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The Efficacy of Fishbean Complementary Feeding and Community-Based Total Sanitation on Toddler Feeding Practices in Stunting Prevention

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ABSTRACT

Background: Childhood stunting is a chronic process, while the reduction of stunting rate can be evidenced by proper breastfeeding practices. Children who receive complementary foods with a frequency below the minimum limit tend to be more at risk of stunting than children who receive complementary foods with the right frequency. This study analyzed the effect of fishbean biscuits complementary feeding and the implementation of the community-based total sanitation (CBTS) approach on feeding practices by mothers of children under five years in preventing stunting in Padang Serai village, Bengkulu city, Indonesia.

Methods: In a quasi-experiment with a two group of pre-test and post-test research design, the selection of research subjects was based on the inclusion criteria, namely permanent residence in the Kampung Melayu District area for the last 6 months. Data analysis was univariate and bivariate using paired t-test and independent t-test.

Results: A significant effect for fishbean complementary food and CBTS was noticed on complementary feeding practices in mothers of toddlers to overcome stunting. There was a significant difference in pre-test and post-test knowledge in cadre mothers and mothers of toddlers.

Conclusion: Fishbean complementary food and the implementation of CBTS could effectively improve the knowledge, attitude, and skill of mothers less than five years in feeding practices, thus contributing to the prevention of stunting in children.

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Introduction

Research data from the World Health Organization (WHO) showed that 22.2% or around 150.8 million toddlers were stunted in the world in 2017 (1). According to data from the Indonesian Ministry of Health, the prevalence of stunting in toddlers in Bengkulu Province was 36.0%. The cause of stunting was mentioned to be poor parenting practices such as healthy latrines for mothers related to health and nutrition before pregnancy, during pregnancy and while breastfeeding (2). The efforts to prevent stunting included providing early breastfeeding initiation (IMD) and complementary foods according to the age

of the child (3). Complementary feeding is a food or a drink that contains nutrients which is given to infants or children aged 6-24 months to fulfill their nutritional needs in addition to breast milk (4). Most of the stunted babies were reported not to get a good breastfeeding. WHO recommends that complementary feeding must fulfill 4 conditions of being timely, sufficient, safe and given in the right way (5).

Stunting in children was demonstrated to be a chronic process due to environmental factors and infectious diseases that can contribute to the emergence of stunting cases (6). According to the Indonesian Ministry of Health, the government program community-based total sanitation (CBTS) is an approach to change the hygienic and sanitation behavior through triggering community empowerment. CBTS aims to realize community hygiene and sanitation behavior independently in order to improve the highest degree of public health (7). Appropriate complementary feeding practices were illustrated to reduce the incidence of stunting. Children who received complementary feeding below the minimum frequency were more likely to be stunted than children who received complementary feeding at the correct frequency. Adequate or higher frequency of complementary feeding can fulfil the food consumption and nutrients needed by children according to their age (8, 9).

The CBTS program is useful to decrease stunting cases, improve the personal and environmental sanitation hygiene and the behavioral changes to improve public health status. There has been a lot of research to overcome stunting as stunting is a serious public health problem, especially in developing countries. It was found that complementary feeding rich in energy and protein and fortification with micronutrients was effective in improving child growth and development (7). Fishbean as a complementary food rich in animal protein from fish and nuts has the potential to improve the nutritional intake of toddlers while empowering local food ingredients that are easily accessible. Based on a previous research, the portion of fishbean biscuits (80 grams) supplemented with 100 grams catfish flour and red bean flour the frequency s 2 times/day could provide an energy of 485.82 kcal, protein of 15.8 grams, fat of 24.78 grams, vitamin A of 46 grams and vitamin A of 594 IU based on the nutritional content value test at the Food Technology Laboratory of the Poltekkes Kemenkes Bengkulu, Indonesia (10). So this study aimed to analyze the effect of fishbean biscuits on feeding practices by mothers of toddlers by a CBTS approach in order to prevent stunting in Padang Serai village, Bengkulu city, Indonesia.

