NUTRITIONAL INTERVENTIONS TO REDUCE STUNTING IN DEVELOPING COUNTRIES: A SYSTEMATIC REVIEW

Lasrika S Sinaga, Ciciilya Candi, Mardiati Nadjib, Adang Bachtiar
Masters Program in Public Health, Faculty of Public Health, Universitas Indonesia

ABSTRACT

Background: Childhood stunting remains a major malnutritional problem in developing countries. Stunting occurred the adverse effects on children's health in the short and long term, including failure to thrive, impairment of cognitive and motor development, stunted stature, metabolic disorders, and decreased intellectual capacity. Integrated nutritional intervention is important to prevent stunting. This study aimed to identify the nutritional interventions to reduce stunting in developing countries.

Subjects and Method: A systematic review was conducted by searching from Wiley Online Library, and ProQuest databases. The research question was formulated in PICO-S format: (1) Population, (2) Intervention, (3) Comparison, (4) Outcome, and (5) Study design. The next step was identification, screening, and checking the eligibility of the studies. The keywords were nutrition intervention and stunting reduction. The inclusion criteria were openly accessed and English-language articles published between 2019 to 2020. The searched articles were conducted identification, screening, and eligibility. The data were reported by PRISMA flow chart.

Results: Nine articles met the inclusion criteria. Integrated efforts to reduce stunting incidence were carried out through sensitive and specific nutritional interventions. A holistic approach involving the non-health sectors had significant impacts. Some limitations had still occurred in the capacity of implementing qualified nutritional interventions and their utilization.

Conclusion: Implementation of nutritional interventions have been focused in developing countries with different approaches to reduce stunting incidence.

Keyword: nutritional intervention, stunting, developing countries

Correspondence:

BACKGROUND
The burden of malnutrition throughout the world is still high. Globally, at least 1 in 3 children under 5 years are not growing optimally because of nutritional deficiencies: stunting, wasting, and overweight. 149 million and 49 million children under five worldwide suffer from stunting and wasting. The cause of 3.5 million deaths universally, 35% of morbidity among children under five was malnutrition. The prevalence of stunting worldwide decreased from 39.3% to 20.8% under 5 years of age from 1990 to 2020. This mostly occurs in low and middle-income countries. (UNICEF, WHO, World Bank, 2020; Hossain et al., 2020).

Apart from the increasing prevalence of stunting, in 2017, 55% of childhood stunting in the world came from Asia and 39% came from Africa, most of them entered developing countries. Nutritional problems such as stunting and other malnutrition are still a big problem that must be addressed, especially in developing countries. Stunting is a condition of failure to thrive in children under five due to lack of nutritional intake for a long time as well as the occurrence of repeated infections.

The 7th International Conference on Public Health Solo, Indonesia, November 18-19, 2020 | 99
https://doi.org/10.26911/the7thicph-FP.03.20
These factors are influenced by inadequate parenting, especially in the first 1,000 days of life. Stunting, defined as the length or height, is more than two standard deviations below the WHO median growth standard for children of the same age and sex. (Indonesian Ministry of Health, 2018).

Stunting poses a risk of physical growth retardation and a child’s susceptibility to disease. It causes growth failure, cognitive and motor development impediments, and not optimal physical body size and metabolic disorders in the short term and risks reducing productivity in adulthood and intellectual capacity in the long term. (WHO, 2019). This is due to chronic or recurrent malnutrition, usually influenced by poor socioeconomic conditions, poor maternal health and nutrition, frequent illnesses, and improper feeding and care for infants and children early in life. (Ministry of National Development Planning / Bappenas, 2018; UNICEF, WHO, World Bank, 2020).

Several factors indirectly affect the nutritional intake and health status of mothers and children, the social environment associated with the practice of feeding infants and children (care), access to services health for prevention and treatment (health), as well as environmental health which, includes the availability of clean water and sanitation facilities. Intervention on these four factors is expected to prevent deficiency or excess of nutritional problems (UNICEF, 2020).

Nutrition interventions include specific nutrition interventions and sensitive nutrition as a step in reducing stunting as well as overcoming direct causative factors. Sensitive nutrition interventions are for indirect causes. The implementation of convergent interventions towards priority groups is the key to improving nutrition, child development and preventing stunting.

