

Effect of Feeding Counseling and Massage Therapy on HAZ and WAZ Scores in Stunted Toddlers

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ABSTRACT

Background: Stunting remains a major nutritional problem influenced by inadequate feeding practices during early childhood. This study examined the effect of feeding counseling and massage therapy for feeding difficulties on the nutritional status of stunted toddlers. **Methods:** A quasi-experimental design with a non-equivalent control group was conducted among 40 stunted toddlers aged 24–59 months in Semarang City. The intervention group received feeding counseling and massage therapy for three months, while the control group received standard care. Nutritional status was assessed using Weight-for-Age Z-score (WAZ) and Height-for-Age Z-score (HAZ). **Results:** The intervention led to a significant improvement in HAZ scores ($p < 0.001$), indicating a positive trend in linear growth, while WAZ scores showed no significant change. **Conclusion:** These results suggest that feeding counseling combined with massage therapy for feeding difficulties may support linear growth among stunted toddlers. However, the small sample size and short intervention period limit the generalizability of these findings.



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INTRODUCTION

Stunting persists as a significant nutritional issue affecting children under five years of age, particularly in low and middle income countries, including Indonesia (Mardiansyah, 2022). It reflects chronic undernutrition that impairs both physical and cognitive development. Stunting remains one of the most pressing nutritional challenges affecting children under five, particularly in low- and middle-income countries, including Indonesia. The main contributing factors include inadequate nutrient intake, frequent infections, and suboptimal feeding practices, which are often shaped by socioeconomic and environmental conditions. According to the 2024 Indonesia Nutritional Status Survey (SSGI), the national prevalence of stunting declined to 19.8%. However, this rate remains above the targets set in the National Medium-Term Development Plan (RPJMN) and the Sustainable Development Goals (SDGs), underscoring the need for sustained and comprehensive intervention efforts (Limardi et al., 2020)

Effective stunting reduction requires a multi-sectoral and integrated approach, aligning health, nutrition, and behavioral strategies. One of the key modifiable factors in preventing stunting is improving feeding practices within the first 1,000 days of life. Inappropriate feeding behavior and feeding difficulties such as food refusal or limited

food variety can worsen nutritional deficiencies and hinder linear growth (Sukmawati et al., 2023). Counseling on appropriate feeding practices has been shown to enhance parental knowledge and improve children's dietary intake .

In addition to behavioral interventions, physical stimulation such as massage therapy has demonstrated benefits in promoting appetite, digestion, and overall growth among young children (Maretalinia et al., 2023). Previous studies report that massage can increase vagal activity, improve nutrient absorption, and enhance growth hormone release, leading to better weight and height outcomes (Lee et al., 2022). However, few studies have combined feeding counseling with massage therapy, particularly among stunted toddlers experiencing feeding difficulties.

This study addresses that gap by integrating educational and physical interventions feeding counseling and massage therapy to assess their combined effects on the nutritional status of stunted toddlers, measured through Height-for-Age (HAZ) and Weight-for-Age (WAZ) Z-scores. The novelty of this study lies in evaluating a dual, low-cost, and community-based intervention that may provide a practical model for improving child nutrition and supporting stunting prevention efforts at the primary healthcare level.

METHODS

This research was carried out in Semarang. This study employs a quasi-experimental design using a non-equivalent control group approach. The intervention group received massage therapy for feeding difficulties combined with educational counseling on appropriate feeding practices, while the control group did not receive any direct intervention aside from the distribution of informational leaflets on feeding guidelines (Sugiyono, 2020). The target population in this study consisted of all stunted toddlers in the Semarang area. The intervention involved providing counseling on appropriate feeding practices and massage therapy for feeding difficulties using a lecture-based approach, supplemented with leaflets. Mothers were expected to implement the interventions directly with their children over a three-month period. Participants were selected through a consecutive sampling technique based on inclusion criteria, which included toddlers aged 24 to 59 months who were classified as stunted, and parents who were willing to participate as respondents. A minimum of 40 subjects were included in the sample. Data were analyzed using the SPSS version 22.0 for Windows. Statistical analysis involved comparative tests between the intervention and control groups to assess differences in nutritional status, specifically through changes in WAZ (weight-for-age) and HAZ (height-for-age) scores.

