



ASSOCIATION OF STUNTING AND SUPPLEMENTARY FEEDING IN STUNTING PREVENTION PROGRAM ON UNDER-FIVE (6 - 59 MONTHS OLD) CHILDREN: A SYSTEMATIC REVIEW

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ABSTRAK

Pengaruh pemberian makanan tambahan dalam program pencegahan stunting pada balita memiliki hasil yang beragam. Tujuan dari penelitian ini adalah untuk mengetahui asosiasi stunting dan pemberian makanan tambahan dalam program pencegahan stunting pada anak balita (6 - 59 bulan). Metode yang digunakan adalah dengan telaah sistematis menggunakan ketentuan PICOTS yang telah disetujui dan disepakati bersama penulis dengan menggunakan penelusuran pada basis data berlangganan dari Universitas Indonesia, yaitu Embase, PUBMED, SAGE, Science Direct, Scopus, dan Taylor & Francis. Telaah sistematis diekstraksi dan disortir menggunakan EndNote dan ditinjau menggunakan Rayyan.ai. Risiko bias dinilai menggunakan alat risiko bias *Cochrane*. Delapan publikasi memenuhi kriteria inklusi dan eksklusi termasuk dalam telaah sistematis ini dan disajikan secara kualitatif. Lima publikasi secara signifikan meningkatkan LAZ dan mengurangi kejadian stunting selama durasi penelitian. Lima dari delapan publikasi yang dianalisa menunjukkan peningkatan LAZ lebih tinggi dibandingkan dengan kontrol dari masing-masing penelitian. Studi menunjukkan bahwa intervensi ganda memiliki peluang lebih tinggi untuk mengurangi kejadian stunting, dan bahwa penelitian lanjutan diperlukan untuk menentukan intervensi yang efektif dan optimal dalam penyerapan makanan melalui peran kesehatan usus.

Kata kunci: Stunting, Makanan Tambahan, Program Pencegahan Stunting, Tujuan Pembangunan Berkelanjutan, Balita

ABSTRACT

Evidence on the effect of supplementary feeding in stunting prevention program in under-five children are mixed. This systematic review was conducted through the agreed PICOTS term and searched through online databases subscribed by Universitas Indonesia; Embase, PUBMED, SAGE, Science Direct, Scopus, and Taylor & Francis. Initial literature was extracted and sorted using EndNote and reviewed using Rayyan.ai. The risk of bias was assessed using the Cochrane risk-of-bias tool. Eight papers met the inclusion and exclusion criteria and were included in this systematic review and were presented qualitatively. Five studies significantly increased LAZ and reduced the incidence of stunting throughout the study duration. Five out of Eight of the analyzed study showed a higher increase in LAZ and stunting reduction compared to the control of each respective study. Studies suggest that multiple intervention has a higher chance to reduce stunting, and that follow-up researches are needed to determine effective and optimal intervention in food absorption through the role of gut health.

Keywords: Stunting, Supplementary Feeding, Stunting Prevention Program, Sustainable Development Goals, Under-five Children

INTRODUCTION

According to the World Health

Organization (WHO), despite the steadily declining rate of stunting from 2000 to 2020, there are 149.2 million (22% of the

global children population) under-five children stunted, with Africa and Asia as the main contributors (1). Undernutrition is expected to be linked as the cause of death for more than 45% of under-five children in low-middle-income countries globally (2). Based on the WHO conceptual framework on childhood stunting, modified by Stewart et al. (2013), inadequate feeding practices, poor quality food, and food-water safety are one of the direct causes of children's stunted growth and development (3). Supplementary feeding acts as a direct specific nutrition intervention to ameliorate stunting. These initiatives aim to immediately address the energy gap in children's needs and act early to improve the long-term health of malnutrition (4).

The Sustainable Development Goals (SDG) calls on the commitment of its member states to eradicate malnutrition in all its forms, including stunting, in 2030 through the second goal, Zero Hunger. Based on the Joint Child Malnutrition Estimate (2021), two-thirds of countries are already off-track in reaching the SDG 2030 target due to the pandemic exacerbating the malnutrition rate. To achieve the global target, the annual rate of decline will need to be 3.9 percent per year, doubling its previous rate of 2.1 percent (5). Given the immense burden of stunting, government and non-government organization all work together to eradicate stunting through various supports.