To ensure the convergence of these interventions, it requires sectoral and non-health sector commitments, including the highest government in each country, political and policy commitment to implementation, and government involvement and capacity to implement. (Rosha et al., 2016; Indonesian Ministry of Health, 2018). This study aimed to review or identify studies related to nutrition interventions in reducing stunting in developing countries.

SUBJECTS AND METHOD

1. Study Design
This study was a systematic review conducted by searching from Wiley Online Library, and ProQuest databases.

2. Population and Sample
Articles were searched using PICO. The population was children aged <5 years with intervention in the form of nutrition to see the status stunting in children.

3. Inclusion and Exclusion Criteria
The inclusion criteria of this study included: 1) Study population with articles on children under 5 years; 2) Research journals in developing countries; 3) Journals, articles in English and published in the last 1 year; 4) availability documents (free); and 5) Documents published in the field of public health and medical science.

Exclusion criteria were as follows: 1) Other databases; 2) Use of language except for English; 3) Inaccessible (paid); and Articles published less than 2019.

4. Data Analysis
This review uses PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) with eliminating irrelevant articles using criteria identification, screening and eligibility.

The stages in this research consisted of identifying research questions, developing a systematic review research protocol, determining the research database as an area to...
search for articles, selecting relevant research results, extracting data, analyzing, and reporting. Duplication checking via the app Mendeley as well as checking back manually.

**RESULTS**

A total of 459 articles were found, which were free of duplication. Furthermore, the feasibility assessment was carried out according to the inclusion and exclusion criteria and found 9 articles. The reviewed article was thoroughly adapted to the systematic review approach as shown in Figure 1.

This study came from developing countries, including Pakistan, Northwest Ethiopia, Sindh (Pakistan), Chandigarh (India), Naushahro Feroze (Pakistan), Southern Ethiopia, Mumbai, and Benin (Western Africa). Based on the research design, 7 studies used quantitative studies and 2 used qualitative studies.

Studies showed that the involvement of all components in fulfilling nutrition is necessary as part of the formulation of efforts to improve nutrition with various programs as well as a country’s development planning. Stunting is one of the Sustainable Development Goals (SDGs) targets, which is included in the second sustainable development goal, namely eliminating hunger and all forms of malnutrition by 2030 and achieving food security. The target set is to reduce the stunting rate by 40% by 2025.

The combination of the three aspects of specific nutrition intervention efforts, sensitive nutrition interventions and, interventions an enabling environment scale, according to political needs, capacities, and opportunities in each context. It is hoped that success in the form of increasing nutritional status can be achieved. Fulfillment of nutritional needs can improve the quality of the next generation, which will indirectly increase significant economic benefits through improving the quality of human resources.

**DISCUSSION**

In response to the high prevalence of stunting is concentrated in several countries. WHO had proposed a global target of reducing the incidence of stunting in children under five years of age by 40% by 2025 (WHO, 2019). Stunting reduction through specific and sensitive nutrition interventions was aimed at various activities.

Zaidi et al. (2020) stated that there were specific nutritional interventions such as providing food supplementation to prevent stunting in Pakistan consisting of Lipid-based Nutrient Supplement (LNS), a moderate quantity lipid-based nutritional supplement (LNS-MQ) developed for the prevention of malnutrition, locally produced which given to children from 6 to 23 months of age.

Guidelines for using LNS for the prevention of malnutrition are based largely on program circumstances and commodity availability and highlight the need for more evidence on the impact of different supplements on nutritional status in specific circumstances. Powder for sprinkling on food for children aged <5 years or 24–59 months and Wheat Soy Blend (WSB) (fortified food made from beans to mix with flour) for during pregnancy and 6 months after delivery (Khan et al., 2020).

Apart from providing dietary supplements, there were also educational interventions, counseling on early initiation of breastfeeding and exclusive breastfeeding, promoting optimal breastfeeding, sustainable breastfeeding, complementary feeding, and hygiene practices. WHO recommended exclusive breastfeeding for babies during the first six months of life to ensure the baby's optimal growth and health (WHO, 2019).

The next intervention was the promotion of optimal complementary feeding thro-
ugh behavioral change interventions with complementary feeding. Communication of changes in complementary feeding behavior delivered through actors at the community level significantly increases the adequacy of baby food (Abiyu and Belachew, 2020). Another study supported behavior change or counseling interventions in Malawi to promote optimal complementary feeding practices primarily targeting caregivers of children.

