



# Stunting Prevention and Control Program to Reduce the Prevalence of Stunting: Systematic Review Study

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## Abstract

**BACKGROUND:** Stunting is a condition in which the occurrence of failure to thrive in children as a result of chronic malnutrition so that the child is too short for his age. The prevalence of stunting in children under five in Indonesia is higher than the prevalence of stunting in the world. One of the impacts of stunting is the occurrence of developmental barriers, where if this is not prevented it will have an impact on the less than optimal performance of children in school and the long-term impact can be a decrease in the quality of human resources.

**AIM:** This study aims to systematically identify stunting prevention and control programs to reduce the prevalence of stunting.

**METHODS:** The method used in this study is the Systematic Review (SR). SR is a method that identifies, assesses, and interprets findings on a research topic to answer predetermined research questions. The keywords used to search for articles on electronic databases are ProQuest, Scinapse, PubMed, and Google Search. The keywords used are "stunting," "parenting," "parenting AND Stunting," "stunting prevention," "stunting prevention," "stunting in lower and middle income countries," "stunting and global programs," and "stunting and Indonesia." "Stunting and Asia Region" obtained from the ProQuest, Scinapse, PubMed, and Google Search database.

**RESULTS:** Based on the identification results of this study, there are several forms of programs and interventions to prevent and control stunting that have been proven to be successful in reducing the prevalence of stunting, namely: CARING Trial, COWPEA, The Lunul Project, Rang-Din Nutrition Study, Tubaramure, NEO-MOM, Preparing for Life, Integrated Child Development Services, Early childhood caries, Small-Quantity, Lipid-Based Nutrient Supplements, Handwashing With Soap and Total Sanitation and Sanitation Marketing, PROCOMIDA, Community-Based Participatory Nutrition Promotion Program, Promote Children's Growth and Development, Community-Based Growth Monitoring Including Nutritional Supplementation, Child Development Agents, Lady Health Worker program, ready-to-use supplementary foods, and Supporting Father Involvement, Positive Deviance/Hearth, JiVitA-3.

**CONCLUSION:** From planning, conducting and reporting, it can be concluded that the intervention as an effort to prevent and control stunting had a significant effect between the intervention group and the treatment group and the control group which was only given normal treatment even without any treatment.

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## Introduction

Stunting is the term given to linear growth retardation (length/height for age) in the early years of life, this has failed to reach a height of adulthood is implied by genetic potential. Stunting can produce negative health effects such as difficulty achieving optimal physical and cognitive development, reduced performance and some studies have also reported an increased risk of non-communicable chronic diseases [1], [2].

The prevalence of stunting globally based on the report of the United Nations in 2018 is 22.2% or 150 million children under five worldwide. Reducing stunting of children aged 0–59 months is the first goal of the six global nutrition development goals by 2025 and is targeted to reduce stunting by 40% of the total

number of stunting. Stunting prevalence data collected by the World Health Organization, Indonesia is included in the third country with the highest prevalence in Southeast Asia/South-East Asia Regional. The average prevalence of stunting infants in Indonesia in 2005–2017 was 36.4% [3].

In 2018, South Sulawesi was in the top four of the prevalence of stunting along with East Nusa Tenggara, Aceh, and West Sulawesi, respectively, 42.7%, 37.1%, and 35.8%. The decline in the prevalence of stunting in South Sulawesi was very slow (52%), from 40.9% to 35.7% during the period 2013–2018. Sulsel position in the top four because the average decline in the national prevalence of stunting in the same period was 6.4% [4].

Stunting can specifically start from a pregnant mother. The nutritional condition of pregnant women

before pregnancy even after that will determine the growth of the fetus. Pregnant women who are malnourished will be at risk of having babies with low birth weight, and this is a major cause of stunting. After birth, infants who are not breastfed are either going to risk suffering from various infectious diseases due to not eating enough nutritional intake and unhygienic. Infant and Child Feeding greatly determines the growth of the child. After the age of 6 months, children need to get nutritional intake that can meet the needs of micro, macro, and safe nutrition [5].

A toddler period is an age group that is prone to nutrition and disease. Infants and children with malnutrition can lead to disruption of the growth and development of the physical, mental, and spiritual as well as result in low quality of human resources. Nutritional status is an important indicator of health for toddlers because children under 5-years-old are vulnerable [6].

Research and studies related to the issue of stunting have been carried out and disseminated through various scientific publication articles and academic works in universities. A solution to the problems of stunting is multi-dimensional and therefore adjusted to the study of theory and previous research and data and the fact the problem in the background of this paper, so the authors are interested in providing information based on scientific evidence on the prevention and reduction of stunting that has proved successful in reducing the prevalence of stunting. So that this study can provide information on alternative actions needed.

Some of the questions that the researcher poses are: 1) How is the population? 2) how is the intervention? 3) how is the comparison, 4) how are the outcomes? and 5) what is the context? This article examines and discusses 5 selected journal articles based on the stages that are made objectively to find answers to the five questions above as well as trying to refer to the five elements of PICOC, which are then given recommendations on how appropriate interventions should be included in the prevention and control of stunting that has been proven to be successful in reducing the prevalence of stunting?

## Research Methods

This study uses the approach Systematic Review (SR), which is one method of using a review, study, structured evaluation, classification, and categorization of evidence-based that has been produced before.