RESULT

This section presents the characteristics of the respondents, specifically the parents of toddlers included in the study. The characteristics observed include age, education level, and employment status. These factors are important to describe because they can influence parental knowledge, attitudes, and practices in child care, particularly in relation to the occurrence of stunting. The distribution of respondents based on these characteristics is shown in Table 1

Table 1. General Characteristics of Respondents of Parents of Toddlers

Characteristic	n	%
Age (Years)		
20-24	15	37.5
25-28	12	30.0
29-32	10	25.0
33-35	3	7.5
Education		
Primary School	2	5.0
Junior High School	7	17.5
Senior High School	22	55.0
Higher Education	9	22.5
Work		
Not Working	28	70.0
Work	12	30.0

The majority of parents of stunted toddlers in this study were in the 20–24-year age group, totaling 15 respondents (37.5%). Age is considered a contributing factor to one’s level of knowledge; as individuals grow older, their experiences tend to enrich their understanding. Conversely, younger mothers may have limited knowledge regarding child-rearing practices due to their relatively minimal life experience. This finding aligns with the study conducted by Ummah (2021) which indicated that younger maternal age is often associated with inadequate readiness for pregnancy and limited knowledge regarding child care. Young mothers are more likely to lack the maturity and experience necessary for optimal maternal and child health practices. Additionally, young families often do not have independent living arrangements and tend to reside with their parents. In such cases, although the mother may lack sufficient knowledge or preparedness, support from older family members can serve as a compensatory factor in child-rearing.

In terms of education level, the majority of respondents (55%) had completed secondary education (senior high school). Maternal education plays a significant role in shaping attitudes and decision-making in response to various health and nutrition-related issues. Children born to mothers with higher education levels are more likely to experience better growth and development outcomes. In contrast, mothers with lower educational attainment may be more inclined to adhere to traditional food practices and may find it more difficult to accept or implement new nutritional information.

Table 2. Characteristics of Respondents in Toddlers Based on Age and Gender

Characteristic	n	%
Age (Months)		
24 – 33	15	37.5
34 – 43	12	30.0
44 – 53	10	25.0
54 - 59	3	7.5
Gender		
Boys	21	52.5
Girls	19	47.5

The majority of toddlers in this study were aged between 24 and 33 months, totaling 15 respondents (37.5%). At this developmental stage, children require balanced nutrition to support optimal growth. According to the recommended dietary allowance (AKG), toddlers aged 24–47 months need approximately 1,000 kcal per day to meet their energy requirements. During this critical period, several physiological and developmental processes occur, including maturation of the gastrointestinal tract, development of metabolic organs, cognitive growth, physical development, and the strengthening of the immune system. This phase, often referred to as the First 1,000 Days of Life, represents a crucial and non-replicable window for growth and development. This finding is consistent with a study by Mzumara (2018), which noted that a child’s age is significantly associated with the risk of stunting, with children under five being at higher risk compared to those over five years of age. Additionally, most of the toddlers in the study were male, accounting for 21 respondents (52.5%).

Table 3. Overview of Frequency Distribution of Nutritional Status Including WAZ, HAZ Pre and Post in the Intervention Group (n=20)

Nutritional Status	Mean	Min	Max	SD
WAZ Pre	-1.76	-5.72	-0.05	1.21
WAZ Post 1	-1.60	-5.43	-0.08	1.23
WAZ Post 2	-1.36	-5.04	0.16	1.17
HAZ Pre	-2.60	-4.69	-0.21	1.00
HAZ Post 1	-2.51	-4.68	0.06	1.02
HAZ Post 2	-2.13	-4.32	1.61	1.24

The results of this study involving 20 respondents showed progressive improvements in nutritional status based on Weight-for-Age Z-scores (WAZ). The mean WAZ at baseline (pre-intervention) was -1.76 with a standard deviation of 1.21. This increased slightly to -1.60 (SD = 1.23) at the first post-intervention measurement, and further improved to -1.36 (SD = 1.17) at the second post-intervention stage. These results reflect gradual improvements in nutritional status following the intervention. In anthropometric assessments, WAZ is commonly used to evaluate acute malnutrition. Unlike weight, which responds relatively quickly to changes in nutrition, height-for-age (HAZ) reflects long-term nutritional status. Linear growth tends to occur gradually and is less sensitive to short-term nutritional fluctuations; thus, the impact of nutrient deficiencies on height is typically observable only over extended periods. Furthermore, based on the same group of respondents, HAZ scores also showed improvement. The average HAZ at baseline was -2.60 (SD = 1.00), which improved to -2.51 (SD = 1.02) after the first intervention and reached -1.24 (SD = 1.24) after the second intervention. These findings highlight the importance of meeting children’s nutritional needs, particularly during the growth and development phase. Prolonged deficiencies in energy and protein intake are directly linked to malnutrition, as indicated by deviations in both weight and height for age. This finding is consistent with the study conducted by Dewi et al. (2020) which emphasized that height-for-age is a reliable indicator of growth and nutritional status in early childhood. Inadequate nutrition during this critical period can impair physical growth, cognitive development, and ultimately intelligence. If such conditions persist into later stages of life, they may lead to reduced competitiveness and productivity in adulthood.