Nutrition education interventions were designed to facilitate a series of age-appropriate food selection, nutrition, diet, child feeding, food preparation, water, sanitation, and hygiene. The intervention showed a significant positive effect on minimum dietary diversity (MDD) and minimum acceptable die (MAD) but not on minimum meal frequency (MMF) (Jordan et al., 2018).

Ethiopia had also implemented specific and sensitive interventions in reducing stunting, such as the sustainable undernutrition reduction activity (SURE) in Ethiopia, which was a multi-sectoral government-led program for increasing nutritional outcomes that specifically focuses on the integration of the health and agricultural sectors. This program had been implemented to reduce stunting by 26% by 2020 and increase complementary feeding and dietary diversity as well as and using a behavior change communication (BCC) approach (Worku et al., 2020).
Figure 1. PRISMA Flow Diagram
<table>
<thead>
<tr>
<th>No</th>
<th>Author (Year)</th>
<th>Title</th>
<th>Study Design</th>
<th>Population</th>
<th>Intervention</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zaidi et al. (2020)</td>
<td>Food supplements to reduce Stunting in Pakistan: A process evaluation of community dynamics shaping uptake</td>
<td>Randomized Controlled Trial / Randomized Controlled Trial (RCT)</td>
<td>120 infants between 6 weeks and 3 months of age</td>
<td>Interventions with low-aflatoxin pre-blended porridge flour containing maize and groundnut (4:1 ratio respectively) and low-aflatoxin groundnut flour Complementary</td>
<td>Feeding interventions have been shown to reduce stunting. Interventions were associated with low-aflatoxin pre-blended porridge flour containing maize and groundnut (ratio of 4:1 respectively) and low-aflatoxin groundnut flour This showed that the optimal behavior change intervention in complementary foods can increase food diversity and adequacy. It was important to design a behavior change intervention strategies that can improve food security for infants complementary foods such as supplementary food, especially in developing countries</td>
</tr>
<tr>
<td>2</td>
<td>Abiyu et al. (2020)</td>
<td>Effect of complementary feeding behavior change communication delivered through community-level actors on dietary adequacy of infants in rural communities of West Gojjam Zone, Northwest Ethiopia</td>
<td>Randomized Controlled Trial / Randomized Controlled Trial (RCT)</td>
<td>612 infants with infants aged &lt;6 months</td>
<td>The intervention group received behavior change interventions with complementary feeding for 9 months. The results showed that the intervention brings about behavioral changes involving the infant-mother and family members. It became a practical approach with significant changes achieved in dietary sufficiency by promoting a variety of locally available and affordable nutritious foods that mothers well receive. This showed that the optimal behavior change intervention in complementary foods can increase food diversity and adequacy. It was important to design a behavior change intervention strategies that can improve food security for infants complementary foods such as supplementary food, especially in developing countries</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Khan et al. (2020)</td>
<td>Effect of lipid-based nutrient supplement-Medium quantity on the reduction of stunting in children 6–23 months of age in Sindh, Pakistan GN</td>
<td>Randomized controlled trial (RCT)</td>
<td>870 children 6–23 months of age</td>
<td>Moderate locally produced lipid-based nutritional supplement (LNS-MQ) known as Wawamum (consisting of roasted green beans, vegetable oil, dry skimmed milk powder, sugar, micro-nutrients), emulsifiers, and antioxidants) had been distri-</td>
<td>Children who received Wawamum were found to have a significantly reduced risk of stunting. The results confirm that giving Wawamum to children aged 6–23 months effectively reduced the risk of stunting, wasting, and anemia.</td>
</tr>
<tr>
<td>No.</td>
<td>Authors (Year)</td>
<td>Title</td>
<td>Study Type</td>
<td>Sample Size</td>
<td>Summary</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------</td>
<td>-------</td>
<td>------------</td>
<td>-------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Worku T et al. (2020)</td>
<td>Sustainable undernutrition reduction program and dietary diversity among children's aged 6–23 months, Northwest Ethiopia</td>
<td>Cross-sectional study</td>
<td>832 pairs of mothers with infants aged 6–23 months</td>
<td>Implemented the Continuous Malnutrition Reduction (SUR) program to address stunting in children aged 6–23 months. Sustainable Reduction of Malnutrition in Ethiopia (SURE) was a multi-sectoral program government-led to reduce stunting incidence. The proportion of adequate dietary diversity was higher in children who attended the program than those who did not.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Sharma et al. (2020)</td>
<td>Effectiveness of a culturally Appropriate educational nutrition intervention delivered through health services to improve growth and complementary feeding of infants:</td>
<td>A quasi-experimental study</td>
<td>202 infants aged six months to 12 months</td>