Systematic steps in the implementation are highly planned and structured so that the method is very different from the methods just to deliver literature. The procedure of SR consists of several steps: 1) planning,

2) conducting, and 3) reporting. Planning includes the Research Question (RQ) as the beginning and the basis of the passage of SR. RQ is used to guide the search process and the extraction of literature. Analysis and synthesis of data, as a result of the SR, are the answer to RQ we set in front. A good RQ is useful, measurable, leading to an understanding of state-of-the-art research on a research topic. Formulation RQ should be based on five elements known as the PICOC: 1) Population (P): The target group of the investigation: children aged 0–72 months, mothers who have children aged 0–72 months, pregnant women, 2) Intervention (I): Aspects details of the investigation, or issue of interest to researchers: All studies with stunting intervention programs, 3) Comparison (C): Aspects of the investigation where Intervention (I) will be compared: Article has intervention and control groups, 4) outcomes (O): The effects and results of Intervention (I): there is a decrease in stunting, and 5) Context (C): Setting and surroundings of the investigation: Interventions on a national scale. The next step preparation protocol that contains the procedures and methods of conducting SR usually contains seven elements: 1) Background, 2) RQs, 3) search terms, 4) selection criteria, 5) quality checklist and procedures, 6) data extraction strategy, and 7) data synthesis strategy.

Search articles relevant research using keywords are: “stunting,” “parenting,” “parenting AND Stunting,” “prevention of stunting,” “prevention of stunting,” “stunting in the lower and middle-income countries,” “stunting and global program,” “stunting and Indonesia,” “stunting and Asia Region” obtained from the ProQuest, Scinapse, PubMed, and Google Search database.

After the article is obtained, the next step is to choose the appropriate literature to answer the question to be answered, namely, “what is the stunting prevention

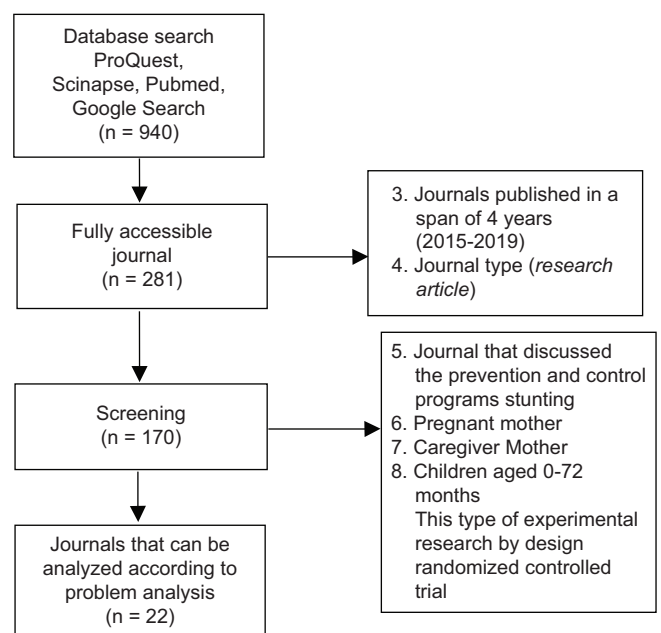


Figure 1: Schematic of search results and article selection

and control program?" To simplify the process, criteria were made to filter the selection and exclusion of articles as shown in Table 1 (inclusion and exclusion criteria). Selection and rejection of articles based on PRISMA flow diagram.

**Table 1: Selection of inclusion and exclusion criteria**

Inclusion Criteria	Scientific articles, published in international journals, published between 2015 and 2019, contain the topic of stunting prevention and control programs, a type of experimental research with a randomized controlled trial design.
Exclusion Criteria	Less scientific articles, not published in journals, not published between 2015 and 2019, containing the topic of stunting but not related to stunting prevention and control programs, a type of research that is not experimental with a randomized controlled trial design.

The SR technique in this article does not synthesize the results statistically (meta-analysis), but the conclusions obtained can be scientifically justified as an effort to prevent and overcome stunting. Analysis of the data will be grouped by subject and type of intervention provided. The analysis will be carried out by looking at the most significant changes after being given the intervention. All articles use the critical appraisal tool, namely, the Joanna Briggs Institute.

## Research Results

### *Number and source of articles included inclusion criteria*

Based on the search result article in ProQuest, Scinapse, PubMed, Google Search by keyword above shows that 281 full articles can be accessed. The next step is a review of the abstract. After reviewing the abstracts of 281 selected articles, 111 articles were excluded because they were not included in the experimental study and 170 articles were included for the next step which was a full-text review. The search for the full text of 22 articles was selected, 148 articles were excluded because not included in the inclusion criteria. A total of 22 articles were selected included for analysis as shown in Figure 1. Of the 22 research articles above, it has shown its feasibility to be carried out a SR because it has met the quality assessment criteria.

### *Presentation of data*

Data analysis begins with extracting data on 22 articles that have been obtained from the study selection. The extracted data is presented in tabular form as shown in Table 2 which includes information about the author, year of publication, population, intervention, comparison, outcomes, and context related to the objectives of this SR. Furthermore, data analysis was carried out by looking for similarities and dissimilarities from the data obtained, criticizing, and comparing each data. Referring to the predetermined goals, the data obtained is expected to show the

stunting prevention and control program to reduce the prevalence of stunting.

## Discussion

Stunting caused by multi-dimensional factors and not just caused by poor nutrition factors experienced by pregnant women and children under five. The most decisive intervention to reduce the prevalence of stunting, therefore, needs to be done in the first 1000 days of life of children under five. Some of the factors that cause stunting are: 1) Poor parenting practices, including lack of knowledge about the mother's health and nutrition before and during pregnancy and after delivery. 2) Limited health services including ANC Ante Natal Care (health services for mothers during pregnancy) Post-Natal Care and quality early learning. 3) Lack of household/family access to nutritious food. 4) Lack of access to clean water and sanitation. Besides, other factors that cause stunting; the health and nutritional condition of the mother before and during pregnancy and after childbirth, the mother's posture (short), the pregnancy is too close, the mother is too young, too old, too often gives birth, and insufficient nutritional intake during pregnancy, initiation is not carried out early breastfeeding, failure of exclusive breastfeeding, and early weaning, quantity, quality, and safety of complementary foods provided can be a factor in the occurrence of stunting [29].

