinforce the parents' love for the child. Infant stimulation massage is to strengthen the inner relationship between parents and babies, to stimulate breast milk production, to build communication, to understand baby cues, to boost the mother's confidence, and to increase the father's confidence [20], [27].

Baby massage is a type of tactile stimulation that can improve the performance of muscles, bones, and organ systems. According to Health and Bainbridge, baby massage activates the valvulus nerve. This nerve will increase the capacity of the intestinal peristaltic, allowing stomach emptying to be faster and the baby to feel more hungry. Furthermore, baby massage can boost a baby's weight by improving blood circulation and metabolism. A skin-to-skin demonstration of affection between parents and children is known as baby massage. Baby massage has several benefits, including increased body weight and growth, increased endurance, increased baby attention and good sleep, more affectionate ties between parents and children, and increased milk production [28].

Massage is an efficient adjuvant treatment for malnourished infants to improve their nutritional status. The study Sudarmi *et al.* (2020) found that baby massage improves favorable interactions between mother and baby when done under observation, making it simpler to mother and supply nursing to the baby. Baby massage has been found in several trials to improve mother-baby attachment. This identified differences in the nutritional status of newborns getting massage and infants not receiving massage [29].

The results showed that the percentage of stunting in infants 0–3 months in the working area of the Wani Health Center, Donggala Regency was 20%. This number is low compared to the prevalence of stunting in Donggala Regency (29.5%) [9] and Palu City 37.24% [30]. The prevalence of stunting in Donggala Regency is still

higher than the prevalence of stunting in children 0-23 months in Central Sulawesi, which is 26.8%. Meanwhile, the prevalence of stunting in children 0–59 months in Indonesia is 30.8% [31]. Stunted infants are affected by poor nutrition in utero and childhood, as well as by frequent infections before or after birth, and are therefore at higher risk of morbidity and mortality [32]. Health and nutritional conditions before and during pregnancy and after delivery affect growth and the risk of stunting. Stunting begins to occur when a teenager becomes a mother who is malnourished and anemic, which becomes severe during pregnancy with insufficient nutritional intake, this condition has an impact on the baby being born [33]. Child stunting can happen in the first 1,000 days after conception and is related to many factors, including socioeconomic status, dietary intake, infections, maternal nutritional status, infectious diseases, micronutrient deficiencies and the environment [34], [35].

Thus, stunting prevention efforts can be started from teenagers and prospective brides so that they have good nutritional status. In addition, improving the economy, access to clean water, sanitation, access to health services, and increasing nutritional knowledge are also very important so that adolescents and pregnant women can have good nutritional status, balanced nutritional intake, do not get sick easily, and the children they conceive do not experience weight gain, low birth weight so that children can avoid stunting.

Conclusions

Treatment with baby massage has an effect on the length of the baby's body but is not significant for preventing stunting in children. Therefore, there is a need for a combination of interventions to prevent stunting, which can begin with improving nutrition during adolescence and pregnancy so that children born have normal nutritional status and need to be supported by balanced nutritional intake through exclusive breastfeeding and baby massage.

Every mother needs to have baby massage skills as an effort to increase the baby's growth and mother-infant attachment. Researchers suggest that pregnant women in the third trimester be given training in baby massage, and baby massage is carried out as early as possible to babies to increase body length gain as an effort to prevent stunting.

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