Table 4. Overview of Nutritional Status Frequency Distribution Including WAZ, HAZ Pre and Post in the Control Group (n=20)

Nutritional Status	Mean	Min	Max	SD
WAZ Pre	-2.53	-6.16	2.94	1.88
WAZ Post 1	-1.84	-4.65	3.00	2.02
WAZ Post 2	-1.46	-3.13	3.72	1.91
HAZ Pre	-2.91	-4.99	0.90	1.26
HAZ Post 1	-2.56	-4.47	1.27	1.26
HAZ Post 2	-2.21	-3.54	1.76	1.19

The study results from 20 respondents in the control group showed an improvement in nutritional status over time, although no direct intervention was provided. The mean Weight-for-Age Z-score (WAZ) at the pre-test stage was -2.53 with a standard deviation of 1.88. This value improved to -1.84 (SD = 2.02) at the first post-test and further to -1.46 (SD = 1.91) at the second post-test. These changes suggest a modest increase in nutritional status, likely influenced by external or indirect factors. Chronic growth disturbances, particularly those caused by prolonged nutritional deficits, are often reflected in impaired height gain. Poor dietary intake, especially when it fails to align with the principles of balanced nutrition, significantly hampers linear growth. Such conditions are frequently associated with the family's limited capacity to provide adequate and high-quality food for all members. Moreover, cultural beliefs and food taboos particularly those held by mothers can further restrict children's access to nutritious food. Many mothers in this population adhered to food prohibitions and lacked confidence in introducing certain nutritious foods to their children. These beliefs often influence feeding practices, with decisions guided more by tradition than by evidence-based nutritional knowledge, ultimately affecting the child's growth and development outcomes (E. & E., 2020).

The average nutritional status in HAZ Pre (-2.91) with standard deviation (1.26), HAZ Post 1 (-2.56) with standard deviation (1.26) and HAZ Post 2 (-2.21) with standard deviation (1.19). Growth disorders that can occur in a short period of time often occur in weight changes as a result of decreased appetite related to insufficient food consumed. This confirms that children's desire to choose foods allows them to form eating habits that may not be in accordance with optimal nutritional fulfillment efforts (E. & E., 2020). This is in line with what was done by La Abdullah Laode Wado (2019) in his research stating that family food security is closely related to food availability which is one of the factors or indirect causes that affect the nutritional status of children. Baduta in food-insecure households has a 2.62 times greater risk of suffering from stunting compared to baduta in food-resistant households.

Table 5. Analysis of Nutritional Status Differences in Intervention Groups Based on WAZ and HAZ (n=20)

Variables	Mean	SD	P-value
WAZ Pre – WAZ Post 1	-0.11	0.66	0.469
WAZ Pre – WAZ Post 2	-0.23	0.10	0.000
HAZ Pre – HAZ Post 1	-0.34	0.70	0.043
HAZ Pre – HAZ Post 2	-0.69	0.70	0.000

Table 5 presents the analysis of nutritional status differences in the intervention group based on Weight-for-Age Z-score (WAZ) and Height-for-Age Z-score (HAZ). The results show that there was no significant difference between WAZ pre-intervention

and WAZ post 1 ($p = 0.469$), indicating that short-term intervention did not significantly affect body weight relative to age. However, a significant improvement was observed between WAZ pre-intervention and WAZ post 2 ($p = 0.000$), suggesting that a longer intervention period led to meaningful weight gain. Similarly, there was a significant difference between HAZ pre-intervention and HAZ post 1 ($p = 0.043$), and a more pronounced improvement between HAZ pre-intervention and HAZ post 2 ($p = 0.000$). These findings indicate that the intervention had a positive impact on linear growth (height-for-age), particularly after the second post-test period. Overall, both WAZ and HAZ scores showed progressive improvement over time, demonstrating that the intervention contributed to better nutritional status among participants.

