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Utilization of Moringa Leaf Pudding as a Solution within the Germas Tating (Turirejo Community Movement to Combat Stunting) Program for Toddlers

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A B S T R A C T

Stunting is a condition in which toddlers have a length or height below the standard for their age, reflecting chronic malnutrition. Various strategies have been implemented to address this issue, including the provision of complementary feeding (MP-ASI) using locally available food sources to ensure age-appropriate nutrient intake. According to the Auxiliary Public Health Center in Turirejo Village, Gresik Regency, the prevalence of stunting has declined in recent years; however, in 2022, 30 toddlers were still identified as stunted, making it a continuing public health concern. The intervention employed a structured approach consisting of problem identification, development of a problem-solving framework, pre-test assessment, health education and practical training, and post-test evaluation. As a practical solution, a demonstration of complementary food preparation using moringa (Moringa oleifera) leaves was conducted. Moringa leaves were processed into moringa pudding as a protein-rich supplementary food for stunted toddlers. Pre-test and post-test results were presented in percentage form, and differences in knowledge among mothers of toddlers and posyandu cadres regarding stunting, complementary feeding, and exclusive breastfeeding were analyzed using the Wilcoxon signed-rank test. The findings indicated a p-value < 0.05, demonstrating a significant improvement in knowledge after the educational session. Participants were able to prepare and serve moringa pudding according to the demonstrated recipe. This socialization and local food–based complementary feeding initiative serves as a community learning strategy to prevent further increases in stunting prevalence in Turirejo Village.

INTRODUCTION

Globally, stunting is one of the targets of the Sustainable Development Goals (SDGs). Indonesia is among the countries committed to achieving SDG 2, which includes addressing malnutrition, particularly by reducing the prevalence of stunting by 2025. This objective is aligned with SDG 3, which aims to ensure healthy lives and promote well-being for all at all ages.

Stunting remains a major nutritional problem in Indonesia. According to the Ministry of Health of the Republic of Indonesia (2023), the prevalence of stunting among children under five in 2022 was 21.6%. This figure remains higher than the 19% target set in the National Medium-Term Development Plan (RPJMN) for 2024. Compared with other nutritional problems such as underweight, wasting, and overweight, stunting represents the most significant concern. Based on prevalence rates, stunting is categorized as mild (20–29%), moderate (30–39%), and severe (≥40%). With a prevalence of 21.6%, Indonesia falls within the mild category.

Stunting is defined as a condition in which a child's length or height-for-age is below the standard. Its primary cause is inadequate nutritional intake, compounded by multidimensional factors such as poor

caregiving practices, limited access to health services (e.g., antenatal care), insufficient access to nutritious food, and inadequate water and sanitation. Additional contributing factors include maternal chronic energy deficiency during pregnancy, recurrent infections, long-term chronic malnutrition, fetal growth restriction, inadequate protein intake, and hormonal changes due to stress. Poor sanitation may also lead to prolonged diarrhea, impairing nutrient absorption.

Comprehensive efforts are required to prevent and address stunting, including community engagement through education and preventive initiatives. Behavioral factors such as low sanitation standards, limited maternal knowledge of nutrition, parental workload, and economic constraints also contribute to the problem. One key intervention is the provision of complementary feeding (MP-ASI) using locally available food sources to ensure age-appropriate nutritional intake.

Turirejo Village, Kedamean District, Gresik Regency, has experienced a gradual decline in stunting cases; however, as of 2022, 30 children under five were still affected. Although the number has decreased, stunting remains a priority issue for the local health authorities. This concern motivated students from Nahdlatul Ulama University of Surabaya, during their 2023 Community Service Program (KKN), to initiate Germas Tating (Turirejo Community Movement to Overcome Stunting).

