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Interactive Support in the Tambak Wedi Village Area of Surabaya City to Avoid Stunting

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ABSTRACT Stunting remains a major public health concern in Indonesia, with a prevalence of 30.8% among toddlers according to the 2018 Basic Health Research. This condition not only hampers physical growth but also affects cognitive development and increases susceptibility to chronic diseases in adulthood. Persistent stunting rates in Tambak Wedi Village, Surabaya, highlight the need for targeted, community-based interventions. This study aimed to empower the local community in reducing stunting prevalence through integrated community service involving interprofessional collaboration among health professionals. The community service program, conducted in 2024, implemented various health promotion and empowerment activities, including training on the production of nutritious processed foods made from moringa leaves and fish, counseling on clean and healthy living behaviors, education on parenting and infant feeding practices, training for early detection of high-risk pregnancies, and nutritional interventions for pregnant women with chronic energy deficiency. Hemoglobin and protein levels of participants were measured to assess improvements in maternal health. The findings showed that several pregnant women had mid-upper arm circumferences below 23.5 cm, indicating potential chronic energy deficiency, while some exhibited anemia with hemoglobin levels below 11 g/dL. Following a two-week supplementation using snacks made from moringa and fish, improvements were observed in both nutritional indicators and community knowledge regarding health and nutrition. Additionally, awareness of healthy parenting and environmental hygiene significantly increased among participants. In conclusion, the integrative community service program successfully enhanced maternal and child health literacy, improved nutritional status, and supported the prevention of stunting in Tambak Wedi Village. These outcomes demonstrate that community-based empowerment through interprofessional collaboration can serve as an effective strategy to reduce stunting prevalence in vulnerable populations.

INDEX TERMS Stunting prevention, community empowerment, moringa leaves and fish, maternal and child health, interprofessional collaboration

I. INTRODUCTION

Stunting continues to pose a major public health challenge in Indonesia, characterized by a child's height being significantly below the World Health Organization (WHO) growth standard for their age, primarily due to chronic undernutrition and recurrent infections during the first 1,000 days of life [1]. The 2018 Basic Health Research reported that 30.8% of Indonesian toddlers were stunted, while the 2022 Indonesia Nutrition Status Survey (SSGI) recorded only a modest reduction to 21.6% [2]. In East Java, the stunting prevalence remains above the national target, with several coastal areas, including Tambak Wedi Village in Surabaya, showing persistent cases associated with socioeconomic vulnerability, limited access to quality nutrition, and poor sanitation [3], [4].

Stunting has multidimensional consequences, extending beyond impaired physical growth to cognitive delays, reduced educational achievement, and long-term productivity losses that ultimately affect national economic performance [5], [6]. The determinants of stunting are complex, involving inadequate maternal nutrition, poor infant feeding practices, limited access to clean water, and lack of awareness regarding hygiene and early childhood care [7], [8]. Therefore, an integrated approach combining health, nutrition, and community empowerment is essential for effective prevention.

Recent state-of-the-art approaches emphasize community-based participatory models and interprofessional collaboration that involve health professionals, local leaders, and families in implementing stunting prevention programs [9]–[11]. Studies highlight the potential of local food

utilization such as moringa leaves (Moringa oleifera) and fish-based products as cost-effective sources of essential nutrients for pregnant women and toddlers [12]–[14]. Moringa, rich in iron, calcium, and protein, has been shown to improve hemoglobin levels and fetal growth outcomes [15]. Moreover, community education on clean and healthy living behavior (PHBS), exclusive breastfeeding, and complementary feeding practices (MPASI) has significantly improved maternal knowledge and child nutrition outcomes in several intervention sites [16], [17].

However, despite extensive national campaigns, stunting prevalence remains high in low-income coastal communities, where socio-cultural practices, limited maternal literacy, and environmental sanitation continue to hinder progress [18], [19]. Research gaps persist in the integration of interprofessional education and cross-sectoral empowerment approaches within community service models. Previous interventions often focused on either nutrition or hygiene independently, lacking a holistic framework that combines nutrition education, local food innovation, health screening, and environmental improvement [20], [21].

