

Artikel NEW.docx

by 122 UMY

Submission date: 28-Jan-2026 11:32AM (UTC+0700)

Submission ID: 2865377508

File name: Artikel_NEW.docx (159.55K)

Word count: 5125

Character count: 31314

Local Food-Based Family Empowerment to Address Childhood Stunting: Evidence from a Quasi-Experimental Study

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ABSTRACT

Introduction: Empowering family to utilize locally sourced food is a strategy for reducing stunting in children. An underutilized native food in Indonesia, which is easily accessible, is the Moringa leaf. This study aimed to assess the impact of family empowerment in utilizing locally sourced moringa leaf nuggets to address the nutritional requirements of stunted children.

Methods: This study employs a Quasi-Experimental with a pretest-posttest design and includes a control group. The participants in this study consisted of 40 stunted children who were chosen using purposive sampling technique. The empowerment process for families consists of four steps: knowledge acquisition, self-efficacy development, training, and evaluation. This approach is delivered over three months. The primary outcome of this research is the measurement of the adequacy of Recommended Dietary Allowances (RDA) using food records and calculating it with Nutrition Survey Software. The secondary outcomes were knowledge, attitude and psychomotor of family related to stunting prevention. The data analysis in this study employed the dependent t-test and independent t-test for RDA and non-parametric test for secondary outcomes.

Results: The intervention group's pretest and post-test findings revealed a significant rise in the RDA value but there is no significant rise in the RDA value in control group. After conducting a post-test comparison between the intervention and control groups, it was found that there was no significant difference in RDA. The results for secondary outcomes show an increase in knowledge and psychomotor but no improvement in the respondents' attitudes.

Conclusion: The intervention group's pretest and post-test findings revealed a significant rise in the RDA value but there is no significant rise in the RDA value in control group. After conducting a post-test comparison between the intervention and control groups, it was found that there was no significant difference in RDA. The results for secondary outcomes show an increase in knowledge and psychomotor but no improvement in the respondents' attitudes.

KEYWORDS: Family strengthening; moringa leaves; Recommended Dietary Allowances (RDA); Stunting.

INTRODUCTION

Stunting remains a significant global health issue affecting children under the age of five in many underdeveloped nations, including Indonesia. Stunting is characterized by a decelerated development rate in children due to prolonged inadequate nutrition, resulting in a z-score value below -2 standard deviations (SD) in the WHO growth standard table (Kementerian Kesehatan Republik Indonesia, 2018; World Health Organization, 2018). Stunting is a condition of delayed growth caused by chronic malnutrition throughout the first 1000 days of life, from birth to 23 months, resulting in reduced height in children (Kementerian Perencanaan dan Pembangunan Nasional/ Badan Perencanaan dan Pembangunan Nasional, 2018). The Indonesia Basic Health Research conducted in 2018 revealed that stunting in Indonesia is 30.8% (Kementerian Perencanaan dan Pembangunan Nasional/ Badan Perencanaan dan Pembangunan Nasional, 2018). The provinces with the highest frequency of stunting in Indonesia are West Sulawesi, with a rate of 23.1%, and East Nusa Tenggara, with a rate of 22.4%. The province of Yogyakarta has a stunting prevalence of 9.2%, with the highest rate observed in the Mountain South regency at 15.4% (Ditjen Bina Pembangunan Daerah - Kementerian Dalam Negeri, 2022).

Stunting is caused by multiple factors that are interconnected with each other (Khoiriyah & Ismarwati, 2023). Children in underdeveloped nations are more likely to experience stunted growth because of low access to nutritious food and healthcare services (United Nations, 2020). Higher-income families have greater ease in accessing education, healthcare services, and adequate nutrition, resulting in improved child nutritional status and development (Huriah & Nurjannah, 2020). An important endeavor is to address the limits in accessing and obtaining essential nutrients directly at the household level, focusing on optimizing local food resources (Saleh et al., 2021). Indonesia is abundant in local food options, including the Moringa leaf. The Moringa leaf easily found in Yogyakarta, particularly in the Gunung Kidul Regency. The Gunung Kidul Regency possesses untapped potential in the form of Moringa leaves, which have yet to be fully utilized (Budiyono et al., 2022).