<td>The study highlights that nutrition education interventions were carried out through ANM interventions in the health system can significantly increase maternal knowledge about complementary breastfeeding and infant feeding practices in the intervention group, especially about consistent feeding and breastfeeding supported individually by trained health workers in infant feeding and followed up for six months. There was weight gain in the infants in the intervention group and the gain in length also. There was a significant reduction in the proportion of malnutrition. This study provided evidence that the growth and practice of complementary feeding in infants can be improved through nutrition education on culturally appropriate foods in vulnerable populations with limited food safety through the routine health care delivery system.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Rasheed et al. (2020)</td>
<td>Socio-cultural factors influencing preschool enrolment in a rural cohort exposed to early parenting interventions in stunting</td>
<td>With a qualitative approach with a phenomenological design</td>
<td>Children aged 3–5 years</td>
<td>Early parenting intervention in the first 2 years showed benefits for children's cognitive skills and the home's learning environment but did not increase school enrollment rates. Early parenting intervention (Early parenting interventions) proven effective in modifying parenting behavior to provide stimulation at home. This indicated that early childhood care, development, and education policies were very important in achieving the target of reducing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Authors</td>
<td>Title</td>
<td>Methodology</td>
<td>Sample Description</td>
<td>Findings</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Athavale et al. (2020)</td>
<td>A qualitative assessment of barriers and facilitators to implementing recommended infant nutrition practices in Mumbai, India</td>
<td>A qualitative design with purposive sampling</td>
<td>Age group of children from mothers of toddlers (6-12 months, 13-18 months, and 19-24 months). IYCF (Infant Young Child Feeding) -based intervention was carried out, the practice of feeding infants. The intervention was given because babies were given complementary foods and processed snacks that were not nutritious, contrary to the recommendations for PMBA interventions such as lack of knowledge and experience, nutritional information, limited social support, and poor self-efficacy in maternal decision making, from a facilitator perspective; professional nutritional guidance, self-efficacy and personal empowerment, and family support.</td>
<td>IYCF-based interventions and infant-toddler feeding practices could help design sustainable interventions in reducing the incidence of stunting. Nutrition interventions should prioritize standardized messages across health care providers that involve all family members, target early introduction of processed sugary and non-nutritious foods, and strengthen maternal self-efficacy to follow recommended guidelines with IYCF interventions.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Lokononet et al. (2020)</td>
<td>Participation in the &quot;nutrition at the Center&quot; project through the women's group improved exclusive breastfeeding practices, as measured by the deuterium oxide dose-to-mother technique</td>
<td>Cross-Sectional Design</td>
<td>Healthy Children Aged 4 to 5.5 months Nutrition at the Center interventions in improving exclusive breastfeeding practice (EBF)</td>
<td>This integrated approach helped improve EBF practice. A significant decrease followed an increase in mothers' proportion exclusively breastfeed in oral non-milk intake in exclusively group compared to the control group.</td>
<td></td>
</tr>
</tbody>
</table>
| 9. | Deksiyous et al.             | Effects of Nutrition Education on Improving Child Feeding Practices   | Randomized Controlled Trial                     | Two hundred (200) pairs of Intervention with complementary feeding practices | This study underscored the research evidence showing that malnutrition...
(2020) Enhancing Knowledge and Practice of Complementary Feeding of Mothers with 6 to 23-Month-Old Children in Daycare Centers in Hawassa Town, Southern Ethiopia (RCT) mothers - children aged 6-23 months following the Alive and Thrive Infant and Young Child Feeding (IYCF) practice guidelines. Nutritional education interventions to increase knowledge and practice of complementary breastfeeding for mothers with children aged 6 to 23 months at the Hawassa City Child Care Center, Southern Ethiopia. Enhanced complementary breastfeeding was the third effective breastfeeding to reduce under-five mortality and increased knowledge of mothers and appropriate complementary feeding practices for mothers.
In another study with analysis in seven countries in South Asia (India, Pakistan, Afghanistan, Bangladesh, Bhutan, Maldives, and Nepal), antenatal IFA interventions can reduce the risk of stunting in children <2 years of age by 8% adjusted for the survey country, mother's education status, resources, source of drinking water, fuel for cooking, etc. This was an important finding for policymakers, program managers, and stakeholders in the health and nutrition sector to support the development and implementation of IFA early initiation programs during pregnancy to increase the coverage and benefits of IFA compliance interventions to reduce the risk of stunting.