Family knowledge about nutrition can help find various alternative solutions for solving toddler nutrition problems. Then the attitude of mothers is very influential, if a less attentive mother's attitude toward her toddler nutrition, it can result in a lack of compliance with the toddler nutrition. Mothers are the most people with toddlers so they have an important role in preventing nutritional problems in toddlers, thus the incidence of malnutrition and even malnutrition and stunting can be prevented. The knowledge that is lacking and can be detrimental to health should be changed to a direction that benefits health. This is because knowledge can influence attitudes which, in turn, can influence how a person behaves. Maternal knowledge about balanced nutrition for children is an important thing. This knowledge can direct mothers to monitor the growth and development of children under five by providing a balanced diet according to the nutritional needs of the children. The fulfillment of balanced nutrition will create a normal nutritional status for toddlers. Mothers with extensive information sources will have more knowledge about toddler nutrition than mothers with minimal sources of information. So that they are considered more capable of handling health problems, especially nutritional problems in their families.

**Table 2: Systematic review study data presentation for selected journal articles**

Citation Number	Research	Elemen				Outcomes	Context
		Population	Intervention	Comparison			
7	Skordis-Worrall et al., 2016	Second-trimester pregnant women until the child is 18-months-old.	CARING trial	1. Intervention: a. Community workers group (children's food consultation, infectious diseases, and child care) 2 times a month through home visits b. Strengthening rural sanitation 2. In the control group was not given.	1. Intervention: a. Community workers group (children's food consultation, infectious diseases, and child care) 2 times a month through home visits b. Strengthening rural sanitation 2. In the control group was not given.	Able to reduce 13% prevalence of stunting for 24 months. Z difference was 0.15 SD TBU score better on intervention group than the control group.	India
8	Stephenson et al., 2017	Children ages 5–6 months of age were recruited and followed up to the age of 12 months.	COWPEA (Malawi Local beans)	1. Giving intervention a. Cowpeas. b. Nuts. 2. Control group, was not given both.	1. Giving intervention a. Cowpeas. b. Nuts. 2. Control group, was not given both.	At the age of 6–9 months, the intervention group had a higher value of z scores (p = 0048) compared to the control group. However, after the age of 9–12 months, there was no difference in the value of z score TB/U.	Malawi
9	Iannotti et al., 2017	Children aged 6–9 months.	The Lulun Project	1. The intervention of consuming 1 egg/day. 2. The control group was not given an egg.	1. The intervention of consuming 1 egg/day. 2. The control group was not given an egg.	There are differences in the value of the biomarker choline between the intervention and control group (p = 0.032). Choline contributes to the growth response.	Ecuador
10	Dewey et al., 2017	Pregnant women aged >140 days of gestation until the child is 24 months old.	Rang-Din Nutrition Study.	1. Intervention a. Voluntary health workers. b. Volunteer community members. c. Tablet IFA. d. LNS. e. MNP. Group A = IFA Control. Group B = IFA-MNP. Group C = IFA-LNS. Group D = LNS-LNS.	1. Intervention a. Voluntary health workers. b. Volunteer community members. c. Tablet IFA. d. LNS. e. MNP. Group A = IFA Control. Group B = IFA-MNP. Group C = IFA-LNS. Group D = LNS-LNS.	The prevalence of stunting was lower in all intervention groups than in the control group, which was only given folic acid and iron (p < 0.05). Whatever the intervention gives better results than just given folic acid + iron.	Bangladesh
11	Leroy et al., 2018	Pregnant women to children aged 24 months.	Tubaramure	1. Intervention a. Feeding. b. Increased access to health services. c. Changes in behavior. Group A: Feeding pregnancy until the age of 24 months. Group B: Feeding the pregnancy until the age of 18 months. Group C: Feeding only from birth to age 24 months. Group D: Regular health care from public health programs.	1. Intervention a. Feeding. b. Increased access to health services. c. Changes in behavior. Group A: Feeding pregnancy until the age of 24 months. Group B: Feeding the pregnancy until the age of 18 months. Group C: Feeding only from birth to age 24 months. Group D: Regular health care from public health programs.	The results of the intervention show that all forms of intervention give better results on children's growth.	Burundi
12	Mahmudiono et al., 2018	Stunted mothers and children aged 2–5 years.	NEO-MOM	1. Group Intervention: Health Care, Nutrition Education, Home Visits. 2. Group Control: Ordinary Health Services + Printed Educational Materials.	1. Group Intervention: Health Care, Nutrition Education, Home Visits. 2. Group Control: Ordinary Health Services + Printed Educational Materials.	There was an improvement in the z score (-2.99--2.85) in the intervention group p = 0.183, but it was not significantly increased for 3 months. The same thing occurred in the control group.	Indonesia
13	Côté et al., 2017	Mother and Children ages 0–48 months.	Preparing for Life program	1. Intervention (1) Home visits (2) baby massage skinny and (3) positive parenting. Visits 2 times a month. In the 1 <sup>st</sup> year, massage the baby twice, while the 2 <sup>nd</sup> year and so on no longer do baby massage. In the 2 <sup>nd</sup> year given Positive Parenting duration of 2 h each session, with the number of sessions 5 times a year. 2. The control groups received regular health services.	1. Intervention (1) Home visits (2) baby massage skinny and (3) positive parenting. Visits 2 times a month. In the 1 <sup>st</sup> year, massage the baby twice, while the 2 <sup>nd</sup> year and so on no longer do baby massage. In the 2 <sup>nd</sup> year given Positive Parenting duration of 2 h each session, with the number of sessions 5 times a year. 2. The control groups received regular health services.	These interventions improve the quality of child health care but are not able to handle cases of child health in emergencies. This program is very effective for the prevention of health problems.	Irelandia
14	Vazir et al., 2018	The third trimester of pregnant women until the child is 15-months-old.	Integrated Child Development Services	1. Group A: Standard of care + education intervention on complementary feeding. 2. Group B: Standard of care + education intervention on responsive complementary feeding and play. 3. Group C: Control: standard of care.	1. Group A: Standard of care + education intervention on complementary feeding. 2. Group B: Standard of care + education intervention on responsive complementary feeding and play. 3. Group C: Control: standard of care.	The height of the children in the intervention group was better than the control group, but not significantly different p = 0.175.	India
15	Muhoozi et al., 2018	Mother and Child aged 6–8 months.	Early childhood caries	1. Group A: Intervention: Education and promotion of hygiene and sanitation. 2. Group B: Control: Regular Health Services.	1. Group A: Intervention: Education and promotion of hygiene and sanitation. 2. Group B: Control: Regular Health Services.	The dentition growth of children in the intervention group was better than the control group (p = 0.01). Number of teeth correlates with child growth.	Uganda
16	Adu-Afarwuah et al., 2016	Pregnant women <20 weeks of pregnancy, children 18 months of age.	Small-Quantity, Lipid-Based Nutrient Supplements	1. Group A: Blood Add Tablet. 2. Group B: Micronutrient Powder. 3. Group C: Oil/fat supplements.	1. Group A: Blood Add Tablet. 2. Group B: Micronutrient Powder. 3. Group C: Oil/fat supplements.	The difference in the prevalence of stunting between different groups of Folic Acid (8.9%), Micronutrient Powder (15.1%), and supplementary fat (11.5%) (p = 0.045).	Ghana
17	Briceño et al., 2017	Village Analysis Unit, Households and Children under five.	Handwashing With Soap and Total Sanitation and Sanitation Marketing	1. Group A: Sanitation Campaign. 2. Group B: Hand Wash Campaign. 3. Group C: Combination of Sanitation and Hand Washing Campaigns. 4. Group D: Control.	1. Group A: Sanitation Campaign. 2. Group B: Hand Wash Campaign. 3. Group C: Combination of Sanitation and Hand Washing Campaigns. 4. Group D: Control.	Reducing ODF 23.1–11.1%, Increasing the use of toilet 49.7–64.8%, there is no significant difference in the effect of stunting in children under five, although the z score of the BBU score in different groups is significantly different. The highest value in group C.	Tanzania
18	Olney et al., 2018	Pregnant Women (3–7 months), Children up to 24 months of age.	PROCOMIDA	1. Group 1 = FFR + CSB + BCC. 2. Group 2= FFR + CSB + BCC. 3. Group 3 = NFR + CSB + BCC. 4. Group 4 = FFR + LNS + BCC. 5. Group 5 = FFR + MNP + BCC. 6. Group 6 = Control.	1. Group 1 = FFR + CSB + BCC. 2. Group 2= FFR + CSB + BCC. 3. Group 3 = NFR + CSB + BCC. 4. Group 4 = FFR + LNS + BCC. 5. Group 5 = FFR + MNP + BCC. 6. Group 6 = Control.	Stunting significantly lowered from the age of 1 month to 24 months. Except in the control group.	Guatemala

