



Evaluating the impact of indigenous foods on stunting prevention in rural Indonesian communities

Evaluasi dampak pangan lokal terhadap pencegahan stunting di komunitas pedesaan di Indonesia

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Abstract

Stunting remains a significant public health concern in Indonesia, underscoring the potential for utilizing local food resources as a key strategy for effective nutritional improvement and prevention measures. This review examined the impact of innovative applications of local foods on enhancing children's nutrition, emphasizing diverse food varieties, methodological approaches, and their efficacy in reducing stunting rates across the country. The research employed a scoping review methodology following the PRISMA-ScR guidelines and PEO framework. Relevant literature from PubMed, ScienceDirect, Crossref, and Google Scholar published between 2013 and 2023 was selected based on inclusion criteria that emphasized the utilization of local foods for stunting prevention, open access, and availability in English or Indonesian. Non-empirical articles were excluded from the review, and the screening procedure involved evaluating abstracts and conducting a full-text analysis using Covidence. The validity of the studies was assessed through qualitative, quantitative, and mixed-methods data analysis utilizing tools developed by the Joanna Briggs Institute (JBI). This review revealed that innovative local food products, such as floss made from snakehead fish and chips created from locally sourced carbohydrates, have a significant positive impact on children's nutritional health. These foods are rich in essential proteins and micronutrients that contribute to improvements in children's weight and height and enhance overall nutrient consumption, thereby aiding in the prevention of stunting. In conclusion, the incorporation of snakehead fish floss and fish flour proved to be effective in enhancing the nutritional status of children with stunting, as demonstrated by mean weight gain of 0,5 kg and a height increase of 2 cm over 30 days.

Keywords: Local food, innovation, stunting prevention

Abstrak

Stunting tetap menjadi masalah krusial di Indonesia, di mana pemanfaatan pangan lokal merupakan peluang penting untuk intervensi gizi dan pencegahan yang efektif. Tinjauan ini bertujuan mengevaluasi peran inovasi pangan lokal dalam meningkatkan status gizi anak, dengan fokus pada jenis pangan, teknik pengolahan, dan dampaknya terhadap pencegahan stunting di Indonesia. Penelitian dilakukan menggunakan metode scoping review berdasarkan pedoman PRISMA-ScR dan kerangka PEO. Literatur dari PubMed, ScienceDirect, Crossref, dan Google Scholar (2013-2023) disaring dengan kriteria inklusi berfokus pada penggunaan pangan lokal untuk pencegahan stunting, akses terbuka, serta diterbitkan dalam bahasa Inggris atau Indonesia. Artikel non-empiris dikeluarkan, dan penyaringan dilakukan melalui evaluasi abstrak dan ulasan teks penuh menggunakan Covidence, dengan analisis data kualitatif, kuantitatif dan metode campuran menggunakan alat JBI untuk menilai validitas. Kajian ini menemukan bahwa inovasi pengolahan pangan lokal, seperti abon ikan gabus dan keripik dari sumber karbohidrat lokal, secara signifikan meningkatkan status gizi anak. Produk ini menyediakan protein esensial dan mikronutrien yang meningkatkan berat dan tinggi badan anak, serta memperbaiki asupan gizi secara keseluruhan, yang berperan dalam pencegahan stunting. Pemanfaatan

abon ikan gabus dan tepung ikan efektif meningkatkan status gizi anak stunting, terbukti dengan peningkatan berat badan 0,5 kg dan tinggi badan 2 cm setelah 30 hari.

Kata Kunci: Inovasi, pangan lokal, pencegahan stunting

Introduction

Stunting refers to a condition in which children experience hindered growth because of prolonged nutritional deficiencies, leading to a height that is considerably below the average for their age group (Samsuddin et al., 2023). Worldwide, approximately 149 million children are affected by stunting, with over half of these—81,7 million young children—living in Asia as of 2018 (UNICEF et al., 2023). Southeast Asia has a stunting pace of 25,7%, which is the second highest globally and surpassed only by South Asia (Sukamto et al., 2021). In Indonesia, the stunting pace dropped from 24,4% in 2021 to 21,6% in 2022, yet this remains considerably higher than the target of 14% set for 2024 (Kemenkes, 2023). Under the Sustainable Development Goals (SDGs), Indonesia pledged to eradicate hunger and decrease the stunting pace by 40% by 2025 (Permenkes RI, 2020).