Germas Tating is a community-based and sustainable movement aimed at increasing public awareness and integrating both specific and sensitive interventions targeting health cadres, pregnant women, mothers of toddlers, and other community groups. As agents of change, university students support local efforts by optimizing the village's natural resources, particularly moringa leaves. Moringa (Moringa oleifera L.) is a nutrient-dense food containing both macro- and micronutrients beneficial for child growth and development. It is also known to enhance breast milk production due to its content of beta-carotene, thiamine (B1), riboflavin (B2), niacin (B3), calcium, iron, phosphorus, magnesium, zinc, and vitamin C.

The objective of the Germas Tating socialization program is to improve the knowledge of health cadres and mothers regarding stunting and to enhance their skills in preparing age-appropriate complementary foods through the optimal utilization of moringa leaves.

METHOD

The implementation methods used in the Germas Tating socialization program included the following stages:

A. Problem Identification

Based on research findings and field surveys, several issues were identified: limited knowledge among mothers and families regarding stunting, exclusive breastfeeding, and complementary feeding (MP-ASI); inadequate skills among health cadres and mothers of toddlers in preparing complementary foods using

locally available ingredients; limited variation in complementary foods; and inappropriate types and portion sizes of MP-ASI that did not correspond to the child's age.

B. Problem-Solving Framework

The agreed problem-solving framework included: (1) addressing limited maternal and family knowledge regarding stunting, exclusive breastfeeding, and MP-ASI through health education sessions delivered via lectures supported by leaflets and PowerPoint presentations. The success indicator was an increase in knowledge among cadres and mothers of toddlers, measured using pre-test and post-test questionnaires; (2) improving the practical skills of cadres and mothers in preparing locally based complementary foods through hands-on training in the preparation and serving of age-appropriate MP-ASI, specifically moringa leaf pudding. The success indicator was participants' ability to prepare and serve moringa pudding appropriately; and (3) correcting inappropriate types and portion sizes of MP-ASI by providing health education on the importance of age-appropriate complementary feeding, with knowledge improvement measured through pre-test and post-test questionnaires.

C. Problem-Solving Methods

The activities included administering a pre-test to assess baseline knowledge; delivering education on stunting, exclusive breastfeeding, and complementary feeding; conducting practical training on preparing complementary foods using local ingredients; and administering a post-test to evaluate knowledge improvement.

D. Data Analysis

Pre-test and post-test results were presented as percentage distributions. To assess differences in knowledge before and after the intervention, the Wilcoxon signed-rank test was used to analyze changes in participants' knowledge regarding stunting, exclusive breastfeeding, and complementary feeding.

RESULT AND DISCUSSION

The results obtained in the counseling entitled "Utilization of Moringa Pudding as a Solution for Germas Tating (Turirejo Community Movement to Overcome Stunting) in Stunted Toddlers" are as follows:

Table 1. Pre-Test

No	Questions	Number of participants who answered correctly	Percentage of participants who answered correctly	Number of participants who answered incorrectly	Percentage of participants who answered incorrectly
1	What is the definition of stunting?	36 Participant	100%	0 Participant	0%
2	At what age do symptoms of stunting begin to appear in infants?	4 Participant	11,1%	32 Participant	88,9%
3	Mention one sign or symptom of stunting.	36 Participant	100%	0 Participant	0%
4	As a stunting risk factor, what should be done to maintain	9 Participant	25%	27 Participant	75%

	environmental hygiene?				
5	At what age should exclusive breastfeeding be given to infants?	35 Participant	97,2%	1 Participant	2,8%
6	At what age may infants receive both breast milk and family foods?	10 Participant	27,7%	16 Participant	72,3%
7	Which of the following are impacts of stunting?	35 Participant	97,2%	1 Participant	2,8%
8	Which of the following are methods to prevent stunting in pregnant women during childbirth?	27 Participant	75%	9 Participant	25%
9	Which of the following are methods to prevent stunting among adolescents?	34 Participant	94,4%	2 Participant	5,6%
10	Practicing clean and healthy living behaviors (PHBS), maintaining balanced nutrition, not smoking, and avoiding drug use are included as methods to prevent stunting in young adults.	31 Participant	86,1%	5 Participant	13,9%