Moringa leaves possess substantial nutrients, making them suitable for incorporation as a supplementary ingredient in different processed foods. This addition enhances the nutritional composition, particularly for children. Moreover, Moringa leaves have effectively addressed nutritional deficiencies prevalent in African nations—the study's authors conducted by Katmawanti et al. in 2021 (Katmawanti et al., 2021). The presence of saponin in Moringa leaves contributes to their unpleasant smell and bitter taste, which affects how children perceive and accept processed food products containing Moringa leaf extract (Indriasari et al., 2019). A popular Moringa leaf dish among children is nuggets (Hiden et al., 2022; Musa et al., 2022; Nurdin et al., 2022; Vidayanana et al., 2020; Z. Suhaemi et al., 2021). The family is primarily an institution for children and is a foundation for promoting healthy behavior among its members. It plays a crucial role in shaping the quality of individuals (Arief et al., 2018; Januarti et al., 2020). Empowering families is seen as a strategy to prevent stunting and enhance their capacity to maintain the health of all family members using the available resources (Indanah et al., 2022).

Various international and national policies aim to address the issue of stunting. For example, The Global Nutrition Targets in 2025 set a goal to reduce stunting cases by 40%. The second Sustainable Development Goal (SDG) aims to eliminate all malnutrition and hunger worldwide by 2030. The National Intermediate Development Plan, 2020-2024, focuses on accelerating maternal deaths and stunting decline, hoping to reduce stunting cases by 14%. These policies emphasize the urgent need for comprehensive interventions to prevent stunting and improve the overall health of future generations. The researcher is interested in understanding the extent to which adding locally sourced leaf nuggets of Moringa, a processed product, to children's diets can significantly impact their nutritional intake and help avoid stunting. Researchers aim to enhance the nutritional intake of young children by providing them with Moringa, a local leafy food, teaching them about its utilization, and implementing a supplementary feeding program.

METHOD

The research design employed in this study is quasi-experimental, with a pretest-posttest with a control group approach. The population under research consists of stunted children in Pilangrejo Village, Nglipar, Gunungkidul, from November 2023 to January 2024. The study includes 40 respondents, with 20 respondents in the intervention group and 20 in the control group with purposive sampling technique. A sample was estimated using a formula to calculate significant data.

Criteria for inclusion in the research include mothers with stunted children. Additionally, mothers who have good communication skills, reading and writing abilities and are willing to participate in the study from start to finish are also eligible. Exclusion criteria for research include having a stunted children with autism, having a stunted children with a history of infection within the past three months, having a stunted children with psychiatric disturbances, being a primary carer with a severe illness, being a mother or nanny with communication and reading difficulties, and having a children who either passed away or decided to stop participating during the study.

The empowerment process for families consists of four essential steps: knowledge acquisition, self-efficacy development, training, and evaluation. Stage knowledge involves imparting facts about stunting in children through lectures and discussion. Stage self-efficacy involves discussing and implementing problem-solving methods to address the issue of stunting in children while drawing upon the resources and support of one's family. Furthermore, the stage provides participants with training on effectively detecting stunting in children and preparing moringa leaf nuggets. The final stage is an assessment that measures the nutritional status of children and evaluates the effectiveness of interventions in preventing stunting. The children were administered 60 grams of Moringa leaf nuggets, equating to 3 pieces, three times a day for one month while closely monitored (Figure 1). Moringa leaf nuggets are produced by nutritionists who have secured food distribution permission from the Food and Drug Supervisory Agency in Indonesia and are certified as halal.

The primary outcome of this research is the Recommended Dietary Allowances (RDA) for stunted children. RDA measurements utilize the food record instrument developed by the World Health Organisation (WHO). The mother must complete a dietary record for three months before and after the intervention. The food record data is inputted into the Nutrition Survey Software to calculate the RDA. The secondary outcome of this research was knowledge, attitude and psychomotor of mothers related to stunting prevention.