(Contd...)

Table 2: (Continued)

Citation Number	Research	Element Population	Intervention	Comparison	Outcomes	Context
19	Kang <i>et al.</i> , 2016	Mother and Children ages 6–12 months.	Community-Based Participatory Nutrition Promotion Programme	1. Group 1: Model PD/Hearth (Tungku). 2. Group 2: Control/Regular program.	Significantly reduces stunting ( $p = 0.046$ ).	Ethiopia
20	Susanto <i>et al.</i> , 2019	Mother and Children ages 0–72 months.	Promote Children's Growth and Development	1. Group Intervention: MCH Book Module + Education Class. 2. Control Group: Regular Program.	The proportion of stunting, wasting, and underweight was higher in the control group than in the intervention group, although it was not statistically significant. Significant increase in mother's self-confidence in parenting.	Indonesia
21	Fink <i>et al.</i> , 2017	Households with children aged 6–12 months.	Community-Based Growth Monitoring Including Nutritional Supplementation	1. Group 1 = Growth Monitoring-based RT + educational posters. 2. Group 2 = Community-Based Growth Monitoring. 3. Group 3 = Control.	Little effect on growth, but significantly improved the quality of feeding in children. Increasing the value of z score in children who are stunted but not significantly different from the control group.	Zambia
22	Rockers <i>et al.</i> , 2016	Caregiver Mother-Child 6–12 months.	CDAs	1. Group Intervention: stimulation and cognitive play practices, child nutrition, and cooking practices, and self-care for good mental health. Household visits and group meetings were held during the study intervention period of 1 year. 2. Group Control: Routine service.	The intervention package was associated with a 0.12 SD increase in weight-for-age (95% CI $-0.14$ – $0.38$ ), a 0.15 SD increase in height-for-age (95% CI $-0.18$ – $0.48$ ) and a reduction in stunting (OR 0.68; 95% CI 0.36–1.28).	Zambia
23	Rockers <i>et al.</i> , 2018	Caregiver Mother-Child 12–24 months.	CDAs	1. Group Intervention: stimulation and cognitive play practices, child nutrition, and cooking practices, and self-care for good mental health. Household visits and group meetings were held during the study intervention period of 1 year. 2. Group Control: Routine service.	The intervention group significantly reduced stunting (56/195 versus 72/182; adjusted odds ratio 0.45, 95% CI 0.22–0.92; $p = 0.028$ ) and have a significant positive impact on the language ( $\beta$ 0.14, 95% CI 0.01–0.27; $p = 0.039$ ). The intervention did not significantly affect cognition ( $\beta$ 0.11, 95% CI $-0.06$ – $0.29$ ; $p = 0.196$ ), motor skills ( $\beta$ $-0.01$ , 95% CI $-0.25$ – $0.24$ ; $p = 0.964$ ), adaptive behavior ( $\beta$ 0.21, 95% CI $-0.03$ – $0.44$ ; $p = 0.088$ ), or social emotional development ( $\beta$ 0.20, 95% CI $-0.04$ – $0.44$ ; $p = 0.098$ ).	Zambia
24	Yousafzai <i>et al.</i> , 2014	Caregiver mother and child aged 6–24 months.	LHW program	1. Group A: responsive stimulation and enhanced nutrition. 2. Group B: responsive stimulation. 3. Group C: enhanced nutrition. 4. Group D: Control (regular health service standards).	Responsive stimulation interventions can be delivered effectively by LHW and positively influence children's development.  In all intervention groups, the z value of the initial and late intervention scores significantly increased, although they were not significantly different between the control groups.	Pakistan
25	Oddo <i>et al.</i> , 2016	Mother and Child 0–24 Months.	JiVitA-3	1. Group 1: Folic Acid Supplementation. 2. Group 2: Multi-Micronutrient Supplementation.	Supplementation reduces the prevalence of stunting at age 1 (RR: 0.95; 95% CI: 0.92, 0.98) dan 3 (RR: 0.91; 95% CI: 0.88, 0.94) bulan.	Bangladesh
26	Schlossman, 2016	Children aged 36–59 months.	Ready-to-use supplementary foods	1. Group I = Kontrol. 2. Group II = Ready-to-Consume Supplements (protein source) 15%. 3. Group II = Ready-to-Consume Supplements (protein source) 30%.	The increase in the Z score of BBU in the intervention group. Supplementation is required and integrated with local sources.	Guinea-Bissau
27	Roche <i>et al.</i> , 2017	Mothers and Children <2 years.	Positive Deviance/Hearth	1. Group Intervention: PD/Hearth. 2. Group Control: No PD/Hearth. 1. Feeding Practice 2. Caring practice 3. Hygiene practice 4. Health seeking behavior 5. 12 Sessions.	The increase in energy and protein intake was better in the intervention group ( $p < 0.05$ ). Practice better hygiene ( $p < 0.05$ ) and the incidence of diarrhea is lower ( $p < 0.05$ ). The Z score of the BBU is better ( $p < 0.05$ ). Parenting practices differed significantly in the two groups.	Ecuador
28	Pruett <i>et al.</i> , 2019	Father and Mother, and children <12 years.	Supporting Father Involvement	1. Group Intervention: Socialization and discussion of the Child Care Index, the Role of Father Parenting, The role of parents in parenting, was carried out for 6 months, in a total time of 32 h. 2. Group Control : Not given any treatment,	49–56% of children will internalize the father-mother parenting models in the intervention group. Father's attention was better and was able to increase family income in the intervention group than in the control group. ( $p = 0.043$ )	California