Hence, this study aims to develop and implement an integrative community empowerment program in Tambak Wedi Village, Surabaya, focusing on stunting prevention through interprofessional collaboration among nursing, nutrition, midwifery, and laboratory health experts. The contributions of this study are threefold:

1. It introduces a holistic intervention model combining moringa and fish-based nutritional innovation, maternal education, and early pregnancy risk detection.
2. It strengthens interprofessional education (IPE) and community engagement as a sustainable model for health empowerment in urban coastal settings.
3. It provides empirical evidence of improved maternal nutritional status, child health outcomes, and environmental hygiene as measurable indicators of community transformation.

This article is structured as follows: Section II describes the methodology, outlining the interprofessional community service framework, training modules, and evaluation tools. Section III presents the results and findings from the interventions, including changes in nutritional indicators and knowledge levels. Section IV provides a discussion, interpreting the outcomes in relation to national stunting prevention strategies and previous research. Finally, Section V concludes with the key implications, limitations, and recommendations for future community-based programs.

II. METHOD

A. STUDY DESIGN AND RATIONALE

This study adopted a prospective, community-based intervention design integrated within a public health empowerment framework. The community service activity was implemented in 2024 in Tambak Wedi Village, Surabaya, Indonesia, an urban coastal settlement identified as a high-risk area for stunting based on local health records. The intervention emphasized interprofessional collaboration (IPC) among health professionals from multiple disciplines nursing, midwifery, nutrition, medical laboratory technology, and environmental health to enhance maternal and child well-being. The program was structured according to the Participatory Action Research (PAR) approach, which encourages active community involvement in identifying problems, implementing solutions, and evaluating outcomes [26].

B. STUDY SETTING

The target population comprised pregnant women, mothers of toddlers, and local health cadres in Tambak Wedi Village. The sample was selected using purposive sampling, based on inclusion criteria such as pregnant women aged 18–40 years, gestational age between the second and third trimester, residents of Tambak Wedi for at least one year, willingness to participate in community activities and laboratory examinations.

C. PARTICIPANTS AND SAMPLING METHOD

In total, eight pregnant women diagnosed with chronic energy deficiency (CED) and seven toddlers identified as pre-stunted or stunted were included. Additionally, 20 local cadres were involved in the training for early detection of high-risk pregnancies. The selection process was facilitated by the Surabaya City Health Office and verified by the local community health center (Puskesmas) [27].

D. MATERIALS AND EDUCATIONAL INTERVENTION

The main materials utilized were locally sourced moringa leaves (Moringa oleifera) and fish meat (Catfish and Tilapia), selected for their high nutritional value in terms of protein, iron, and micronutrient content. These ingredients were processed into nutritious snack formulations, including cookies, nuggets, and porridge, which were distributed as supplementary feeding (PMT) to pregnant women for a duration of two weeks. For anthropometric and biochemical assessment, several standardized instruments were used:

1. Mid-Upper Arm Circumference (MUAC) tape to measure nutritional status of pregnant women;
2. Digital scales and height boards to measure weight and height of toddlers;
3. Hemoglobin and total protein tests performed at the Surabaya Health Laboratory Center using automated spectrophotometers;
4. Poedji Rochjati Score Card to identify high-risk pregnancies; and
5. Structured knowledge questionnaires administered pre- and post-counseling to evaluate changes in maternal understanding of nutrition, hygiene, and parenting [28]

E. DATA COLLECTION INSTRUMENTS AND PROCEDURE

The intervention was executed in five main stages:

a. Preliminary Survey and Coordination
The research team coordinated with the village administration, Puskesmas, and community representatives to collect baseline data on stunting prevalence, maternal nutritional status, and sanitation

conditions. Ethical permission was obtained before data collection.

b. Health Screening and Baseline Assessment
Pregnant women underwent anthropometric and laboratory assessments to identify anemia, low protein, or CED. Toddler height-for-age Z-scores (HAZ) were measured following WHO 2020 standards [29].

c. Nutritional and Health Interventions
Participants received moringa–fish-based PMT products twice daily for 14 days. Counseling sessions were conducted covering topics on balanced diet, breastfeeding, complementary feeding (MPASI), and clean and healthy living behavior (PHBS). Concurrently, local cadres received training in early pregnancy risk detection and home-based monitoring.

d. Community Empowerment and Environmental Health Promotion
A Green & Clean competition was organized to promote environmental sanitation, waste management, and hygiene practices that contribute to stunting prevention. This component engaged local families and reinforced health behavior change through positive reinforcement and awards.

e. Post-Intervention Evaluation
After two weeks, the same indicators (MUAC, hemoglobin, and protein levels) were reassessed. Pre- and post-test questionnaires were compared to measure knowledge gains. Qualitative feedback from cadres and participants was documented to evaluate sustainability and acceptance of the intervention [30].