A key factor contributing to stunting in young children is a dietary pattern that focuses more on feeling full than on meeting nutritional needs. This habit often arises in situations where food availability is limited (Vale et al., 2022), leading parents or caregivers to provide food that is easily accessible and inexpensive, but lacks essential nutrients. Consequently, when a child's growth and development needs are not met with adequate essential nutrients, stunting can occur over time (Zefanya et al., 2024).

When these risk factors are combined, they intensify the effects of chronic malnutrition, outcoming stunting, and, in turn, cause serious health problems, along with cognitive and learning difficulties (Soliman et al., 2021). Therefore, early nutritional intervention is important in hindering stunting, especially during the important period of the first 1,000 days of life (Lubis et al., 2023), which spans pregnancy when the child is 23 months old (Soviyati et al., 2023). An inadequate nutritional intake can lead to stunting (Adriani et al., 2022). Stunting prevention can be achieved through the consumption of a balanced nutritious diet that utilizes local natural resources (Harahap et al., 2023).

The use of local foods offers numerous benefits, including access to fresh, nutritious produce, affordable prices, support for the local economy, and strengthening of national food security (Irawan et al., 2022). The diversity and richness of nutrients in Indonesia's local foods offers opportunities for innovation in hindering stunting (Bekele & Turyashemerewa, 2019).

The success of utilizing local foods in an effort to prevent stunting has been proven in various studies. Local foods that are rich in nutrients and easily accessible to the community are an important model for improving children's nutritional status. Research indicates that local food culture can contribute to preventing stunting through community acceptance, increased weight and height in children, and food availability and affordability (Fauziah, 2022). Local food supplements, such as sweet potatoes, red rice, and legumes, have been shown to be effective in promoting the growth of children affected by stunting (Helmizar et al. 2017). Additionally, studies have demonstrated that millet porridge (Kurniati & Sunarti, 2020) and other local foods, such as sago worms in Southeast Sulawesi, are well accepted by the community and significantly improve children's nutritional intake, substantially reducing the prevalence of stunting (Nirmala et al., 2017).

Therefore, the use of local foods that are rich in nutrients and widely available as a means of hindering stunting in children under five years of age is important. Further research on the types of local foods, their procedures, and their benefits is needed, excluding commercial or culturally irrelevant foods. This review aims to fill this gap and provide a comprehensive understanding of the potential of local foods to hinder stunting.

Methods

This scoping review engaged in a comprehensive examination of the existing literature on the model of local foods that hinders stunting. The review procedure involved identifying and assessing articles according to specific inclusion

criteria. These criteria mandated that the articles be directly pertinent to the subject, accessible in open-access formats, and published in English or Indonesian between 2013 and 2023. The 2013 cutoff was chosen to ensure that the literature used was pertinent to current practices. The

relevance of the literature was assessed utilizing the Population, Exposure, Outcome (PEO) framework, where the population studied was children under 5 years old, the exposure was the use of local foods, and the desired outcome was the prevention of stunting.