Food supplementation, through specialized nutrient-dense packages, is suggested to provide a swift and cost-effective approach to prevent undernutrition in under-five children (6). Supplementary feeding provides additional food intake to the child's daily habits. Low-middle-income countries are more susceptible to the unavailability of particular food sources due to a diet consisting mainly of plant-based food and limited to animal products, dairy,

and legumes (7). Providing high-quality, accessible, palatability, and diverse supplementary feeding in the targeted areas and unique settings can improve both macro and micronutrient intake in children and prevent undernutrition, including stunting (7). Earlier evaluations on food supplementation that were not based on the Cochrane methodology provided mixed results, hence the impact of food supplementation in large settings remains to be discovered. A holistic review of supplementary feeding would be beneficial because of its ability to overcome the limitation of setting, timing, duration, supplement type, variation, etc.

This systematic review aims to identify and evaluate the role of supplementary feeding in increasing length-for-age z score (LAZ) in under-five children through stunting prevention programs promoting and in the corridors of supporting the sustainable development goals in alleviating stunting.

METHODS

This review uses the Cochrane Handbook for Systematic Review as the guiding principle and complies with the Population, Intervention, Comparator, Outcome, Timeframe, and Setting (PICOTS) set at the beginning of the study (Table 1) (8).

Table 1. Inclusion Criteria based on PICOTS

PICOTS	Inclusion Criteria
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Participant	Children age 6 - 59 months
Intervention	Received Supplementary Feeding for the means to increase LAZ through stunting prevention program
Comparator	Did not receive or received lower dose than the intervention group of Supplementary Feeding for the means to increase LHZ through stunting prevention program
Outcome	Increase Length-to-Age Z Score (LAZ)
Timeframe	Published by 2012 - 2022
Setting	All Countries and Territories

Participants

The population was under-five children aged 6 - 59 months for both female and male.

Intervention and Comparator

The study intervention was supplementary food given through stunting prevention programs to children aged 6 - 59 months old to increase their Length-Age Z-score (LAZ). The comparators were children aged 6 - 59 months old who did not receive (delayed) or receive a lower dose of supplementary food than the intervention group.

Outcome

The primary outcome was the increase in LAZ.

Inclusion Criteria

Publications included in this systematic review are those within the timespan of ten years.

Information Sources

The main source of the online publications were online databases subscribed to by Universitas Indonesia: Embase, PUBMED, SAGE, Science Direct, Scopus, and Taylor & Francis. The reviews included are free-full text journals in English.

Search Methods/Strategy

The search used the PICOTS framework and was searched in each database by synonyms, MeSH terms, and syntax applicable to each. Keywords used were (“Stunting” OR “Stunt” OR “Stunted” OR “Growth Disorder”) AND (“Supplementary

Feeding”), AND (“Stunting Prevention Program”), AND (“Sustainable Development Goals”), AND (“Underfive” OR “Children” OR “Underfive children” OR “Preschool” OR “infant”). The authors then used Microsoft Excel to arrange the number of journal counts based one by one through the respective databases.

Study Selection

The journal extraction was done by CI using the EndNote software. Upon extraction, it was divided based on the journal database and was de-duplicated. CI and RJ then assessed the remaining journals through Rayyan.ai to deduct irrelevant journals by titles, abstracts, and design studies (Systematic Review and Meta-analysis).

Data Collection Process,

The authors assessed the data through a tabular format in Microsoft Excel Spreadsheet. Studies were arranged by brief study background and objective, study methods (i.e., study design, setting, participant, outcome, exposures, predictors, potential confounder, effect modifier, bias, study size, quantitative variable), result (i.e., result participant, descriptive data, outcome data, key result) and Discussion, limited but limited to author limitation and interpretations.

Risk of Bias in Individual Studies

Biases were assessed using the revised

Cochrane Risk-of-Bias tool for randomized trials. The tool's output was to provide judgment on each bias (i.e., low or high risk of bias or some concern). The authors did peer discussion and expert consultation upon disagreement among authors.

RESULTS

Eight journals were narrowed out of 3776 pieces of literature found through online databases. From the selected database, 1616 relevant searches came through PubMed, followed by Taylor & Francis, SAGE, Embase, Scopus, and Science Direct, respective of the hits volume. A collective of 513 pieces of literature was excluded due to duplication. Titles and abstracts were screened and excluded 3221 due to irrelevancy. As follows, 42 studies were subjected to a full review and resulting in excluding 29 studies due to different interventions (n=7), different outcomes (n=9), different outcomes and interventions (n=2), different populations (n=2), and studies protocols (n=9). Our selection process is provided in Figure 1.