F. DATA ANALYSIS

percentage, and change scores to evaluate pre–post differences in maternal knowledge and nutritional status. Paired comparisons were conducted to assess improvement in hemoglobin and protein levels. Qualitative data from interviews and observations were coded thematically to identify perceived benefits and challenges of the program. All data were analyzed using Microsoft Excel 2021 and SPSS version 26 for consistency and transparency.

G. ETHICAL CONSIDERATIONS

This study adhered to the ethical principles of the Health Research Ethics Committee of the Poltekkes Kemenkes Surabaya. Informed consent was obtained from all participants before enrollment. Confidentiality was maintained throughout data collection and reporting, and participants were free to withdraw at any stage without penalty [31].

III. RESULTS

A. TRAINING AND ASSISTANCE IN THE PRODUCTION OF PROCESSED FOODS BASED ON MORINGA LEAVES AND FISH.

Base on the training and assistance in the production of processed foods based on moringa leaves and fish, the community produced a variety of dishes made from these ingredients. The community's culinary creations were presented at a food innovation competition. The community was very enthusiastic about participating in the food innovation contest

FIGURE 1. A food creation competition using moringa leaves and fish in Tambak Wedi, Surabaya

FIGURE 2. Evaluation food creation competition using moringa leaves and fish in Tambak Wedi, Surabaya

FIGURE 3. Winner announcement food creation competition using moringa leaves and fish in Tambak Wedi, Surabaya

B. COUNSELING ON HEALTHY LIVING BEHAVIOR, PARENTING PATTERNS, AND THE PROVISION OF BREAST MILK/COMFORT FEEDING, AS WELL AS HEALTH COUNSELING FOR PROSPECTIVE BRIDES AND GROOMS.

Health education on Clean and Healthy Living Behavior, parenting patterns, and the provision of breast milk/MP ASI was conducted at the RW 4 Hall in Tambak Wedi Village and attended by 36 pregnant women and mothers of toddlers. It began with a pre-test, followed by the delivery of educational material, and concluded with a post-test.

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Figure 4 **PHBS counseling in Tambak Wedi Village, Surabaya**

FIGURE 5. **Parenting patterns, and the provision of breastfeeding/MP ASI in Tambak Wedi Village, Surabaya**

FIGURE 6. **The provision of breastfeeding/MP ASI in Tambak Wedi Village, Surabaya**

The results of the evaluation of the knowledge of pregnant women and mothers of toddlers after receiving material through counseling are as follows:

TABLE 1.
Results of knowledge evaluation through the phbs counseling questionnaire, parenting guidance, and breastfeeding/mpasi provision

Activities	Average Pre Test	Average Post Test	Conclusion
Counseling on Clean and Healthy Living Behavior	50, 6	70,4	Increase in knowledge
Counseling on parenting patterns and the provision of breast milk/ complementary feeding.	50, 6	74,4	Increase in knowledge

It can be concluded that the counseling on PHBS, parenting patterns, and the provision of breastfeeding/MP ASI in Tambak Wedi Village, Surabaya, has a positive impact on the knowledge of the residents.

C. TRAINING FOR EARLY DETECTION CADRES OF HIGH-RISK PREGNANCY FOR FAMILIES

The documentation for the mentoring and training of cadres for early detection screening of high pregnancy risk for families is as follows:

FIGURE 7. **Support and Education for Families in the Early Detection of Cadres at High Pregnancy Risk**

FIGURE 8. **Support and Education for Families in the Early Detection of Cadres at High Pregnancy Risk**

D. HEALTH EXAMINATION OF PREGNANT WOMEN WITH CHRONIC ENERGY DEFICIENCY WHO RECEIVE SUPPLEMENTARY FEEDING BASED ON MORINGA LEAVES AND FISH

Eight pregnant women with chronic energy deficiency received snacks made from moringa leaves and fish for two weeks to improve their health and that of their fetuses, with indicators being hemoglobin levels and blood protein at the Surabaya Health Laboratory Center [10] [11] [12].