IFA: Fe + Asam Folat, LNS: Lipid nutrient supplement, MNP: Mikro nutrient powder, BCC: Behavior-change communication, CSB: Corn-soy blend, FFR: Full family ration, LNS: Lipid-based nutrient supplement, MNP: Micronutrient powder, NFR: No family ration, RFR: Reduced family ration, CDAs: Child development agents, LHW: Lady health worker. Source: Secondary Data, 2021

One of the ways to increase knowledge, attitudes, and behavior is through health education. Health education is a means of information that is very intensive and also effective in efforts to improve

aspects of health that are still lagging in one place. Health education itself can be carried out with a variety of methods to adjust the targets that will be given education.

Educational interventions can improve infant and young child feeding in a SR, Vazir *et al.* (2013) demonstrated an increase in body weight and linear growth from interventions providing complementary foods or nutritional counseling alone. Mixed results for counseling only increase when food animal sources are also promoted. Effectiveness tests promoting adequate and sustainable complementary feeding in India found that good feeding practices and strengthening existing government services were associated with increased breastfeeding and children's dietary intake but had no significant effect on physical growth. In Peru, nutrition education at health centers alone has improved nutritional status and decreased stunting [14].

Based on the results of this study, it shows that intervention from the knowledge aspect affects reducing the incidence of stunting, namely the first Community-Based Participatory Nutrition Promotion (CPNP) Program conducted by Kang *et al.* [19] is a program and intervention for caregivers (knowledge). In her research, the treatment given to group 1: The PD/Hearth (Furnace) model significantly reduced stunting ( $p = 0.046$ ). Second, JiVitA-3 Program conducted by Oddo *et al.* [25] is an intervention program and caregiver (knowledge and behavior). In his research, consisting of the treatment given to the first group: folic acid supplementation, group 2: Multi-micronutrient supplementation showed supplementation reduce the prevalence of stunting at age 1 (RR: 0.95; 95% CI: 0.92, 0.98) and 3 (RR: 0.91; 95% CI: 0.88, 0.94) months. Third, the Community-Based Growth Monitoring Program Including Nutritional Supplementation (CBGM + NS) conducted by Fink *et al.* [21] is a program and intervention for caregivers (knowledge). In his research, it consisted of the treatment given to group 1: RT-based growth monitoring + poster education and group 2: community-based growth monitoring which showed little effect on growth but significantly improved the quality of children's feeding. The increased z score in children who were stunted was not significantly different from the control group. Fourth, the Child Development Agents Program (CDAs) conducted by Rockers *et al.* [22] is a program or intervention for caregivers (knowledge). In their research, the intervention group was given treatments such as stimulation and cognitive play practices, children's nutrition and cooking practices, and self-care for good mental health. Household visits and group meetings were held during the intervening period of the 1-year study. The intervention package was associated with a 0.12 SD increase in weight-for-age (95% CI -0.14-0.38), a 0.15 SD increase in height-for-age (95% CI -0.18-0.48), and a reduction in stunting (OR 0.68; 95% CI 0.36-1.28).