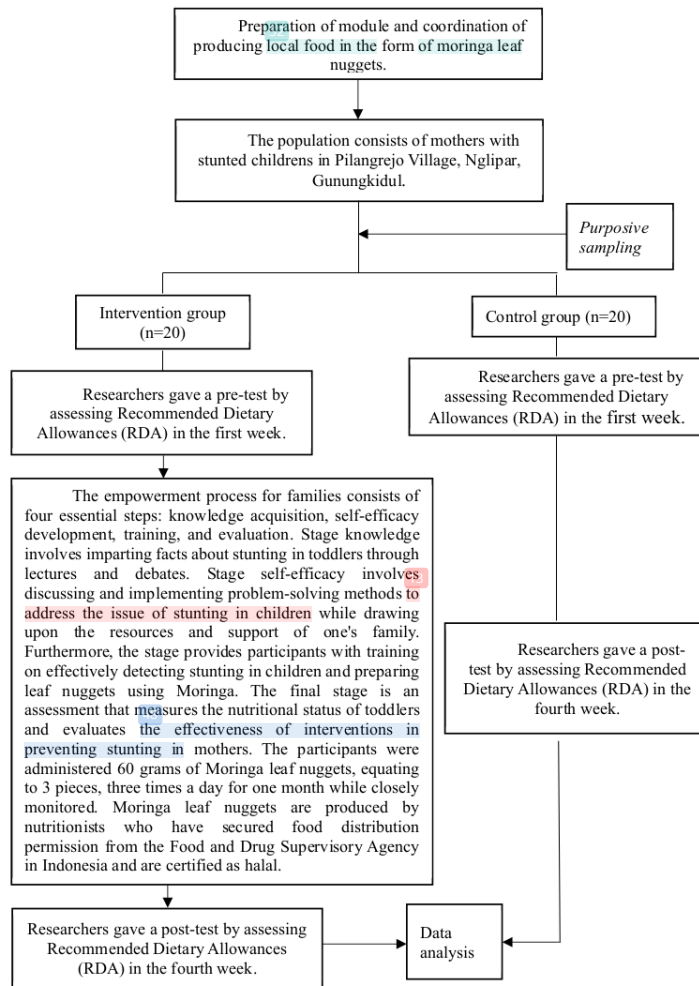


Figure 1.

Huriah. The research instruments to measure knowledge, attitude and psychomotor used the questionnaire from Huriah (2022).

The participants in this study have already received an explanation about the research and have provided informed consent. Author submitted the Ethics Research to Muhammadiyah University of Yogyakarta's Health Research Commission with reference number 310/EC-KEPK FKIK UMY/XII/2023.

RESULTS

Table 1. The respondents' description is based on the mother's age, the children's age, the child's order, and the number of children (n=40).

Characteristics Respondent	Group Control (n=20)		Group Intervention (n=20)		p*
	Min-Max	Mean±SD	Min-Max	Mean±SD	
Age Mother (years)	24-49	33.60 ± 7.54	23-44	30.50 ± 7.13	0.095
Age child (months)	13-58	35.95 ± 14.29	7-53	33.15 ± 13.87	0.267
Child order	1-4	2.20 ± 1.06	1-4	1.65 ± 0.87	0.04*
The number of children	0-4	1.25 ± 1.12	0-4	0.70 ± 0.92	0.049*

Note: *P<0.05 based on independent t-test, primary data (2024)

Table 2. The Characteristics of respondents in the intervention and control groups based on parental occupation, parental education, exclusive breastfeeding status, immunization history, parent employment, and children's gender (n = 40).

Respondents Characteristics	Control Group (n= 20)		Intervention Group (n= 20)		p*
	f	%	f	%	
Mother's Job					
– Housewife	20	100	15	75	0.057
– Self-employed	0	0	3	15	
– Civil servants/Private	0	0	2	10	
– Laborer	0	0	0	0	
Father's occupation					
– Self-employed	2	10	7	35	0.002*
– Civil servants/ Private	3	15	9	45	
– Laborer	15	75	4	20	
Mother's Education					
– College	0	0	4	20	0.061
– Senior High School	13	65	13	65	
– Junior High School	7	35	3	15	
– Elementary School	0	0	0	0	
Father's Education					
– College	1	5	2	10	0.712
– Senior High School	13	65	14	70	
– Junior High School	3	15	3	15	
– Elementary School	3	15	1	5	
Exclusive breastfeeding					
– Exclusive	20	100	15	75	0.017*
– No	0	0	5	25	
Immunization History					
– Complete	17	85	16	80	0.677
– No complete	3	15	4	20	