This program had three main components, such as community-based nutrition improvement (CBN) to overcome, complementary feeding, increase household food diversity through IFCF and, familiarize nutritionally sensitive agriculture. (Nisar et al., 2020).

The intervention in Chandigarh, India, provides evidence that the growth and practice of complementary feeding in infants can be improved through nutritional education regarding proper food by considering the culture of people with limited food safety through routine health care delivery systems (Sharma et al., 2020).

This activity also promoted effective communication of social behavior change and EBF practices in Benin, during which pregnancy and breastfeeding provided maternal food or micronutrient supplements had significantly resulted in high adherence among the participants and showed that the EBF rate improved in the intervention group.

Intervention in Mumbai, India by intervening Infant and Young Child Feeding (IYCF), (Athavale et al., 2020) aimed to bring about optimal changes in complementary breastfeeding behavior that can increased diversity and adequacy according to the research conducted (Blasbalg et al., 2011). Interventions such as nutrition education and counseling, micronutrient supplementation, food fortification, and micronutrient supplementation are recommended to improve nutritional status (Idohou-Dossou, 2020).

There was increasing interest in the use of dietary supplements to prevent stunting in childhood, but the close monitoring is still incomplete. The intervention was in nutrition education activities to increase the knowledge and practice of complementary feeding for mothers with children aged 6 to 23 months at the Hawassa City childcare center, Southern Ethiopia.

The appropriate complementary feeding activity was assessed by adapting the Alive and Thrive Infant, and Young Child Feeding (IYCF) practice guidelines and nutrition education interventions were given for four consecutive months using the IYCF guidelines. Governments and other partners working on reducing stunting should focus on nutrition education to increase knowledge and practice of complementary feeding, including child care centres (Selam et al., 2020).

Although the world’s developed countries had made rapid progress in controlling under-five mortality, in 2018, Sub-Saharan Africa and Central and South Asia reported that around 50% of all deaths in 2020 occurred in just five countries; India, Pakistan, Nigeria, Ethiopia, and the Democratic Republic of the Congo.

The most prominent under-five mortality was malnutrition which was 45% of deaths. Regarding stunting, apart from Pakistan, several countries are still in the category of very high wasting prevalence rates (more than 30%) in children under five: Bangladesh, Bhutan, Yemen, Ethiopia, India, Indo-
nesia, Maldives, Madagascar, Myanmar, Nepal, Nigeria, and Sudan. All of which belong to the developing or underdeveloped regions of the world. (Osama et al., 2020). Although the countries named are the countries with the highest malnutrition, each country is also moving towards improving nutrition.

The systematic limitations of this review can occur because of technical errors when filtering journals and the limitations of the literature published for this study. However, this reference was very helpful in showing nutrition interventions in reducing the number of stunting in developing countries. So, it was hoped that this review’s results could be useful for policymakers in health services to innovate in health services in the future.

Reducing the number of stunting needs to be focused on specific nutritional interventions to address direct causes and sensitive nutrition interventions to address indirect causes. Although the intervention was carried out differently from country to country, the goal was to achieve the target of reducing the number of stunting. The effort of convergence of interventions that adjust situation in each country, cooperation across sectors, strengthening all components as well.

REFERENCES
Khan GN, et al. (2020). Effect of lipid-based nutrient supplement—Medium quantity on reduction of stunting in children 6–23 months of age in Sindh, Pakistan:

The 7th International Conference on Public Health Solo, Indonesia, November 18-19, 2020 |109 https://doi.org/10.26911/the7thicph-FP.03.20