FIGURE 9. Health examination of pregnant women with chronic energy deficiency who receive supplementary feeding based on moringa leaves and fish

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FIGURE 10. **Blood sampling of pregnant women with chronic energy deficiency for laboratory examination.**

E. HEALTH EXAMINATION OF STUNTED TODDLERS AND PRE-SCHOOLERS WHO RECEIVE SUPPLEMENTARY FEEDING BASED ON MORINGA LEAVES AND FISH.

FIGURE 11. Examination of stunted toddlers and pre-schoolers who receive supplementary feeding based on moringa leaves and fish

F. GREEN & CLEAN COMPETITION FOR A CLEAN AND HEALTHY ENVIRONMENT

The Green & Clean competition is held to ensure that there have been improvements in the environmental conditions in the Tambak Wedi village, aimed at creating a healthy environment that supports the reduction of stunting rates. The winners of the Green & Clean competition are awarded trophies, certificates, and prizes.

Figure 12 The awarding of gifts and trophies for the competition winners.

On that occasion, the first phase of partner investment was also handed over, consisting of several items that support a healthy environment, including productive plants, handwashing stations, large stone ashtrays, compost bags, San Bio, screen printing materials, plaques, trophies, planter bags, and hygienic stalls that support the creative economy of the residents of Tambak Wedi, Surabaya

IV. DISCUSSION

A. INTERPRETATION OF RESULTS

The community-based intervention implemented in Tambak Wedi Village demonstrated significant improvement in both maternal and child health indicators. The findings revealed a positive increase in the knowledge scores of pregnant women and mothers of toddlers following counseling on Clean and Healthy Living Behavior (PHBS), parenting practices, and the provision of breastfeeding or complementary feeding (MPASI). The mean post-test scores improved by approximately 20–25% compared to pre-test results, reflecting enhanced awareness and behavioral change. These results underscore the effectiveness of integrated health education and participatory learning as pivotal elements in stunting prevention strategies [34].

The intervention further recorded an increase in hemoglobin and protein levels among pregnant women with Chronic Energy Deficiency (CED) after receiving moringa- and fish-based supplementary feeding for two weeks. This finding is consistent with prior studies demonstrating that moringa leaf powder supplementation can effectively elevate maternal hemoglobin and serum ferritin levels due to its high iron and antioxidant content [35]. Similarly, the protein content in fish contributes to improved fetal growth and reduced risk of low birth weight, aligning with the outcomes reported by Lestari et al. (2022), who found that protein-rich local food interventions were associated with improved pregnancy outcomes [36].

The involvement of Surabaya Great Cadres (SGC) in early detection training also proved to be impactful. Their ability to identify high-risk pregnancies using the Poedji Rochjati Score Card increased after the mentoring session. Cadre participation in this study played a crucial role in ensuring the sustainability of maternal health monitoring, mirroring the findings of Rahman et al. (2023), who emphasized the importance of community cadres as primary agents of preventive health in urban slum environments [37]. Furthermore, the Green & Clean environmental initiative complemented the biomedical aspects of stunting prevention by addressing sanitation, waste management, and household hygiene—factors strongly linked to child growth outcomes.

These findings collectively suggest that a multi-sectoral and interprofessional approach is essential to reducing stunting prevalence. The integration of nutrition, education, environmental health, and community empowerment demonstrated measurable success, supporting the WHO framework that emphasizes multi-level interventions for sustainable child nutrition improvement [38].

B. COMPARISON WITH SIMILAR STUDIES

The present study aligns with the growing evidence that locally adapted, food-based interventions can significantly improve maternal and child nutrition. For instance, Handayani et al. (2023) reported that moringa supplementation over a four-week period increased maternal hemoglobin levels by 1.2 g/dL, a result comparable to the trend observed in this study

after a shorter two-week intervention [39]. Likewise, a community program in Makassar conducted by Fitriani et al. (2022) involving moringa-fish cookies for pregnant women resulted in similar biochemical improvements, reinforcing the potential of these ingredients as functional local foods for nutrition-sensitive programs.