Primary Caregiver					
– Mother	20	100	20	100	1,000
– Father	0	0	0	0	
– Other	0	0	0	0	
Child 's Gender					
– Boy	14	70	9	45	0.110
– Girl	6	30	11	55	

Several factors influence the nutritional needs of toddlers, including the specific qualities of the toddlers themselves and the characteristics of their families. Tables 1 and 2 present the characteristic data of the respondents. Tables 1 and 2 demonstrate distinct characteristics of respondents between the control group and the intervention group in terms of the sequence of children, number of siblings, father's occupation, and exclusive breastfeeding, with a p-value of less than 0.05. Table 3 demonstrates an increase in the Recommended Daily Allowance (RDA) value in the group that received family empowerment intervention and were provided nugget products containing Moringa leaves. Additionally, there was a difference in the RDA value in the control group. Table 4 indicates no significant difference between the intervention and control groups in Recommended Daily Allowance (RDA) values.

The results indicate that in the pretest, the majority of the intervention group had moderate levels of knowledge, attitudes, and skills. After the intervention, all participants demonstrated good knowledge, moderate attitudes, and good psychomotor skills. The difference test results showed an improvement in knowledge and psychomotor skills, but no improvement in attitudes (Table 5).

Table 3. The disparities in RDA among the intervention and control (n=40)

RDA	Before Intervention (n=20)		After Intervention (n=20)		P*
	Min-Max	Mean±SD	Min-Max	Mean±SD	
RDA in Intervention Group (kcal)	478.18-1895.05	886.130 ± 336.49	581.88-1370.87	1063.99 ± 208.04	0.012
RDA in Control Group (kcal)	432.07-3519.68	1117.69±647.86	598.59-1553.27	1028.43 ± 251.53	0.289

Note: *P<0.05 based on dependent t test

Table 4. The disparities in RDA post-test scores between the group interventions and the control groups (n=40).

Research variable	Intervention Post-Test (n=20)		Control Post-Test (n=20)		P*
	Min-Max	Mean±SD	Min-Max	Mean±SD	
RDA (kcal)	581.88-1370.87	1063.99 ± 208.04	598.59-1553.27	1028.43 ± 251.53	0.324

Note: *p<0.05 based on independent t test

Table 5. The disparities in knowledge, attitude and psychomotor between the group interventions and the control groups (n=40).

Research variable		Intervention Post-Test (n=20)		Control Post-Test (n=20)		P*
		f	%	f	%	
Knowledge	Four	0	0	0	0	0.014*
	Pair	9	45	0	0	
	Good	11	55	20	100	
Attitude	Four	1	5	5	25	0.201
	Pair	18	90	15	75	
	Good	1	5	0	0	
Psychomotor	Four	5	40	0	0	0.001*

Pair	13	65	3	15
Good	1	5	17	85

Note: * $p < 0.05$ based on Mann Whitney test

DISCUSSION

The research findings indicate that the average pretest results of the RDA value in the group intervention are 886.130 ± 336.49 , with a minimum score of 478.18 and a maximum score of 1895.05. The average pretest findings of RDA values in the control group is 1063.99 ± 208.04 , with a minimum score of 432.07 and a maximum score of 3519.68. The study found that parental education and employment are significant factors determining the occurrence of stunted children, which impacts their nutrition and overall fulfillment.