Table 2. Posttest

No	Questions	Number of participants who answered correctly	Percentage of participants who answered correctly	Number of participants who answered incorrectly	Percentage of participants who answered incorrectly
1	What is the definition of stunting?	35 Participant	97,2%	1 Participant	2,8%
2	At what age do symptoms of stunting begin to appear in infants?	28 Participant	77,7%	8 Participant	22,3%
3	Mention one sign or symptom of stunting.	36 Participant	100%	0 Participant	0%
4	As a stunting risk factor, what should be done to maintain environmental hygiene?	17 Participant	47,2%	19 Participant	52,8%
5	At what age should exclusive breastfeeding be given to infants?	35 Participant	97,2%	1 Participant	2,8%
6	At what age may infants receive both breast milk and family foods?	14 Participant	38,9%	22 Participant	61,1%
7	Which of the following are impacts of stunting?	36 Participant	100%	0 Participant	0%
8	Which of the following are methods to prevent stunting in pregnant women during childbirth?	32 Participant	88,9%	9 Participant	11,1%
9	Which of the following are methods to prevent stunting among adolescents?	36 Participant	100%	0 Participant	0%
10	Practicing clean and healthy living behaviors (PHBS), maintaining balanced nutrition, not smoking, and avoiding drug use are included as methods to prevent stunting in young adults.	36 Participant	100%	0 Participant	0%

Table 3. Difference between Pre-Test and Post-Test averages

Test Statistics[a]

	posttest - pretest
Z	-4,811[b]
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

The results of questionnaire distribution to 36 seminar participants, consisting of posyandu cadres and mothers of toddlers, showed that based on the pre-test scores, 100% of participants understood the definition of stunting; 11.1% knew the age at which stunting symptoms begin to appear; 100% recognized the signs and symptoms of stunting; 25% understood appropriate hygiene practices as a preventive measure against stunting risk; 97.2% knew when exclusive breastfeeding should be given; 27.7% knew the appropriate age at which infants may receive both breast milk and family foods; 97.2% understood the impacts of stunting; 75% knew how to prevent stunting during pregnancy and childbirth; 94.4% understood prevention strategies during adolescence; and 86.1% were aware of prevention efforts in young adulthood. Following the health education intervention and practical training, participants' knowledge increased significantly: 100% understood the definition of stunting; 77.7% knew the age at which symptoms begin to appear; 100% recognized its signs and symptoms; 47.2% understood hygiene-related preventive measures; 97.2% knew when exclusive breastfeeding should be provided; 38.9% knew the appropriate age for introducing family foods alongside breastfeeding; 100% understood the impacts of stunting; 88.9% knew prevention strategies during pregnancy and childbirth; and 100% understood prevention efforts during adolescence and young adulthood. The Wilcoxon test results indicated that the p-value was less than α (0.05), demonstrating a statistically significant difference in knowledge before and after the educational intervention.

The flagship community service program conducted by Group 25 of Universitas Nahdlatul Ulama Surabaya in Turirejo Village, Kedamean District, Gresik Regency, was implemented through a stunting awareness seminar entitled "Utilization of Moringa Pudding as a Solution for Germas Tating (Turirejo Community Movement to Overcome Stunting) for Toddlers," held on Monday, July 31, 2023, at the Turirejo Village Hall. The activity was attended by 36 participants, including mothers of toddlers and posyandu cadres.

The issues addressed were identified through situational analysis and interviews with healthcare staff from the Turirejo Village Auxiliary Health Center. Identified problems included limited maternal and family

knowledge regarding stunting, exclusive breastfeeding, and complementary feeding; inadequate skills in preparing locally based complementary foods; limited variation in complementary feeding; and inappropriate types and portion sizes of complementary foods. Although the prevalence of stunting has declined annually, 30 toddlers in Turirejo Village were still reported to be affected.

Therefore, the Germas Tating (Turirejo Community Movement to Overcome Stunting) program was implemented as a community-based initiative to enhance awareness and provide practical solutions, including the utilization of local resources such as moringa leaves as a complementary food source for stunted toddlers. The first step involved administering a pre-test consisting of ten open-ended questions to assess participants' baseline knowledge prior to the educational session.

