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Holistic Approach: Emotional Touch Intervention (Kissing and Hugging) and Macronutrient Nutrition in Stunting Prevention in Early Childhood)

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Stunting can lead to complications such as decreased intelligence and impaired growth, which may further deteriorate development into adulthood. This study aimed to examine the effectiveness of maternal kissing, hugging, and macronutrient intake in the prevention of stunting. A randomized clinical trial was conducted involving 170 mothers with toddlers aged 6 to 60 months who were at risk of stunting in 2024. Participants were randomly assigned to intervention and control groups. In both groups, parenting behaviors involving maternal hugging and kissing were measured using a structured questionnaire, while macronutrient intake, particularly protein-rich intake, was assessed using microtoise and length boards. The results showed a significant improvement in the intervention group compared to the control group ($p < 0.001$). The incidence of stunting was significantly lower in the intervention group than in the control group ($p < 0.001$). Additionally, the effectiveness of the Emotional Touch Intervention (Kissing and Hugging) and Macronutrient Nutrition (a local playful interaction technique) was statistically significant with a p-value of 0.000 (< 0.05). These findings indicate that maternal kissing, hugging, and adequate macronutrient intake are beneficial strategies in stunting prevention among toddlers. This study contributes to health innovations by promoting a combined approach of affectionate parenting and nutritional support to enhance toddler health and well-being.

Keywords: Hug, Kiss, Macronutrient Intake, Stunting, Toddler

INTRODUCTION

Stunting has been associated with poor cognitive development during childhood and adolescence, reduced productivity, and impaired growth and development (Soliman et al., 2021). To achieve Sustainable Development Goal (SDG) 4, which targets quality education by 2030, the risk of stunting among toddlers must be significantly reduced (World Health Organization, 2016).

Stunting, a growth disorder among young children, is closely linked to poverty and affects over 200 million children worldwide, the majority of whom live in low- and middle-income countries. Approximately 150 million children globally are at risk of stunting, defined by a height-for-age z-score (HAZ) of less than -2 standard deviations (SD) on the WHO growth chart, with more than half of these cases occurring in Asia (Karra & Fink, 2019; Parikh et al., 2021). A national analysis of child malnutrition reported an average stunting rate of 39.3% among toddlers (Desmond & Casale, 2017). Although recovery from stunting may be possible, there is limited

research on whether stunted children can fully catch up in growth and development over the long term (Pedreschi et al., 2024). Therefore, preventive strategies, control measures, and interventions that combine adequate nutrient intake and appropriate stimulation are necessary to reduce stunting prevalence (Elisanti et al., 2023).

Non-pharmacological interventions are widely recommended for addressing and preventing stunting (Saeidi et al., 2011). However, nutritional intake interventions targeting toddlers have not yet achieved optimal outcomes. Consequently, there is a need for sustainable and easily implemented stunting prevention strategies (Wiliyanarti et al., 2022). One promising non-pharmacological approach is affectional stimulation through kissing and hugging (Mangat et al., 2018). Kissing and hugging are considered basic human needs that support healthy growth and provide therapeutic effects (Cobo et al., 2022; Shykhveisi et al., 2023). Such affectionate stimulation influences the central nervous system, modulates neurotransmitter release, and triggers

the release of analgesic substances, which may increase appetite in toddlers (Z et al., 2011).

Behavioral interventions such as skin-to-skin contact and improved macronutrient intake have also been found effective in stunting prevention and management (Hijrawati et al., 2021). Studies by Abasi et al. and Esfahani et al. reported that kissing and hugging helped alleviate irritability following macronutrient intake in toddlers (Mrljak et al., 2022; Z et al., 2011). Similarly, research by Seo et al. and Cheraghi et al. demonstrated that maternal hugging reduced crying time, improved respiratory patterns, and positively influenced physiological responses, including lower heart rates and increased arterial oxygen saturation in toddlers (Agarwal et al., 2023; García-Valdivieso et al., 2023). Furthermore, Taavoni et al. found that maternal affection through kissing and hugging created a sense of comfort in toddlers following nutrient intake (Taavoni & Neisani, 2010). Maternal affection and adequate macronutrient intake are essential human needs, particularly for infants and toddlers, highlighting the importance of appropriate strategies to prevent and reduce stunting incidence.