The demographic data obtained indicates that neither the control nor the intervention group had a dominant level of parental education at the high school and middle school levels. According to Jasmawati (2020), education and maternal knowledge are strongly associated with and significantly impact children's nutritional well-being (Jasmawati, 2020). Mothers with higher education possess more information in several areas and have a heightened awareness of the need to nurture and provide proper nutrition for their children. The research conducted by Maulina et al. (2021) asserts that mothers play a crucial role in the family as they possess autonomy and are responsible for their children's health, including providing appropriate nutrition and creating a conducive environment (Maulina et al., 2021). Furthermore, the study suggests that mothers with a higher level of knowledge are more likely to take actions that promote good habits in their children. This finding is supported by the works of Ilmani & Fikawati (2023), Munawaroh et al. (2022) (Ilmani & Fikawati, 2023; Munawaroh et al., 2022). Contrary to the previous statement, other studies by Pertiwi et al. (2021); Simamora & Kresnawati (2023) suggest that educated mothers who are tall and have high-intensity work activities tend to have reduced time and attention for their children, which can lead to nutritional deficiencies (Pertiwi et al., 2021; Simamora & Kresnawati, 2023).

The mother's role in the household mainly involves overseeing and managing the household affairs. In contrast, the father's role mainly focuses on working as a civil servant and professionally overseeing larger groups and interventions. Parents' occupation is directly linked to their economic position, affecting the family's ability to purchase food and complete their child's nutritional needs. The procurement of additional food is influenced by effort, fulfillment of balanced nutrition, and increased expenses. Higher-income families have a greater likelihood of being able to provide adequate nutrition for their children (Ghosh, 2020; Khotimah et al., 2023). However, there are conflicting opinions on this matter. According to Huriyah et al. (2021), Pertiwi et al. (2021), Simamora & Kresnawati (2021, 2023), working mothers often spend a significant amount of time on their jobs, which can result in insufficient time and attention being given to properly care for their children's growth and nutrition (Huriyah et al., 2021; Pertiwi et al., 2021; Simamora & Kresnawati, 2021, 2023). This factor could increase the risk of stunting.

The researcher's research demonstrates a considerable enhancement in the RDA value when comparing the pretest and post-test AKG values in the control group. The p-value is 0.289, indicating that the difference is insignificant ($p > 0.05$). The research findings indicate that no treatment or dietary intervention for toddlers is available. According to the study conducted by Simamora & Kresnawati, 2021, it was found that a balanced nutrition intake during pregnancy should include a variety of foods that meet the body's needs in terms of type and quantity (Simamora & Kresnawati, 2021). However, the research results indicate that many toddlers need more nutrition due to a lack of vegetable consumption.

The pretest and post-test findings of RDA values in the group intervention indicate a p-value of 0.012, suggesting a statistically significant improvement in nutritional fulfillment after administering the moringa leaf product in the intervention group. This topic arises from the implementation of group intervention, where leaf nuggets made from Moringa are introduced as a dietary variation in children's daily lives. According to a study conducted by Khotimah et al. (2023), it has been found that consuming a well-balanced diet consisting of a variety of foods has a crucial role in meeting children's nutritional needs and helps reduce stunting (Khotimah et al., 2023). Diversity in cuisine is achieved by offering a variety of dietary staples, side dishes, vegetables, and fruits. Additional research suggests that meals' frequency and portion size are related to fulfilling a child's nutritional needs. Eating less can also impact the fulfillment of a child's daily nutritional requirements, which are necessary for their everyday activities. A prolonged lack of fulfillment can lead to stunting in children, hindering their growth (Hadi et al., 2022; Samosir et al., 2023).

1 The results of the post-test comparison of RDA levels between the group intervention and control demonstrate no significant difference. The significant number of RDA indicated by the p-value of 0.314 is more significant than 0.05. Several things may influence this matter. Factors influencing a study include parental knowledge, fulfillment, nutrition, and stunting education. The researcher does not measure parental knowledge or provide instruction on nutrition fulfillment for toddlers, as their focus is solely on stunting education. According to a study by Hapsari & Ichsan, 2018, there is a direct correlation between the level of knowledge of mothers regarding nutrition and the risk of stunting (Hapsari & Ichsan, 2018). The demographic data shows that the average education level of mothers is high school and middle school, although some parents have completed college. These results suggest that the parents' knowledge level in both groups, including those with higher education, can be linked to the incidence of stunting. According to Lemaking et al. (2022), the depth of parental work studies is another factor that increases the risk of stunting (Lemaking et al., 2022). However, this aspect has yet to be well investigated; it is nevertheless associated with family wealth, but the specific relationship still needs to be understood. Demographic statistics indicate that many workers were employed in group control roles, while many civil servants worked in group intervention roles.