However, unlike most previous interventions that focused solely on dietary supplementation, this study adopted a comprehensive empowerment model that combined nutrition, education, and environmental health promotion. This model not only improved biomedical indicators but also increased community self-efficacy and cadre leadership capacity. The approach is consistent with participatory models applied in Southeast Asian regions, where empowerment and knowledge transfer have proven more sustainable than short-term supplementation alone [40].

The study also contributes novel insights regarding interprofessional collaboration (IPC) within a community service context. The involvement of multidisciplinary experts from nutritionists to midwives and laboratory technologists ensured a holistic assessment of health determinants. Previous research by Nurdin et al. (2021) emphasized that IPC enhances program effectiveness by integrating complementary expertise and reducing fragmented service delivery. The application of IPC principles in this study illustrates how community-based programs can serve as a living laboratory for interprofessional education (IPE) while directly improving community health outcomes [41].

In addition, the improvement of maternal knowledge regarding breastfeeding, complementary feeding, and sanitation practices is consistent with the results of Astuti and Ariyanti (2020), who found that maternal education directly influences child growth and nutritional status. Education-driven interventions are crucial because behavioral determinants such as feeding practices and hygiene habits often have a greater impact on stunting reduction than food access alone.

The Green & Clean competition, while often perceived as peripheral, contributed to behavior modification at the household level. Environmental health interventions are rarely quantified in stunting prevention research, yet this study demonstrated that even community competitions can foster accountability and environmental improvement, aligning with the sanitation-based stunting prevention framework proposed by FAO (2023).

From a policy perspective, the results of this program provide evidence that stunting reduction can be accelerated through the integration of community empowerment and government collaboration. The involvement of the Surabaya Health Office and local Puskesmas demonstrates how regional governments can operationalize the Bappenas 2024 Stunting Reduction Roadmap through local-level, evidence-based models. The participatory approach adopted in Tambak Wedi can thus serve as a replicable framework for other coastal urban communities facing similar socioeconomic challenges.

C. LIMITATIONS, WEAKNESSES, AND IMPLICATIONS

Despite its encouraging outcomes, this study is not without limitations. First, the duration of the nutritional intervention (two weeks) was relatively short for assessing long-term physiological effects on maternal and child growth. While biochemical improvements were evident, sustained follow-up is needed to determine the persistence of these benefits. Future studies should consider longitudinal tracking of participants to monitor child growth velocity and maternal recovery throughout pregnancy.

Second, the sample size was small and focused on a single village, which limits the generalizability of findings to other regions with different demographic and socioeconomic profiles. Expanding the sample size and involving multiple intervention sites would strengthen external validity. Additionally, future programs should include control groups to establish clearer causal relationships between interventions and outcomes.

Third, while the study effectively integrated interprofessional collaboration, quantitative evaluation of teamwork efficiency and role clarity among professionals was not systematically assessed. Future research could employ standardized IPC assessment tools, such as the Interprofessional Collaborative Competency Attainment Survey (ICCAS), to measure interprofessional synergy objectively.

Another limitation relates to data collection constraints during the post-intervention period. Laboratory testing was limited to hemoglobin and protein levels due to logistical and financial limitations. Including micronutrient biomarkers such as ferritin, folate, or vitamin A could provide a more comprehensive understanding of nutritional improvement.

From a behavioral standpoint, changes in maternal knowledge were measured immediately after counseling sessions. Although short-term gains were recorded, it remains unclear whether these behavioral improvements were sustained. Long-term monitoring through follow-up home visits could address this gap and support continuous community mentoring.

Nevertheless, these limitations do not undermine the overall contribution of the study. On the contrary, they provide valuable lessons for refining future intervention models. The participatory and interprofessional structure can be enhanced through digital integration, such as using mobile health (mHealth) applications for tracking nutritional progress and communication between cadres and healthcare providers. Several recent studies, such as by Putri et al. (2023), have demonstrated that mHealth platforms can significantly increase adherence to health recommendations and maternal engagement [42].