The socio-economic and sanitary conditions of the residence are also related to the occurrence of stunting. Economic conditions are closely related to the ability to meet nutritious intake and health services for pregnant women and toddlers. Meanwhile, sanitation

and food safety can increase the risk of infectious diseases. Infectious diseases caused by poor hygiene and sanitation (e.g., diarrhea and worm infection) may interfere with the absorption of nutrients in the digestive process. Some infectious diseases suffered by babies can cause the baby to lose weight. If this condition occurs for a long time and is not accompanied by adequate intake for the healing process, it can result in stunting [29].

However, stunted children that occur in Indonesia are not only experienced by poor and underprivileged households/families, because stunting is also experienced by households/families who are not poor/who are above 40% of the level of social and economic welfare. Nutritional intake in toddlers is very important in supporting growth under the growth chart so that growth faltering does not occur which can cause stunting. To meet the nutritional adequacy of children under five, a supplementary feeding program (PMT) has been established, especially for underweight toddlers in the form of local PMT and manufactured PMT, namely, toddler MT biscuits. If the bodyweight is by the calculation of body weight according to height, MT for underweight children can be stopped and continued with a balanced nutrition family diet [29].

Increasing the coverage of households that have access to proper sanitation services is the strongest predictor of reducing stunting among children under five in Indonesia. In Indonesia, there is a significant interaction between sanitation and household water treatment with stunting. Children who live in a house that does not have a toilet compared to those who have a latrine have a significant difference in the prevalence of stunting, namely, 35.3% and 24.0%, respectively. Households that do not use soap to wash their hands, compared to the opposite, have a stunting prevalence of 31.6% and 25.8%, respectively. The absence of sanitation facilities in the household reduces access of family members to proper sanitation services, thus encouraging the behavior of not washing hands properly after defecating and preparing and providing food for children [30].

Opportunities under five suffer stunting due to poor sanitation 4 times higher than with good environmental sanitation. Another study in India even shows other interesting things that households living in communities with worse health conditions and vulnerable to influence a greater increase in body height of 0.7 cm suit children 4 years old to invest in household sanitation. It is known that the absence of proper sanitation facilities has led to an increase in diseases caused by bacterial contaminants from human and animal digestion such as diarrhea and worms, which, in turn, affect the nutritional status of children [31], [32], [33].

Diarrhea cases in children under five are still quite high at 18.5% and increased from 12.3% in 2013. 20 Research in Ethiopia has further shown that the

integration of Water, Sanitation, and Hygiene (WASH) with nutrition improvement programs can reduce stunting and fever in children compared to a nutrition program alone. Although WASH alone does not always reduce stunting, it has the potential to accelerate progress in reducing the proportion of stunting as an important component of a comprehensive strategy [4].

Based on the results of this study, it shows that intervention from the family/household aspect affects reducing the incidence of stunting, namely, the first COWPEA program conducted by Stephenson *et al.* [8] is a program and family/household intervention (household food security). In his research, consisting of the treatment is given to the group cowpeas and beans group. At 6–9 months of age, the intervention group had a higher z score ( $p = 0.048$ ) than the control group. However, after 9–12 months of age, there was no difference in the z value of TB/U scores. Second, The Lulun Project program conducted by Iannotti *et al.* [9] is a family/household program and intervention (household food security). In his research, the treatment of consuming 1 egg/day for the intervention group showed a difference in the value of choline biomarkers between the intervention group and the control group ( $p = 0.032$ ). Choline contributes to the growth response.

The Indonesian government has carried out specific nutrition interventions aimed at addressing the direct causes of stunting in the form of nutritional intake and infection, as well as sensitive nutrition interventions aimed at addressing indirect causes such as food security, access to health services, environmental health, and parenting [4], [34].

The lack of involvement of health workers with mothers in providing nutrition promotion during pregnancy has an impact, among others, on maternal knowledge, and the health of mothers and children. Therefore, it is necessary to prevent stunting in children under five, either directly (specific nutrition intervention) or indirectly involving cross-sectors and communities in the provision of food, clean water and sanitation, poverty alleviation, education, social, and so on [4].

There are eight specific nutrition intervention programs, namely: First, health and nutrition during adolescence, pre-conception, pregnancy, and breastfeeding. The second is to provide maternal food or micronutrient supplements, and third, namely, promoting optimal breastfeeding. The fourth program is supplementary feeding, responsive feeding practices, and feeding simulations. The fifth program is in the form of food supplementation, food diversification, and micronutrient supplementation or fortification for children. The sixth program is the treatment of severe acute malnutrition. The seventh program is in the form of disaster prevention and management, as well as the eighth nutrition in an emergency [35], [36].

Interventions designed to reduce stunting in Asian countries require a combination of factors and

components that together provide an appropriate context. Strong political commitment and multi-sectorial collaboration between government, non-government, national, and international organizations is one of the keys to the success of the program. Although nutrition interventions are very much needed, if the program focuses only on the nutritional aspect, it tends to be insufficient. Countries such as Bangladesh, require education and counseling programs, vitamin supplementation, immunization, and food security. However, the same combination of interventions was not equally effective in India. Differences can be caused by differences in needs, geographic location, organization, administration, administration of the intervention, and the population being targeted affect the overall effectiveness of the intervention [2], [37].