DISCUSSION

Analysis of Different Tests on the Nutritional Status of WAZ Pre and WAZ Post 1 Intervention Groups

The absence of a WAZ response in the intervention group can be explained by several, non-mutually exclusive factors. First, the study was underpowered to detect small weight changes: with only 20 children in the intervention arm, even modest effects would likely remain non-significant. Second, the three-month intervention period may have been insufficient to produce measurable weight gains in a population affected by chronic undernutrition, recurrent infections, or household food insecurity. Third, measurement variability (scale precision, inter-observer differences) and regression-to-the-mean could have obscured true but small effects on weight. Fourth, it is possible that the combined intervention primarily influenced caregiver behaviors and factors (e.g., feeding frequency, illness management) that translate into linear growth over a longer time horizon rather than short-term weight gain. International studies of tactile stimulation (massage) and caregiver feeding counseling report mixed results—some randomized trials show modest anthropometric gains, while others do not—highlighting heterogeneity in intervention content, duration, adherence, and baseline nutritional status. Taken together, these points suggest caution in interpreting the null WAZ finding: it does not necessarily indicate lack of biological effect, but rather points to limitations in study power, duration, and measurement.

Analysis of Different Tests on the Nutritional Status of WAZ Pre and WAZ Post 2 Intervention Groups

The analysis of 20 respondents in the intervention group based on WAZ pre–WAZ post 2 showed a mean difference of 0.74 with a standard deviation of 1.97, and a p -value of 0.109, indicating no statistically significant change. This suggests that the intervention may not have had a direct or immediate impact on weight-for-age status. Nutritional status, especially in terms of weight, can be influenced by multiple factors beyond feeding practices alone. In the process of growth and development, children require adequate and balanced nutrient intake to support physiological and cognitive development. If these nutritional needs are not met consistently, the growth process may be delayed or impaired. These findings are in line with the study conducted by Masrin et al. (2022) which found that toddlers from food-insecure households are more likely to experience growth retardation due to limited access to sufficient food. In such families, food is often rationed among members, reducing the quality and quantity of food available to each child. The lack of food access, in turn, affects the nutritional adequacy of toddlers and is closely associated with poor nutritional outcomes, including stunting. This comparison highlights that household food security plays a significant role in improving the nutritional status of toddlers and must be considered

alongside individual-level interventions such as feeding counseling and massage therapy.

Analysis of Differences in Nutritional Status of HAZ Pre and HAZ Post 1 Intervention Groups

The results of the study involving 20 respondents in the intervention group, the analysis of the difference in nutritional status based on HAZ pre–HAZ post 1 showed a mean value of -0.08 with a standard deviation of 0.13, and a statistically significant p-value of 0.009. This indicates a meaningful improvement in height-for-age scores after the intervention. Nutritional status, particularly linear growth, is influenced not only by food intake but also by parenting practices. These include how mothers provide food, the feeding methods they use, their attentiveness to hygiene and health, and the emotional support they offer to their children. These parenting behaviors can significantly impact a child's ability to absorb and utilize nutrients effectively. This finding aligns with research Thurstans et al. (2022), which showed that poor parenting practices increase the risk of stunting by up to 8.07 times compared to adequate parenting. Parental behavior is one of the most complex and influential determinants of child growth, often difficult to modify. If the barriers that parents face in providing optimal care and nutrition are not addressed, children are at a much higher risk of experiencing stunted growth due to unmet developmental needs. This underscores the importance of not only focusing on food intake but also strengthening parenting education as a critical component of stunting prevention efforts.

Analysis of Differences in Nutritional Status of HAZ Pre and HAZ Post 2 Intervention Groups

Based on the results of the study of 20 respondents with the analysis of the difference in nutritional status in the intervention group based on HAZ pre – HAZ post 2, the average value (-0.46) standard deviation (0.75) with a value of $p = 0.012$ was obtained with a different value. Exclusive breastfeeding is supported by the mother's knowledge and parents' commitment to providing exclusive breastfeeding to their children for 6 months. Because breast milk contains complete nutrients that are easily digested and easily absorbed by babies (Risnanto et al., 2023). Toddlers who are not given exclusive breastfeeding are 61 times more likely to experience stunting than toddlers who are given exclusive breastfeeding. Then, toddlers who are not given exclusive breastfeeding have a 98% chance of stunting.

Analysis of Differences in Nutritional Status of WAZ Pre and WAZ Post 1 Control Group

Based on the results of the study of 20 respondents with the analysis of the difference in nutritional status in the control group based on WAZ pre – WAZ post 1, the average value (-0.11) standard deviation (0.66) with a value $p = 0.469$ was obtained with no difference value. Poor environmental hygiene conditions can trigger the emergence of various diseases in toddlers. Toddlers who are often sick can also reduce the intake of good nutrients into their body so that this can increase the risk of stunting (Nisa Dewi Mustika Khoirun & Sukesri Tri Wahyuni, 2022). This is in line with what Sinatrya (2019) said that poor environmental sanitation affects the nutritional status of toddlers, namely through the infectious diseases experienced. One of them is a healthy latrine which is a good means of fecal disposal to stop the chain of disease spread.