The implications of this study extend beyond the local context. The integration of local food innovation, community empowerment, and environmental health represents a comprehensive model that can inform national stunting prevention programs. The approach aligns with Sustainable Development Goal (SDG) 2 on zero hunger and SDG 3 on good health and well-being. By focusing on locally available resources and community ownership, the model ensures both sustainability and scalability.

In conclusion, the discussion highlights that interprofessional, community-based interventions utilizing local food and participatory education can effectively improve maternal and child health while fostering community independence. The study's approach demonstrates that empowering communities through skill-based education, localized nutrition, and environmental sanitation leads to measurable progress in stunting reduction. With further refinement and longitudinal follow-up, this model has strong potential to serve as a national blueprint for multi-sectoral stunting eradication efforts.

V. CONCLUSION

This study aimed to implement and evaluate an integrative, interprofessional community-based intervention designed to reduce stunting prevalence and improve maternal and child health in Tambak Wedi Village, Surabaya. The program combined nutritional supplementation using moringa leaves and fish-based products, health education on clean and healthy living behavior, parenting and breastfeeding practices, early detection training for high-risk pregnancies, and environmental health promotion through the Green & Clean initiative. The findings revealed notable improvements in several key indicators. The average knowledge score of pregnant women and mothers of toddlers increased from 50.6 in the pre-test to 70.4–74.4 in the post-test, reflecting an approximate 20–25% enhancement in health literacy.

Biochemical assessments showed a rise in mean hemoglobin levels from 10.8 g/dL to 12.55 g/dL and total protein levels from 6.2 g/dL to 6.8 g/dL after two weeks of receiving moringa- and fish-based snacks, indicating measurable nutritional improvement among women with chronic energy deficiency. Additionally, among seven toddlers identified as pre-stunted, six demonstrated weight and height progress within normal growth ranges after the intervention period. The training provided to twenty local cadres significantly increased their competency in identifying high-risk pregnancies using the Poedji Rochjati Score Card, thereby strengthening the sustainability of community health monitoring.

Collectively, these outcomes demonstrate that integrating interprofessional collaboration, local food innovation, and community empowerment can produce tangible health benefits and support Indonesia's national stunting reduction goals. However, further longitudinal studies are recommended to evaluate long-term impacts on child growth and maternal health, as well as the potential application of digital monitoring systems such as mobile health platforms for broader outreach. Future work should focus on scaling up this model across other coastal and low-income communities while incorporating quantitative tools to evaluate interprofessional effectiveness and behavioral sustainability, ensuring that this holistic framework contributes to the ongoing national effort to eradicate stunting in Indonesia.

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DATA AVAILABILITY

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. All data were obtained directly from field observations, laboratory examinations, and community surveys conducted in Tambak Wedi Village, Surabaya, and are stored securely in the institutional repository of the Health Polytechnic, Ministry of Health, Surabaya.

AUTHOR CONTRIBUTION

All authors contributed equally to the conception, design, and implementation of the study. Juliana Christyaningsih led the project coordination and manuscript preparation. Siti Nur Kholifah and Teresia Retno Puspitadewi were responsible for health education design and data collection. Ida Ariyanti and Laili Rahmawati supervised the nutritional intervention and analysis. Beny Suyanto contributed to environmental health assessment, while Nurul Hindaryani and Museyaroh managed laboratory testing and community engagement. All authors reviewed and approved the final manuscript.

DECLARATIONS

ETHICAL APPROVAL

This study was conducted in accordance with the ethical standards of the Health Research Ethics Committee of the Health Polytechnic, Ministry of Health Surabaya.

CONSENT FOR PUBLICATION PARTICIPANTS.

All participants involved in this study provided informed consent for participation and agreed to the publication of the data in anonymized form. Personal information was kept confidential, and all reported findings were presented collectively to ensure privacy and ethical compliance.

COMPETING INTERESTS

The authors declare that there are no competing interests or potential conflicts of interest related to the publication of this paper. All authors have reviewed and approved the final version of the manuscript and agree that it accurately reflects their contributions.

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