Although various stunting prevention methods in toddlers have shown modest reductions in stunting risk, no single intervention has been proven entirely effective, nor has any method emerged as definitively superior. Both maternal affection and macronutrient supplementation represent cost-effective, accessible, and practical interventions (Kristiani & Mahmudiono, 2020; Mangat et al., 2018). Given the mixed findings from previous studies in this field (Crookston et al., 2010; Laksono et al., 2022; Z et al., 2011) further research is needed to strengthen the evidence base, particularly in the Indonesian context.

This study integrates the Emotional Touch Intervention (Kissing and Hugging) and Macronutrient Nutrition, which combines macronutrient supplementation with maternal affectionate behaviors to enhance toddlers' appetite and growth. Therefore, the objective of this study is to examine the effectiveness of maternal affectionate behaviors—kissing and hugging—combined with macronutrient intake in preventing stunting among toddlers.

METHOD

This study employed a randomized clinical trial design and was conducted over a six-month period from July to December 2024. The research was carried out at a community health center (Puskesmas) located in Sleman Regency, Yogyakarta, Indonesia. The selected Puskesmas is the largest community health center in the Yogyakarta, Indonesia.

The study population consisted of toddlers referred for growth and developmental assessments. The inclusion criteria were mothers with toddlers at risk of stunting, aged between 6 and 60 months, who actively attended community health posts (Posyandu). Stunting categories were classified as severely stunted, stunted, normal, and tall based on World Health Organization (WHO) growth standards. Toddlers with congenital chromosomal

abnormalities (such as Down syndrome or other genetic conditions) were excluded from the study. Ten participants (five from each group) were excluded due to toddler uncooperativeness, excessive fussiness, or maternal discomfort during the intervention. Ultimately, 85 toddlers were retained in each group.

Participants were selected using convenience sampling and were then randomly allocated to either the intervention or control groups using block randomization. Group A received maternal kissing, hugging, and macronutrient supplementation, while Group B received only macronutrient supplementation. The sample size was determined based on Taavoni's (2010) study, targeting 85 participants per group, with a 95% confidence level and 10% Type II error rate. Considering potential dropouts, the final sample included 85 toddlers per group.

Data were collected using a structured questionnaire consisting of two parts: demographic information and maternal parenting patterns, specifically affectionate behaviors such as kissing and hugging. The first part collected demographic details, including the toddler's age, gender, and maternal age. The second part assessed physiological parameters, such as the toddler's age, weight, and height. Toddler height was measured using a microtoise and length board. The parenting questionnaire included three items covering parenting styles: democratic, authoritarian, and permissive. Response options were categorized as Always (5–7 times per week), Often (3–4 times per week), Sometimes (1–2 times per week), and never. This questionnaire had been previously validated by Millward (2017) and demonstrated acceptable validity and reliability.

The primary outcome was the incidence of stunting, measured by the toddler's height-for-age using microtoise and length board, which had been calibrated by an affiliate company of Universitas Aisyiyah Yogyakarta on February 13, 2024. Macronutrient intake was monitored and recorded daily.

Upon obtaining ethical approval and the necessary permissions, the researchers coordinated with community partners and began participant recruitment. Parents of eligible toddlers were invited to participate through convenience sampling. After providing detailed explanations of the study procedures, informed consent was obtained from all participating mothers. Participants were assigned to one of two groups. The first is Intervention Group, who received maternal kissing and hugging before and after macronutrient consumption. Each affectionate interaction was provided for approximately three seconds. The second is Control Group, who received only macronutrient supplementation without the affectionate intervention. Toddlers were fed as they would be in their normal routine without maternal kissing or hugging before or after eating.

It is acknowledged that while maternal affection provides emotional benefits, it may not have a direct physiological effect on stunting prevention. Therefore, adequate nutritional intake remained the primary strategy for stunting prevention.

Throughout the intervention, the toddlers’ comfort and safety were closely monitored. Mothers were allowed to either sit or stand while feeding, and they were permitted to hug or kiss their toddlers if they became upset during feeding in both groups. Feeding times were aligned with each toddler’s regular mealtime schedule. Stunting assessments were conducted by trained midwives working at the local Puskesmas.

Statistical analyses were conducted using SPSS version 20. Descriptive statistics were used to summarize the characteristics of the two groups. The chi-square test was employed to compare categorical variables. Since the data were not normally distributed, the Friedman test was applied for within-group comparisons, and the Kruskal–Wallis test was used for between-group comparisons. A significance level of $p < 0.05$ was set for all statistical tests. This study was approved by the Ethics Committee of Universitas Aisyiyah Yogyakarta (Approval No. 3802 KEP_UNISA/ VII/ 2024).