This study shows that there is a significant improvement in mothers' knowledge about toddlers after the empowerment program, with a p-value of 0.001 in the intervention group. This result aligns with the predetermined hypothesis, indicating a difference before and after family empowerment in utilizing local food, specifically Moringa leaf nuggets, among mothers.

A person's level of knowledge about stunting reflects their behavior in addressing the issue. Good knowledge is expected to influence their ability to tackle stunting-related problems, such as its prevention and management. Therefore, the empowerment program on stunting aimed to improve knowledge and prevention strategies. The findings of this study are consistent with research conducted by Rohayati & Aprina (2021), which reported an increase in knowledge following teaching sessions using discussion methods (Rohayati & Aprina, 2021). However, Noviyanti (2020) found that when the teaching method was limited to lectures without discussion, there was no progress or improvement in respondents' knowledge levels (Noviyanti, 2020). Efforts to enhance the knowledge of mothers of toddlers regarding stunting prevention behavior have proven effective, with discussion-based counseling offering notable advantages. The interactive delivery of messages makes the material clearer and fosters respondents' enthusiasm for learning (Astuti et al., 2023).

During the stunting prevention counseling for mothers of toddlers, the use of instructional modules supported the learning process, making it easier for respondents to understand the material on stunting and its prevention using local food, such as Moringa leaf nuggets. The module's content includes definitions of stunting, risk factors, causes, prevention strategies, and the use of local Moringa leaves to address stunting issues. This study aligns with research conducted by Prihartanti et al. (2023), which demonstrated that using modules effectively increases individuals' knowledge (Prihartanti et al., 2023).

The findings of this study revealed a data analysis result of $p = 0.201$, indicating that there was no significant effect of attitude after family empowerment. This outcome is likely due to several factors, including educational background. The respondent characteristics in this study indicated that most caregiver mothers had completed their education only up to high school, with 65% in both the intervention and control groups. In contrast, a study conducted by Ekayanthi & Suryani (2019) demonstrated a change in attitude after the intervention. In that study, the majority of respondents had a lower level of education (elementary and middle school) at 57.1%, and prior to the intervention, 51.4% of respondents exhibited negative attitudes, meaning they had limited information about stunting in toddlers (Ekayanthi & Suryani, 2019).

Based on the above, it can be concluded that a person's level of education significantly influences their attitude formation regarding stunting issues. The higher the level of education, the greater the impact on attitude formation, and conversely, lower education levels may result in a lesser influence on attitude development.

The research findings indicate a difference in psychomotor skills between the intervention group and the control group, as shown by a statistical p-value of 0.001. The education method using demonstrations enhances skills and provides new experiences for mothers of toddlers in stunting prevention behavior (Rahmawati et al., 2021; Sarinengsih et al., 2021). In line with the research results, after treatment was given to the intervention group, the majority were able to improve their psychomotor skills in efforts to prevent stunting in mothers of toddlers.

CONCLUSION

Based on the study's results, family empowerment in utilizing locally sourced moringa leaf nuggets can improve the nutrition of stunted children. The secondary outcome of this study shows an improvement in the knowledge, attitudes, and psychomotor skills of mothers of toddlers regarding stunting prevention. Various factors influence the success of this intervention; however, they have yet to be thoroughly explored by the researchers.

AUTHOR'S CONTRIBUTION STATEMENT

All authors (TH, AAP, and EA) discussed the conceptualization of the study, prepared the proposal through to the research findings, conducted the intervention, and drafted the manuscript. Additionally, TH carried out data processing and analysis of the research results, AAP prepared the research instruments, and EA was responsible for coordinating with the research enumerators and managing research permits.

CONFLICTS OF INTEREST

There is no situation where personal interests could influence or compromise objective decision-making.

SOURCE OF FUNDING STATEMENTS

We express our gratitude to the UMY Study and Innovation Institute for their support in this research endeavor.

ACKNOWLEDGMENTS

We thank everyone who participated in the research, including community health workers and anonymous parties.

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