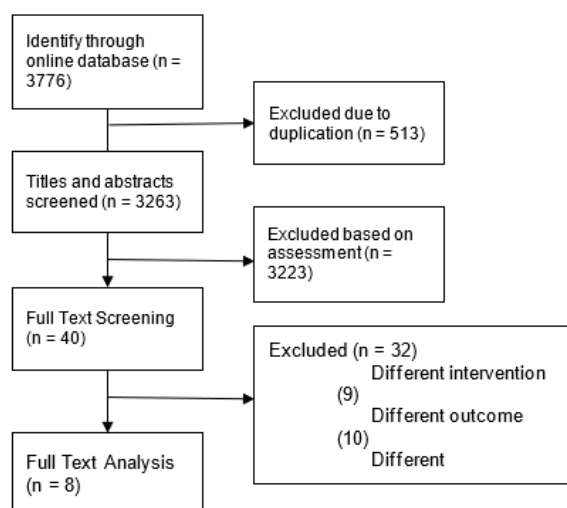


Figure 1. PRISMA Chart

Study Characteristic

The publication dates of the eight studies were from 2015 (n=4), 2017 (n=1), 2019 (n=2), and 2022 (n=1). Half of the study

settings were in Africa, with five studies in Malawi, one in South Africa, and one in Burkina Faso. The remaining studies were done in Bangladesh, Ecuador, and India. The overall sample size is 13,944 under-five children aged between 6 to 18 months at the enrolment of the study. The population characteristic of the examined studies was between the age of 6 to 9 months (n=2), 6 to 12 months (n=4), and 6 to 18 months (n=2). All the studies used RCT design. The variety of supplementary food was categorized into preparation with gas or heat required (n=4), mixed between ready-to-use and preparation with gas or heat required (n=2), preparation without gas or heat required (n=1), and Ready-to-Use (n=1). The study duration ranges from 6 months to 18 months. Table 2 presents the descriptive summaries of the eight studies. Adherence was reported through mean (Smuts et al.), median (Christian et al.), and overall estimated consumption of the supplements. Journals collecting adherence data used self-reported data by mothers or caregivers, which was later provided by the field team between 1 - 2x/week, depending on the study. Three journals (Stewart et al., Mangani et al., and Maleta et al.) did not collect estimated adherence. Table 3 presents the adherence to supplements.

Table 2. Descriptive Summaries of the 9 studies

Author,	Sample	Supplementary	Food	Duration	Outcome
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Setting	Size	Food	Variety		
Christian et al. Bangladesh, Asia	5,067 aged 6-12 months	Plumpy'Doz, Rice Lentils RUSF, Chickpea RUSF, WSB++	Mixed	18 Months	There was a significant positive association of Plumpy'Doz, Rice Lentils, RUSF, Chickpea, RUSF, and WSB++ for the LAZ mean difference compared to the control group at age 18 months by 0.10; 95% CI [[0.04,0.16], 0.07; 95% CI [0.00,0.14], 0.08; 95% CI [0.01,0.16], and 0.10; 95% CI [0.03,0.17], respectively.
Hess et al. Burkina Faso, Afrika	3,220 aged 6-12 months	LNS with Zinc (0 - 10 mg) and Placebo, LNS with no Zinc and Zinc Tablet	Preparati on with gas or heat required	18 Months	In the present study, the standardized mean difference of LAZ at the end of the study was 0.27 between the children in the intervention group who received the intervention package compared to children in the control group.
Iannotti et al. Ecuador, South America	163 aged 6 - 9 months	Eggs	Preparati on with gas or heat required	18 Months	There was a significant increase of LAZ in the intervention group by 0.63; 95% CI [0.38,0.88]. This negative association indicates that Egg consumption was associated with decreased LAZ growth.
Maleta et al. Malawi, Africa	1,932 aged 6 - 18 months	LNS (milk containing & milk free) 10 g/d, 20 g/d, 40 g/d	Preparation with gas or heat required	18 Months	There was no significant difference in LAZ mean difference between control, 10g/d milk LNS, 10g/d milk LNS, 20g/d no-milk LNS, 40g/d milk LNS, and 40 g/d no-milk LNS (-0.47 ± 0.77, -0.39 ± 0.72, -0.46 ± 0.71, -0.44 ± 0.77, -0.44 ± 0.82, and -0.50 ± 0.82, respectively).
Mangani et al. Malawi,	840 aged 6 - 18 month	milk-LNS, soy-LNS, CSB	Mixed	12 Months	There were no conclusive evidence of a causal association between the

Africa

LNS supplementation and the positive difference in LAZ between both groups. However, at the age of 9 - 12 months intervention group milk-LNS had a negligible change (-0.02 z score units), whereas other groups, including the control, dropped their mean LAZ.