Figure 1. Pretest

The second step involved delivering health education on stunting, exclusive breastfeeding, and complementary feeding (MP-ASI) using leaflets and PowerPoint presentations as educational media. The socialization session was conducted using a two-way communication approach, beginning with a presentation by the speakers followed by a discussion and question-and-answer session. The material was presented by Mauladatul Choir, a medical student from the Undergraduate Medical Education Program, and Afianti Diah Anjelia, an undergraduate midwifery student.

Participants' interest and enthusiasm were evident from their punctual attendance and active engagement throughout the session. They listened attentively and demonstrated a strong commitment to understanding the material presented. Several participants actively asked questions regarding stunting and the appropriate preparation of complementary foods according to a child's age. In addition, participants inquired about how to prepare complementary foods using locally available ingredients in Turirejo Village.

Figure 2. Material explanation

The third step involved administering a post-test to assess participants' understanding after the educational session had been delivered. The post-test was conducted by distributing a questionnaire consisting of ten open-ended questions to the participants. They were then asked to complete the questionnaire according to their level of knowledge following the lecture and discussion.

Figure 3. Posttest

Natural resources in Turirejo Village are abundant, one of which is moringa (Moringa oleifera L.). The utilization of moringa leaves has strong potential to address the problem of stunting in the village. Proper processing innovations are necessary to optimize its nutritional benefits. Therefore, moringa leaves were processed into pudding, as pudding can be consumed by children starting at nine months of age and has a soft texture that is suitable and easily accepted by toddlers.

Moringa (Moringa oleifera L.) is a plant native to India and is commonly cultivated in Indonesia as a living fence. It contains numerous bioactive compounds, particularly antioxidants found in its leaves.

Moringa leaves are rich in flavonoids, triterpenoids, alkaloids, saponins, and phenolic compounds. In addition, they contain essential nutrients such as protein, β-carotene, vitamin C, and various minerals. A study by Hermansyah et al. (2014) reported that moringa leaf extract supplementation increased body weight among pregnant women working in the informal sector. The World Health Organization (WHO) also recommends the addition of 10–15 grams of moringa leaf powder to 100 grams of breast milk or formula for infants over six months of age to enhance nutritional value.

To reinforce participants' understanding and address questions regarding the use of local ingredients for complementary feeding (MP-ASI), a live demonstration on preparing moringa pudding as a protein-rich complementary food for stunted toddlers was conducted. The preparation involved the following steps: first, preparing the necessary equipment (blender, pot, ladle, cloth filter, stove, gas cylinder, bowls, pudding cups, spoon, strainer, and molds) and ingredients (moringa leaves, eggs, agar powder, coconut milk, water, sugar, salt, and pandan leaves).

To prepare the pudding, 25 grams of cleaned moringa leaves were blended with 15 ml of water and then strained using a cloth-lined strainer to obtain the extract. Three eggs were blended until frothy and mixed with the moringa extract in a pot. The mixture was diluted with 1,500 ml of water, heated over medium flame while stirring until boiling, and then 75 grams of agar powder were added and mixed evenly. Pandan leaves and 195 ml of coconut milk were added, and the mixture was heated until boiling while ensuring a smooth consistency. The cooked pudding was poured into molds and allowed to set.

The solidified moringa pudding was then served to participants. It can be stored for up to two days under refrigeration or approximately 10 hours at room temperature.

Figure 3. Distribution of Moringa Pudding to Socialization Participants

CONCLUSION

The stunting education and moringa pudding demonstration program in Turirejo Village was successfully implemented with the participation of mothers of toddlers and community health cadres. Conducted through problem identification, pre- and post-tests, health education, and practical training, the Germas Tating initiative aimed to improve knowledge of stunting, exclusive breastfeeding, and complementary feeding (MPASI) while promoting moringa-based complementary food as a local nutritional solution. The program enhanced participants' knowledge and creativity, supported stunting prevention efforts, and offered potential economic benefits for the community.

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