Materials and Methods

This research was a type of quasi experimental research with a two groups of pre-test and post-test research design (Figure 1). Ethics statement was issued by Poltekkes Kemenkes Bengkulu with No. KEPK.BKL/165/04/2023. The enrolled population was mothers of toddlers and mother cadres in Padang Serai village, Indonesia. Samples were taken using purposive sampling technique with inclusion criteria of mothers (n=253) of children less than five years who had children aged 6-23 months in Kampung Melayu District, Indonesia. Treatment 1 subjects were children aged 6-23 months who had body length-for-age (PB/U) z-scores <-2SD. Treatment 2 subjects were children aged 6-23 months who had PB/U z-scores ≥-2SD and lived close to the treatment 1 subjects; Being active cadre mothers in the study area and to be willing to follow the program until completion.

Fishbean which was made from fish and nuts were given as an additional food for toddlers for duration of 30 days with a dose of 40 g/day. For the CBTS approach and activities education to mothers of toddlers and mother cadres were conducted regarding the five pillars of STBM, namely stop open defecation, hand washing with soap, household drinking water and management of food, household waste and household liquid waste. Education was carried out through training, group discussions, and

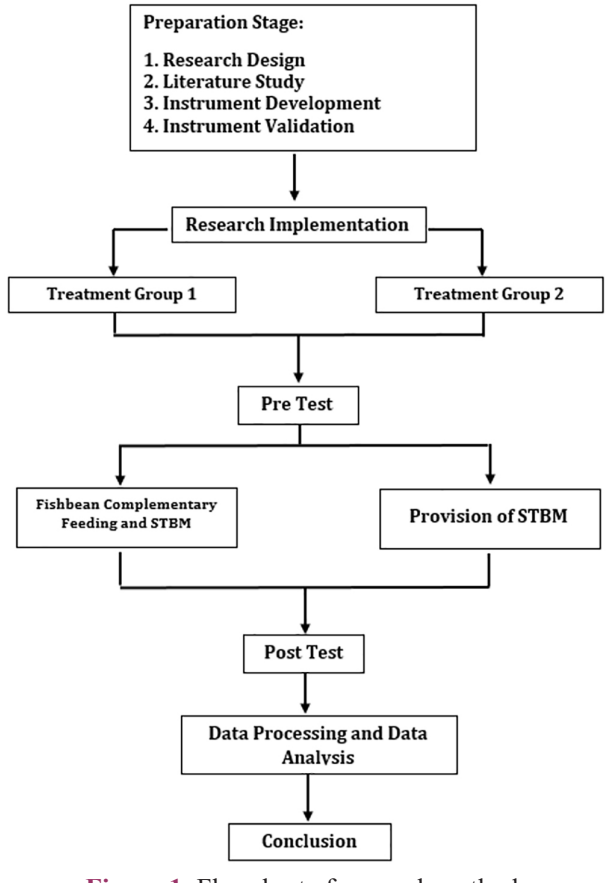

Figure 1: Flowchart of research method.

practical simulations in the field. The knowledge variables were measured using pre-test and post-test questionnaires to identify mothers' level of understanding regarding nutrition, complementary feeding, and CBTS practices. Attitude variables were measured through an attitude scale before and after the intervention. Furthermore, skills were observed directly through simulations of feeding practices and the application of CBTS pillars. CBTS variables were assessed based on indicators of successful implementation of the five pillars of CBTS in respondent households.

Questionnaires were used to measure the knowledge, attitudes and practices of mothers of children less than five years regarding complementary feeding and CBTS. Then, the skills of mothers under five years and cadres in implementing feeding practices and the implementation of CBTS pillars were determined. Data were analyzed using statistical software including paired t test to compare the pre-test and post-test results of knowledge, attitude, and skills. Then descriptive analysis described the success rate of CBTS pillar implementation. The questionnaire instrument was tested for validity and reliability prior to use by trailing on a small sample with similar characteristics to the main respondents. This method was designed to provide a comprehensive picture of the effectiveness of fishbean complementary feeding and CBTS implementation in improving feeding practices, knowledge, attitudes, and skills of mothers of children less than five years and the mother cadres.