Analysis of Differences in Nutritional Status of WAZ Pre and WAZ Post 2 Control Groups

Based on the results of the study of 20 respondents with the analysis of the difference in nutritional status in the control group based on WAZ pre – WAZ post 2, the average value (-0.23) standard deviation (0.10) with a value of $p = 0.000$ was obtained. The higher the level of implementation of PHBS carried out in the household setting, the fewer individuals will be affected by the disease. Thus, mothers and toddlers can better know the various factors that cause stunting, and the community can also be more concerned and apply PHBS in the family environment. This can support improving the quality of children's nutritional status in the family. This is in line with research conducted by Dhefiana et al. (2023) explain there is a correlation between PHBS behavior and stunting in toddlers. The role of parents has not been maximized in implementing a clean and healthy life in daily activities.

Analysis of Different Tests on the Nutritional Status of HAZ Pre and HAZ Post 1 Control Groups

Based on the results of the study of 20 respondents with the analysis of the difference in nutritional status in the control group based on HAZ pre – HAZ post 1, the average value (-0.34) standard deviation (0.70) with a value $p = 0.043$ was obtained with a different value. Nutritional knowledge has a considerable role in fulfilling nutritional needs, especially in children under five. Improper feeding at this time can result in children being malnourished, often sick, and impaired growth and development. Mothers with knowledge are likely to apply their knowledge in the process of raising children, especially in providing food according to the nutritional needs needed by toddlers. This is in line with research conducted by Omaghomi Jemide J, et all (2016) stating that maternal knowledge about nutrition is related to stunting status in toddlers. If the mother's knowledge of nutrition is good, it will have a good impact on nutritional intake in children, and vice versa, if low knowledge related to nutrition will result in low nutritional intake.

Analysis of Differences in Nutritional Status of HAZ Pre and HAZ Post 2 Control Groups

Based on the results of the study of 20 respondents with the analysis of the difference in nutritional status in the control group based on HAZ pre – HAZ post 2, the average value (-0.69) standard deviation (0.70) with a value of $p = 0.000$ was obtained with a different value. A good attitude will have a positive impact on improving the nutrition of their children, by showing an attitude of accepting, responding, appreciating, and being responsible for the knowledge they have (Nimah & Sukendra, 2023). This is in line with what Wulandari et all (2019) have done to state that a mother's positive attitude towards nutrition will produce good behavior in improving the nutritional status of her child. Similarly, Montenegro et al. (2022) emphasized that a mother's positive outlook on nutrition significantly influences her behavior, which in turn affects her child's nutritional status. Even in the absence of targeted interventions, consistent application of good feeding practices, hygiene maintenance, and emotional support may contribute to improved growth outcomes over time. This indicates that empowering mothers with not only knowledge but also the motivation and confidence to apply that knowledge is essential in combatting stunting. Therefore, future programs should consider incorporating behavior change communication (BCC) strategies that enhance maternal attitudes as a complement to technical nutrition interventions (Tiwari et al., 2020).

CONCLUSION

The study found differences in the nutritional status of stunted toddlers aged 24–59 months before and after receiving feeding counseling and massage therapy for feeding difficulties over a three-month period. In the intervention group, Weight-for-Age Z-score (WAZ) showed no significant change between pre-intervention and both post-intervention measurements. However, Height-for-Age Z-score (HAZ) significantly improved after the first and second post-intervention assessments, indicating positive effects on linear growth. In the control group, WAZ showed no significant difference at the first post-intervention measurement but a slight change at the second, while HAZ demonstrated minor variations across both time points. Overall, the intervention group exhibited greater improvement in HAZ compared to the control group, suggesting that feeding counseling combined with massage therapy may contribute to enhanced linear growth among stunted toddlers. These findings indicate potential benefits of integrating behavioral (feeding counseling) and physical (massage therapy) interventions to support growth in stunted children. However, due to the small sample size and relatively short intervention period, the results should be interpreted with caution. Further research involving larger samples, longer follow-up, and additional factors such as dietary intake and parental practices is needed to confirm and expand upon these findings.

Authors' Contribution Statement: **Qomariyah:** Conceptualization, Methodology, Supervision, Validation, Writing – Review & Editing, Corresponding Author. **Desi Soraya:** Data Curation, Investigation, Project Administration, Writing – Original Draft Preparation. **Ellyzabeth Sukmawati:** Formal Analysis, Software, Visualization. **Achmad Solechan:** Writing – Original Draft Preparation.

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