Based on the results of this study, it shows that interventions from the environmental aspects of the community affect reducing the incidence of stunting, namely first, the CARING Trial program conducted by Skordis-Worrall *et al.* [7] is a community environmental program (participation in health services, clean water facilities, environmental hygiene). In his research, consisted of treatment given to groups of community workers in the form of child food consultations, infectious diseases, and child care, 2 times a month through home visits, and strengthening village sanitation, which was able to reduce 13% of the prevalence of stunting for 24 months. Second, the Rang-Din Nutrition Study (RDNS) Program conducted by Dewey *et al.* [10] is a community environmental program and intervention (participation in health services and support for nutrition improvement funds). In their research, the intervention group was given treatment such as the involvement of voluntary health workers, voluntary community members, giving Fe + folic acid (IFA) tablets and lipid based nutrient supplements (LNSs), micronutrient powder (MNP) which showed a lower prevalence of stunting in all intervention groups. ( $p < 0.05$ ). Third, the Supporting Father Involvement Program conducted by Cowan *et al.* [28] is a community environmental program and intervention (support for nutrition improvement funds). Fourth, Programs Positive Deviance/Hearth is a community environmental program and interventions (support fund to improve nutrition). In his research, the intervention group was given treatment such as socializing and discussing the childcare index, the role of fathers' parenting, the role of parents in parenting, which was carried out for 6 months, in a total time of 32 h which showed that 49–56% of children would internalize the father's parenting model mothers in the intervention group. Father's attention was better and was able to increase family income in the intervention group than in the control group ( $p = 0.043$ ) [27]. Fifth, the ready-to-use supplementary foods (RUSFs) program conducted by Schlossman [26] is a community environmental program and intervention (support for nutrition improvement funds). In his research, consisting of the treatment given to Group II = 15% ready-to-consume

supplement (protein source), Group II = 30% ready-to-consume supplement (protein source) which showed an increase in the Z score of BBU in the intervention group. Supplementation is necessary and integrated with local resources.

Nutritional problems, in general, can involve aspects of knowledge, attitudes, and behaviors that are lacking in creating a healthy lifestyle. The high number of children under five with stunting shows that public awareness about nutrition is still lacking. Lack of knowledge and perceptions about the needs and value of food in children under five is a common thing. Lack of maternal knowledge about toddler nutrition will also have an impact on the fulfillment of nutrition for toddlers because knowledge is a very important domain from the formation of a person's behavior, including behavior in fulfilling nutrition. A person's behavior is known to be more lasting if it is based on knowledge of that matter.

Changes in the socio-cultural structure in society are marked by shifting the roles and functions of the family, one of the things that mark the change, the number of mothers who have children who also functions as breadwinners. Therefore, they have very little time to care for and educate their children. As a result, not a few children experience delays in their growth and development, especially during the golden age, which is under 5 years. This is due to the lack of stimulation and learning opportunities provided by parents to their children.

Fine motor development in children aged 4 years is very developed, even almost perfect. However, children of this age still have difficulty tracing, cutting, shaping with plasticine, playing blocks, and folding. Children aged 5 years have been able to coordinate visual-motor movements, such as coordinating eye and hand movements, arms, and body simultaneously.

One of the factors in the occurrence of optimal growth and development in children is good feeding practices because feeding practices greatly affect children's nutritional intake. This is in line with the research of Kabir *et al.* [38] which states that knowledge and practice of feeding children greatly affect children's growth and development. This means that even though a mother has high nutritional knowledge, poor feeding practices, it will not fully support the supervision of children's nutritional intake. Good feeding practice for children is important, especially for mothers who have children under 2 years of age to avoid nutritional problems because children under five are still susceptible to disease. Unicef (1997) proposes a theory regarding the principles of good feeding practice, including three aspects, including the provision of sustainable complementary foods, namely the introduction of complementary foods, food diversity, adequate nutrition, and feeding frequency. The next aspect regarding the mother's attitude in feeding practice is the adjustment of the feeding method with the child's psychomotor abilities, responsive feeding,

and creating a good eating situation. The last aspect regarding the adaptation of children to family food.

Less than optimal nutritional intake will increase the chances of developing nutritional problems in children, one of which is the problem of stunting nutrition; therefore, it is necessary to have optimal nutritional supervision. The accuracy of complementary feeding also has a significant effect on increasing the height of children aged 6–24 months so that it can reduce the risk of stunting; therefore, this is very important to do regarding the introduction of complementary foods, food diversity, and adequate nutrition and frequency of feeding food. This means that there should be the firmness of parents to limit children to buy snacks outside and make innovations on breastfeeding so that children are interested in eating at home.

Based on the results of this study, it shows that intervention from the aspects of caregivers (knowledge and behavior), family/household (household food security, playing props for children, house hygiene, and family toilet hygiene), community environment (participation in community services, water facilities clean, environmental cleanliness, and support for nutrition improvement funds) affect reducing the incidence of stunting, namely, first, the Tubaramure Program conducted by Leroy *et al.* [11] is a program and intervention for caregivers (behavior), family/household (household food security) (stairs), and the community environment (participation in health services). In his research, the intervention group was given treatment such as feeding, increased access to health services, and behavior changes which showed that all forms of intervention gave better results on children's growth. Second, the NEO-MOM program conducted by Trias Mahmudiono *et al.* [12] is a program and intervention for caregivers (knowledge), and the community environment (participation in health services). In his research, the intervention group was given the treatment of health services, nutrition education, and home visits which showed an improvement in the z score (-2.99--2.85) in the intervention group  $p = 0.183$ , but it was not significantly increased for 3 months. The same thing happened to the control group. Third, the Preparing for Life (PFL) Program conducted by Côté *et al.* [13] is a program and intervention for caregivers (knowledge and behavior) and the community environment (participation in health services). In his research, the intervention group was treated with home visits, infant massage, and positive care. Visit twice a month. In the 1st year, massage the baby twice, while in the 2nd year and so on, there is no longer massage for babies. In the 2nd year, 2 h of positive care were given per session, with 5 sessions a year. This intervention shows an increase in the quality of child health care but is unable to handle child health cases in an emergency. This program is very effective for the prevention of health problems. Fourth, the Integrated Child Development Services (ICDS) Program