Results

The average pre-test knowledge in treatment I was a value (x) of 59.00 and a post-test of 81.67 and in treatment II, the average pre-test knowledge was a value of 73.67 and a post-test of 85.00 revealing the efficacy before and after providing nutritional education on fishbean MP-ASI and CBTS. There was a significant influence between pre-test and post-test knowledge (p=0.001) and a significant effect on the real difference between pre-test and post-test knowledge (p=0.0001) (Table 1). Differences in maternal knowledge in in treatment I was a value (x) of 70.33±9.091 and in treatment II was a value (x) of 79.33±13.88 (p=0.004). There was a significant difference between the average pre-test and post-test scores in cadre mothers and mothers of toddlers (p=0.004) (Table 2).

Regarding the attitude, the average pre-test in treatment I was a value (x) of 31.93 and the average of post-test in treatment I was a value (x) of 1.07. The average pre-test in treatment II was a value of 31.37 and the post-test was a value of 32.87 demonstrating the impact on attitudes before and after providing nutritional education for fishbean and CBTS (Table 3). There was a significant influence between pre-test and post-test knowledge (Treatment I: p=0.017). Also, there was a significant effect between pre-test knowledge and post-test on the real difference (Treatment II: p=0.0001). Differences in maternal attitudes in the treatment group with the provision of fishbean MP-ASI and CBTS in treatment I was a value (x) of 32.50±1.091 and the average in

Table 1: The effect of increased maternal knowledge before and after providing fishbean and CBTS in prevention of stunting in Padang Serai village, Bengkulu city, Indonesia.

Knowledge	x	SD	Max	Min	*P* value
Treatment 1					
Pre-test	59.00	11.55	100	30	0.0001
Post-test	81.67	11.16	100	3 0	
Treatment 2					
Pre-test	73.67	19.91	1 00	30	0.001
Post-test	85.00	11.67	100	3 0	

CBTS: Community-Based Total Sanitation, SD: Standard deviation. Max: Maximum, Min: Minimum.

Table 2: The impact of mother's attitude in providing fishbean complementary food and CBTS on practical feeding in mothers of toddlers in prevention of stunting in Padang Serai village, Bengkulu city, Indonesia.

Attitude	x	SD	Max	Min	*P* value
Treatment 1					
Pre-test	31.93	2.828	39	23	0.0001
Post-test	31.07	4.533	39	19	
Treatment 2					
Pre-test	31.37	3.243	33	16	0.017
Post-test	32.87	0.346	33	32	

CBTS: Community-Based Total Sanitation, SD: Standard deviation, SD: Standard deviation. Max: Maximum, Min: Minimum.

Table 3: The effect of mothers' skills for fishbean complementary feeding and CBTS on practical feeding of mothers of toddlers to prevent stunting in Padang Serai village, Bengkulu city, Indonesia.

Skill	x	SD	Max	Min	*P* value
Treatment I					
Pre-test	11.47	0.629	12	10	0.001
Post-test	11.87	0.346	12	11	
Treatment II					
Pre-test	7.90	1.788	11	4	0.107
Post-test	8.20	1.769	12	4	

CBTS: Community-Based Total Sanitation, SD: Standard deviation, SD: Standard deviation. Max: Maximum, Min: Minimum.

treatment II was 33.12±1.795 (p=0.0001). There was a significant difference between the average pre-test and post-test attitude scores among mothers too (p=0.0001).

Maternal skills in treatment I revealed a pre-test average value (x) of 7.90 and post-test value of 8.20 (p=0.107) indicating to no significant effect between pre-test and post-test skills. In treatment II, the average value of pre-test was 11.47 and for post-test value was 11.87 (p=0.001) showing the impact on skills before and after providing nutritional education for fishbean and CBTS. The Differences in mothers' skills in the treatment groups regarding pre-test and post-test for fishbean and complementary food were significant too (p=0.009).