RESULT AND DISCUSSION

The research shows no significant difference in the gender of the toddlers or the maternal age between the two groups ($p > 0.05$). However, the mean age of toddlers in the control group was significantly higher than that in the intervention group ($p = 0.04$) (Table 1).

Table 1.

Comparison of demographic characteristics of the sample between the two groups.

Group	Intervention Group	Control Group	Kruskal–Wallis test	p -Value
Variables	Mean $\pm$ SD	Mean $\pm$ SD		
Toddler Age (Months)				
6-8	32 (60)	28 (51.1)	1.25	0.04
9-12	23 (40)	27 (48.9)		
Gender				
Woman	29 (53.3)	29 (53.3)	0.53	0.77
Man	26 (46.7)	26 (46.7)		
Mother's Age (Years)				
< 20	10 (11.1)	11 (13.3)	1.98	0.74
20-35	29 (53.3)	28 (51.1)		
> 35	21 (35.6)	21 (35.6)		

There was no significant difference in the baseline stunting scores between toddlers in the intervention and control groups. However, following the intervention, the incidence of stunting was significantly lower in the intervention group compared to the control group (Table 2).

Table 2.

Comparison of the average scores of stunting incidence at different times between the two intervention and control groups.

Group	Intervention	Control	Kruskal–Wallis test	p -Value
Stunting Incident	Mean $\pm$ SD	Mean $\pm$ SD		
Very Short	0.53 $\pm$ 1.29	0.84 $\pm$ 1.57	4.72	0.1
Short	6.67 $\pm$ 1.55	6.27 $\pm$ 1.03	4.15	0.13
Normal	0.91 $\pm$ 1.56	2.98 $\pm$ 2.68	17.22	<0.001
Tall	0.53 $\pm$ 1.29	0.84 $\pm$ 1.57	4.72	0.1

It can be concluded that the incidence of stunting in the intervention group was significantly lower than in the control group ($p < 0.001$), indicating a significant effect of maternal affectionate behaviors—kissing and hugging—combined with macronutrient intake on reducing stunting (table 2).

Table 3.

Effectiveness of the kiss, hug and macronutrient supplement methods

Group	N	Mean	Std. Dev	p-value
Pretest	170	72.40	54.06	0,000*
Posttest	170	86.41	63.31	

Based on Table 3, the p -value was 0.000 (< 0.05), indicating a significant effect of maternal affectionate behaviors—kissing and hugging—combined with macronutrient intake as a strategy for preventing stunting in toddlers. The analysis of participant characteristics showed no significant differences in toddler gender or maternal age between the two groups ($p > 0.05$). This is likely due to the predominance of female toddlers at the Sleman health center. This study could not establish an association between gender and stunting, as the high proportion of female participants was not found to be a risk factor in this context. Nonetheless, gender cannot be entirely excluded as a potential factor in stunting, as other underlying variables may also contribute. These findings are consistent with a systematic review and meta-analysis using DHS reports from 35 countries, which found no universal gender effect on stunting risk (Li et al., 2020).

Conversely, other studies have identified gender as a significant predictor of stunting, suggesting that female children may be at higher risk compared to males. This is supported by meta-analyses conducted in 16 countries and by studies in Zambia and Ethiopia (Muche et al., 2021). A study conducted in Worabe, Southern Ethiopia, explored maternal age in relation to stunting risk and found no significant association (Awoke et al., 2020). The present study's similar result may be attributed to the fact that most mothers in Sleman were within the reproductive age range. However, maternal age alone does not guarantee protection against stunting, as multiple

contributing factors remain, such as maternal knowledge, exclusive breastfeeding practices, complementary feeding quality, parenting patterns, parental income, and poor sanitation.

Additionally, the toddlers in the control group were significantly older than those in the intervention group ($p = 0.04$). This finding aligns with previous research indicating that children over six months are at a higher risk of stunting than younger infants (Masibo et al., 2020). Household food quality has a significant impact on child nutrition, and the "double burden of malnutrition"—the simultaneous presence of undernutrition and overnutrition—has been widely reported globally. The tendency to consume energy-dense but nutrient-poor foods contributes to stunting and undermines the critical nutritional needs of toddlers (Shinsugi et al., 2019). Unequal food distribution within households, where mothers may consume more nutritious food portions than their children, further exacerbates this issue (Canavera et al., 2018).