conducted by Shahnaz Vazir *et al.* [14] is a program and intervention for caregivers (knowledge), family/household (playing props for children). In his research, consisting of the treatment given to Group A: Standard of care + education intervention on complementary feeding, kelompok B: Standard of care + education intervention on responsive complementary feeding and play. The height of the children in the intervention group was better than the control group, but not significantly different,  $p = 0.175$ . Fifth, the early childhood caries (ECC) program conducted by Muhoozi *et al.* [15] is a program and intervention for caregivers (knowledge and behavior), family/household (house hygiene and family toilet hygiene), and the community environment (water facilities) clean, environmental cleanliness. In his research, it consisted of the treatment given to the intervention group in the form of education, promotion of hygiene, and sanitation. The dentition growth of children in the intervention group was better than the control group ( $p = 0.01$ ). The number of teeth correlates with child growth. Sixth, the Small-Quantity LNSs, (SQ-LNSs) Program conducted by Adu-Afarwah *et al.* [16] is a program and intervention for caregivers (behavior), community environment (support for nutrition improvement funds). In his study, consisting of the treatment given by Group A: Blood added tablets, Group B: Micronutrient powder, and Group C: Oil/fat supplementation which showed a difference in the prevalence of stunting between different groups of folic acid (8.9%), micronutrient powder (15.1%), and supplements of fat (11.5%) ( $p = 0.045$ ). Sixth, the PROCOMIDA program carried out by Olney *et al.* [18] is a program and intervention for caregivers (behavior), the community environment (support for nutrition improvement funds). In his research, consisting of the treatment given to Group 1 = Full family ration (FFR) + Corn-soy blend (CSB) + Behavior-change communication (BCC), kelompok 2 = RFR + CSB + BCC, Group 3 = No family ration + CSB + BCC, Group 4 = FFR + LNS + BCC, and Group 5 = FFR + MNP + BCC significantly reduced stunting from 1 month to 24 months of age, except in the control group. Seventh, the Handwashing With Soap (HWWS) and Total Sanitation and Sanitation Marketing (TSSM) Program conducted by Briceño *et al.* [17] is a program and intervention for caregivers (behavior), family/household (house hygiene and family toilet hygiene) and the community environment (clean water facilities and environmental cleanliness). In their research, it consisted of the treatment given by Group A: a sanitation campaign, Group B: a hand washing campaign, Group C: a combination of a sanitation campaign and hand washing. Reducing ODF 23.1–11.1%, increasing toilet use 49.7–64.8%, there was no significant difference in the effect of stunting in children under five, although the z score of BBU scores differed significantly between groups. The highest value in Group C. Eighth, Program Promote Children's Growth and Development (PCGD) conducted by Susanto *et al.* [20] is a

program and caregiver intervention (behavior), family/household (props playing children). In his research, the intervention group was given treatment in the form of a KIA book module + education class which showed the proportion of stunting, wasting, and underweight was higher in the control group than the intervention group, although it was not statistically significant increase in mother's self-confidence in parenting. Ninth, the CDAs Program conducted by Rockers *et al.* [23] is a caregiver (behavior), family/household (playing props for children). In their research, the intervention group was given treatments such as stimulation and cognitive play practices, children's nutrition and cooking practices, and self-care for good mental health. Household visits and group meetings held during the 1-year study intervention period showed the intervention group significantly reduced stunting (56/195 vs. 72/182; adjusted OR 0.45, 95% CI 0.22–0.92;  $p = 0.028$ ) and has a significant positive impact on language ( $\beta$  0.14, 95% CI 0.01–0.27;  $p = 0.039$ ). The intervention did not significantly affect cognition ( $\beta$  0.11, 95% CI –0.06–0.29;  $p = 0.196$ ), motor skills ( $\beta$  –0.01, 95% CI –0.25–0.24;  $p = 0.964$ ), adaptive behavior ( $\beta$  0.21, 95% CI –0.03–0.44;  $p = 0.088$ ), or social-emotional development ( $\beta$  0.20, 95% CI –0.04–0.44;  $p = 0.098$ ). Tenth, the Lady Health Worker (LHW) program conducted by Yousafzai *et al.* [24] is a program and intervention for caregivers (behavior). In his research, consisting of the treatment given to Group A: Responsive stimulation and enhanced nutrition, Group B: Responsive stimulation, and Group C: Enhanced nutrition which shows responsive stimulation interventions can be delivered effectively by LHW and positively affects children's development. In all intervention groups, the z value of the initial and late intervention scores significantly increased, although they were not significantly different between the control groups.

## Conclusion

1. The SR method of this study identified that caregivers, pregnant women, and children (0–72 months) are the most important populations against stunting.
2. The SR method of this study identifies several programs and interventions that can be used as efforts to prevent and control stunting that have been proven successful in reducing the prevalence of stunting, namely: CARING Trial, COWPEA, The Lulun Project, RDNS, Tubaramure, NEO-MOM, PFL, ICDS, ECC, SQ-LNSs, HWWS and TSSM, PROCOMIDA, CPNP Programme, PCGD, CBGM + NS, CDAs, LHW programme, RUSFs, Supporting Father Involvement, Positive Deviance/Hearth, v. JiVitA-3.

3. The SR method in this study has been used for comparison or interventions to be compared with the intervention or exposure. Giving treatment to the intervention group and the control group were only given conventional treatment and were not given any treatment.
  4. The SR method in this study succeeded in identifying that the interventions applied to prevent and control stunting from each of the studies affected reducing the prevalence of stunting. However, differences in interventions can result from differences in needs, geographic location, organization, administration, administration of the intervention, and the population being targeted affects the overall effectiveness of the intervention.
  5. The SR method in this study has also been able to identify data that the context for preventing and overcoming stunting is the commitment of each country. The state does not want to play games on preventing and combating stunting in children because they are the generation that will continue the life and leadership of a country in the future.
  6. This study summarizes various programs or interventions carried out to prevent and reduce stunting rates in various countries. This allows these programs to be replicated by other countries. Further research is needed to look at the results of interventions longitudinally in all programs implemented in reducing stunting rates.
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