Discussion

Dietary patterns can impact different aspects of overall health (11, 12) as dietary ingredients can affect cellular function (13, 14). It was shown that the proper activity of the immune system is essential for the human survival; while the optimal immune response is dependent on an adequate nutrition and appropriate food pattern to prevent any infection (15-17). So determining the patients who are at risk of malnutrition in the early stages of great importance to start interventions to improve nutritional condition, and for this reason, most guidelines recommend evaluation of the nutritional status of affected patients (18-20). Complementary feeding for infant growth and development is influenced by maternal factors including internal and external factors. Internal factors consist age, knowledge, educational level, occupation, family income, experience and external factors enroll socio-culture of health workers and their knowledge on health status (21-23).

CBTS has five pillars named stopping open defecation, hand washing with soap, household drinking water and food management, securing household waste, and securing household liquid waste. The implementation of these five pillars of CBTS would facilitate efforts to increase access to better community sanitation so that in the long term to reduce morbidity and mortality caused by poor sanitation. The CBTS approach aims to implement changes in community sanitation behavior through community empowerment activities using the triggering method.

Triggering is an activity that invites the community to analyze their environmental conditions, explore behaviors related to causes of diseases such as open defecation and then take action to abandon these behaviors (2).

Maternal knowledge showed an effect before and after the provision of fishbean MP-ASI nutritional education and CBTS; while a significant difference was noticed between the mean pre-test and post-test scores of mothers in the treatment group. Before treatment, mothers of children under five years had varying levels of knowledge about nutrition and sanitation. After treatment, a significant increase in knowledge was observed in the group of mothers of children less than five years who received commercial fishbean and CBTS complementary food. Better results achieved in the fishbean complementary food approach group due to the introduction of nutrient-rich fishbean biscuits and two feedings per day.

In line with our research, Rini and Hani found a significant difference in nutritional knowledge scores before and after the test due to counselling on balanced nutrition for toddlers (24). Toddlers needed a balanced nutritional intake to prevent stunting through an increased maternal nutritional knowledge (25). Another research revealed the effect of giving Ayo Dedis based on android on increasing knowledge of balanced nutrition in pregnant women before and after administration (26). The study on cadre knowledge showed the effect of cadre application media on the knowledge of Posyandu cadres in early detection of stunting (27). In a nutrition intervention, an improved nutritional knowledge was demonstrated to bring more positive changes and encourage healthier eating habits in children (28).

Acute diarrhea can cause fluid loss, impaired food absorption, decreased food digestion and nutrient loss. Toddlers with frequent defecation were shown to have impaired absorption of proteins, carbohydrates and fat. Complementary feeding pays attention toward food hygiene so that children avoid bacterial infections that can cause digestive tract disorders. Therefore, the role of posyandu cadres, nurses, and other health workers is expected to be able to provide health education to mothers who have babies so that they understand about the correct provision of complementary feeding (29).

Complementary feeding with commercially available Ikan Buncis and CBTS can influence the attitudes of mothers of children less than five years towards nutrition and sanitation. The introduction of local foods such as Ikan Buncis in biscuit form and the emphasis on community-based sanitation practices in CBTS can help create positive attitudes towards the importance of good nutrition and clean and healthy sanitation behaviors. Some of the guiding principles recommended by WHO in feeding children in the first 2 years of life include the implementation of exclusive breastfeeding practices until 6 months of age, the principle of implementing complementary feeding at 6 months of age and continuing breastfeeding and age-appropriate complementary feeding until 24 months of age. The principle of implementing complementary feeding that is responsive to psychosocial principles, the principle of implementing sanitation, feeding, and the principle of feeding when children are sick were described before (30).

Maternal knowledge, attitudes, and practices in breastfeeding and complementary feeding can impact infant growth (31). The relationship between attitude and complementary feeding is of great importance. A positive attitude will lead to creation of a behavior. With a positive attitude towards the risk of early complementary feeding in infants, there would be positive behavior, namely giving appropriate complementary food to infants (32). Providing education on the importance of breastfeeding, complementary feeding, and nutritious food for mothers and posyandu cadres can increase the knowledge of mothers and Posyandu cadres. Increased knowledge of mothers and cadres about the importance of breastfeeding, complementary foods, and nutritious foods for infants is expected to prevent or reduce stunting rate (33).