Age alone does not fully protect against stunting, as additional factors such as parental knowledge, exclusive breastfeeding, appropriate complementary feeding, family income, and environmental sanitation also contribute. The Indonesian government has prioritized stunting reduction as part of its national health agenda. Inadequate complementary feeding and premature or delayed weaning are known contributors to stunting among toddlers aged 1–5 years. Proper complementary feeding from six months of age and continued breastfeeding until at least two years are considered the gold standards for promoting optimal growth. Education on appropriate nutrition and effective parenting practices is essential to ensure adequate nutrient intake and to prevent malnutrition-related stunting (Ali, 2021; Luyten et al., 2017).

While affectionate parenting through kissing and hugging provides emotional benefits, it may not directly prevent stunting. More effective prevention strategies involve ensuring adequate macronutrient intake, appropriate healthcare, and routine growth monitoring. Nevertheless, affectionate parenting practices create emotional bonds that improve the toddler's comfort during feeding, enhancing macronutrient intake and supporting optimal growth (Millward, 2017). In 2021, approximately 24.4% of Indonesian children experienced stunting, and 7.1% were underweight or wasted (Christian et al., 2023). Despite the persistent challenge of high stunting rates, the Indonesian government has implemented national stunting reduction programs emphasizing macronutrient intake, particularly animal protein sources. However, efforts to promote fish consumption remain difficult to sustain at the community level (WHO, 2014).

Stakeholders are particularly concerned about meeting the SDG targets to reduce child morbidity and mortality. The affectionate parenting approach—incorporating kissing and hugging—represents an affordable, accessible, and community-friendly alternative strategy that can be easily adopted as a long-term solution

to stunting (Canavera et al., 2018). The mechanism of affectionate parenting may improve toddlers' sense of safety and comfort, positively influencing their mental health. Additionally, this affectionate stimulation may modulate neurotransmitter release through central nervous system pathways, triggering the release of analgesic substances and increasing toddlers' appetite. Balanced macronutrient intake plays a crucial role in regulating appetite, enhancing nutrient absorption, and preventing growth and developmental delays.

The present study also demonstrated that the Emotional Touch Intervention (Kissing and Hugging) and Macronutrient Nutrition was effective in preventing stunting, with a p -value of 0.000 (< 0.05), confirming the significant role of affectionate maternal behaviors combined with adequate macronutrient intake. These findings are supported by previous studies (Savarino et al., 2021), which emphasized the importance of sensory input experienced by toddlers during breastfeeding and physical closeness with their mothers (Huff et al., 2021). Therefore, affectionate gestures such as touching and kissing during breastfeeding should be consistently practiced to maintain maternal bonding and reduce stunting risk (Marshall et al., 2011). From 2018 to 2024, the Indonesian government's nutritional programs have mainly focused on improving nutritional status and addressing stunting (WHO, 2014).

Stunting is a critical growth disorder in children under five (Canavera et al., 2018; Savarino et al., 2021), with long-term impacts on growth and development (Huff et al., 2021; Marshall et al., 2011). The affectionate parenting method may improve child nutrition status (Abed, 2014; Maharani et al., 2020), and parental roles and parenting quality are essential for the well-being and nutritional adequacy of toddlers (Abeshu et al., 2016; Win et al., 2022). However, inappropriate parenting practices and inadequate feeding remain challenges in reducing stunting prevalence (Bentley et al., 2011).

In this study, macronutrient intake was estimated based on the following daily requirements: energy 1125 kcal, protein 26 grams, carbohydrates 155 grams, fat 44 grams, water 1200 ml, and fiber 16 grams. Active parental involvement in decision-making and caregiving is critical for toddler care. Both parents should participate directly and share caregiving responsibilities with compassion and sensitivity. Verbal communication between parents and toddlers can further improve macronutrient intake (Fitriahadi et al., 2021, 2024; Saaka et al., 2021).

CONCLUSION

The results of this study demonstrated that the Emotional Touch Intervention (Kissing and Hugging) and Macronutrient Nutrition in the intervention group significantly reduced stunting incidence compared to the control group ($p < 0.001$), indicating that maternal affectionate behaviors—kissing and hugging—combined with macronutrient intake are effective in preventing stunting among toddlers. This finding suggests that toddlers who received affectionate interactions from their mothers along with adequate macronutrient intake were

better protected against stunting. Given that this method is time-efficient, cost-effective, and does not require specialized equipment, it is recommended as a practical approach to accompany toddler feeding practices.

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