Smuts et al. South Africa, Africa	514 aged 6 - 12 months	SQ-LNS, SQ-LNS plus	Ready-to- Use	12 Months	There was a significant positive association of SQ-LNS-plus intervention group for the LAZ mean difference compared to the control group at age 8 months by 0.11; 95%CI [0.01,0.22]; (p<0.05), and 10 months by 0.16; 95% CI[0.04, 0.27]; (p<0.05), but not at 12 months
Stewart et al. Malawi, Afrika	660 aged 6 - 9 months	Eggs	Preparation with gas or heat required	6 Months	There were no overall benefits on length gain or risk of stunting on the provision of 1 egg per day for 6 months.
Taneja et al.	1,548 aged 6 - 12 months	SQ-LNS, SQ-LNS- plus	Preparation with gas or heat required	12 Months	There was a significant positive association of the high-protein group intervention group for the LAZ mean difference compared to the control group at age 12 months by 0.08; 95% CI:[0.01-0.15].

Table 3. Adherence of Supplement

Author	Collection Method	Reported Outcome	Result
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Christian et al.	Self-reported daily consumption and sachet counts bi-weekly by field distributor.	Median	Median percent (intraquartile range) adherence was 93 (81–98), 92 (81–98), 91 (79–97) and 90 (76–96) in the Plumpy’doz, rice-lentil, chickpea and WSBpp groups, respectively. Adherence to supplementation was high in the four groups and did not differ between groups ($P > 0.05$).
Smuts et al.	Self-reported daily consumption and sachet counts weekly by field distributor.	Mean	Estimated mean adherence to the intervention was 94.1% and 94.4% in the SQ-LNS and SQ-LNS-plus groups, respectively.
Stewart et al.	No Information	No Information	No Information
Mangani et al.	No Information	No Information	No Information
Iannotti et al.	No Information	No Information	No Information
Maletta et al.	Self-reported daily consumption	Overall	Overall reported consumption was 71.6% \pm 16.8%, with no difference in adherence ($P = 0.26$) observed between the intervention groups.
Hess et al.	Self-reported daily consumption and package counts weekly by field distributor. Package collected for assessment to verify adherence.	Overall	Overall reported adherence was 97 \pm 6% for SQ-LNS and tablets. Caregivers reported high daily adherence to SQ-LNS (96.8% \pm 6.5%) and to tablets (97.4% \pm 6.4%).
Taneja et al.	Self-reported daily consumption and sachet counts weekly by field distributor.	Overall	The proportion of infants who consumed milk–cereal mix on >75% of days for the modest-protein and high-protein group was 85.6% and 82.9%, respectively.

Risk of Bias Within the Studies

Risk of biases is assessed using the Cochrane Risk of Bias Tool studies. Our

judgment of the studies is provided in table 4

Table 4. Risk of bias in randomized and stepped wedge studies

No	Component	Christi an	Smut et	Stew art et	Mang ani et	Ianno tti et	Male ta et	Hess et al.	Tanej a
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		al.	al.	al.	al.	al.	al.	al.	et al.
1	Random sequence generation (selection bias)	+	++	++	++	++	++	++	-
2	Blinding of participants (performance bias)	+	++	++	++	++	++	++	++
3	Blinding of outcome assessment (detection bias)	++	+	++	+	++	++	-	++
4	Incomplete outcome data (attrition bias)	+	++	++	++	++	+	++	+
5	Selective reporting (reporting bias)	++	++	++	++	++	++	++	++

Note: high risk of bias: -; some concerns: +; low risk of bias: ++; unclear: ?

CONCLUSION

The systematic review on the association of stunting and supplementary feeding in stunting prevention for under-five children examines eight pieces of literature with a mixed population of stunted and normal under-five children. Due to this, the review was able to compile evidence of the increment of the stunting indicator using the length of age z-score. Five out of eight examined studies suggest a higher increase of LAZ compared to the control group of each respective study. Studies also highlight that multiple interventions have higher chances of reducing stunting and that follow-up research and hadst suitable prevention program for children in each unique setting are needed to determine effective intervention.

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