In addition, CBTS would facilitate efforts to improve access to better community sanitation and change and maintain the sustainability of a clean and healthy living culture. Long-term implementation of CBTS can also reduce morbidity rates such as diarrhea and mortality due to poor sanitation. Mothers' attitudes towards the adequacy of energy from breast milk and complementary foods are causally related to the growth of infants aged 6-11 months. Maternal attitudes and practices towards nutritional needs can affect growth, especially children's weight gain. Children who get good nutrition (protein and energy) tend to have a strong immune system so that the risk of disease is smaller so that growth can run normally (34).

Feeding legumes would teach mothers of toddlers' skills in cooking and serving nutritious dishes. Mothers of children younger than five are likely to be taught how to process legume biscuits into attractive and tasty dishes. Meanwhile, the commercial CBTS approach can also teach skills in maintaining hygiene when preparing food (10). Fish consumption among toddlers from fishing families was shown to be higher than mothers not from fishing families who have toddlers. Fishing families tend to meet their needs with what is around their place of residence, provide quality food according to children's nutritional needs, and routinely monitor children's growth and development at the nearest health center, besides the need for continuous cross-sector cooperation in providing education and knowledge to mothers (35).

CBTS is associated with morbidity especially in children under five years old. Diarrhea in these children is usually caused due to two main factors of behavioral factors such as inappropriate complementary feeding and environmental factors such as poor sanitation and personal hygiene. CBTS has five pillars including stopping open defecation, washing hands with soap, managing household drinking water and food, securing household waste, and securing household liquid waste (36). Environmental health services as a specific intervention to support the acceleration of stunting reduction is accompanied by an increase in the achievement of clean water supply through community empowerment and CBTS is an effort to prevent and reduce stunting too (37).

Improving the knowledge, attitudes and skills of mothers who receive legumes is expected to increase the frequency and quantity of nutritious feeding as legumes are given twice per day. This can help fulfil the nutritional needs of children less than five years and prevent stunting. On the other hand, CBTS can influence the hygiene and quality of food served. Both approaches can finally contribute to changing the eating and sanitation behaviors of mothers of children younger than five years. Fishbean complementary food with nuts can influence daily diets by introducing nutrient-rich dishes (2). CBTS

can help increase awareness and lead to better community-based sanitation practices. The results of this study would greatly benefit stunting prevention efforts, as it provides information on effective ways to increase the knowledge and skills of mothers of children less than five years to provide healthier diets and improve sanitation practices. Thus, it can help reduce the prevalence of stunting in children of this age in the working area. The strength of this study was that using an approach that combines fishbean complementary food with nuts and the CBTS program can provide multiple benefits in improving children's nutritional status and sanitation practices, while both of which are important factors in stunting prevention. The weakness of this study was that measuring the impact of this integrated program can be complicated due to multiple factors that can influence children's nutritional status and health in addition to the intervention provided.

Conclusion

The provision of fishbean complementary food and the implementation of the CBTS approach could significantly improve the knowledge, attitudes and skills of mothers of children less than five years and result in better feeding practices. These interventions also contributed to reducing the risk of stunting through an improved fulfillment among nutritional needs of children less than five years and adopt clean and healthy behaviors. Future researches should evaluate the long-term impact of the combination of interventions on the nutritional status of children younger than five years and involve a wider population size and consider socio-cultural factors that can influence a successful implementation. In addition, the development of technology-based educational materials and intensive training for cadres are also recommended to strengthen intervention outcomes.

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Authors' Contribution

Kamsiah: Responsible for study planning and design, supervision of CBTS intervention implementation, and data analysis related to changes in feeding practices among mothers of children. Emy Yuliantini: Instrumental in the development and evaluation of fishbean complementary food, including formulation, distribution, and monitoring of its impact on the nutritional status of children. Tonny Cortis Maigoda: Responsible for checking the grammar, spelling, layout, and all references. Rachmawati: Contributed to the interpretation of research results.

Conflict of Interest

None of the authors were involved in any unwanted conflicts.

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