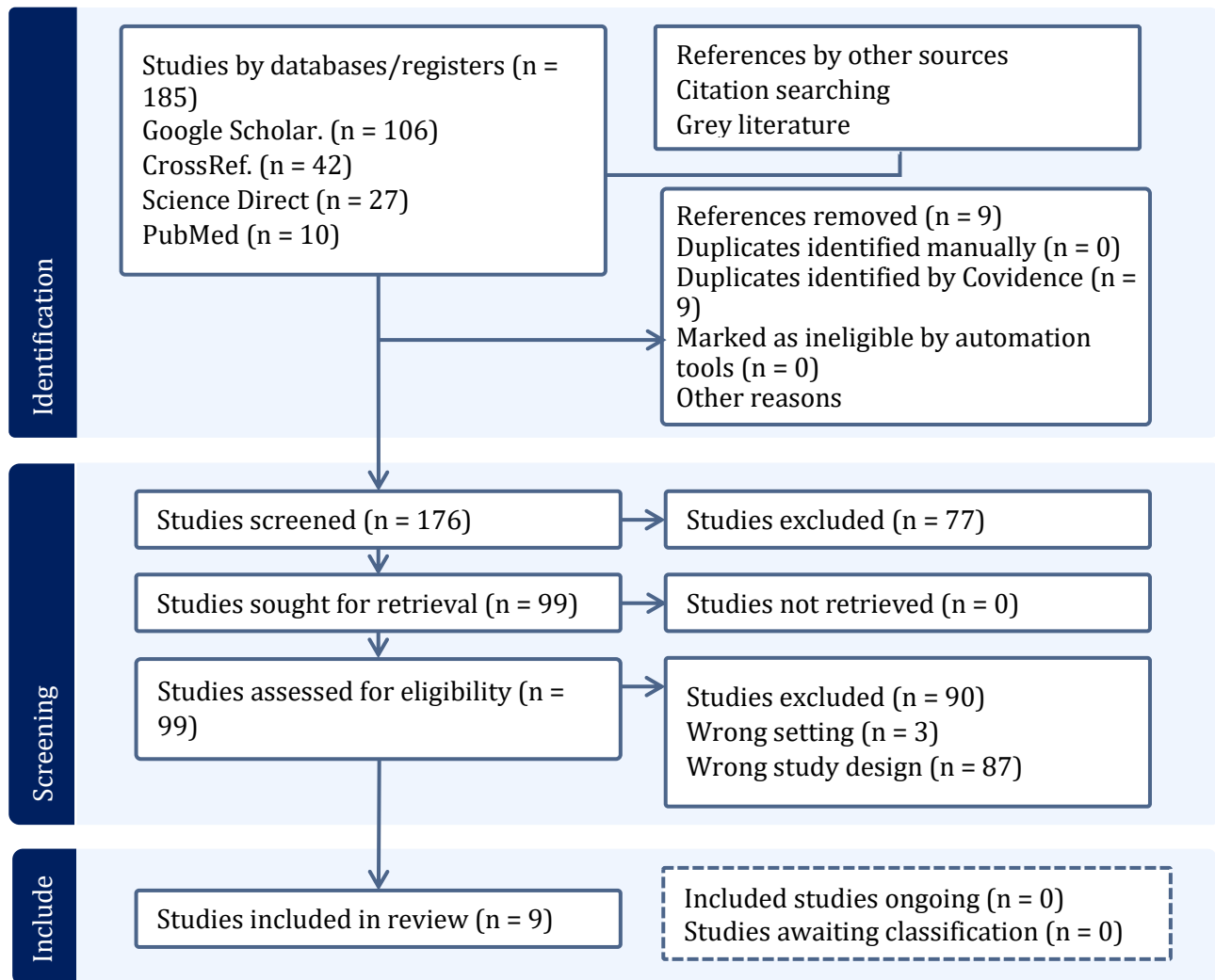


Figure 1. PRISMA flow diagram.

After identifying the articles, further screening was conducted to ensure alignment with the research topics. Articles such as reviews, opinion pieces, and brief reports that did not align with the inclusion criteria were excluded from the analysis because they do not offer direct empirical evidence. The exclusion procedure involved an initial assessment of abstracts with a full-text review to confirm the relevance of the articles.

A literature search was conducted using popular databases such as PubMed, ScienceDirect, Crossref, and Google Scholar, which provide access to pertinent and up-to-date scientific literature.

The keywords used in the search were chosen to encompass various pertinent terms such as “Local Food OR Traditional Diet OR Indigenous Food AND” stunting prevention. Covidence was used for source selection to screen the articles, identify duplicates, extract abstracts, and conduct full-text readings. After the selection procedure, the researchers compared and discussed the outcomes of the literature review. This is visualized in Figure 1 using the PRISMA Flow Diagram.

This scoping review conducts an important appraisal utilizing the Joanna Briggs

Institute (JBI) tool, incorporating evaluations by quantitative, qualitative, and mixed-methods studies. For quantitative studies, appraisal emphasizes the assessment of study design, outcome reliability, and the application of suitable statistical methods, such as t-tests and chi-square tests, with repeated measurements to maintain precision. It also examines the methodology, potential biases, and validity using statistical tools and strategies to control for confounding factors. Qualitative research focuses on ensuring the credibility, dependability, and transferability of the findings, verifying that the collected data are both meaningful and broadly applicable. For mixed-methods studies, the evaluation examines how effectively quantitative and qualitative data are combined and interpreted as a whole, although there are often gaps in explaining the integration of findings and addressing inconsistencies between the two approaches. The evaluation results are presented in Table 1.

Table 1. Joanna Briggs Institute (JBI) important Appraisal outcomes

No.	Research Design	Value Measure	important Appraisal outcome (Yes)
A1	Experimental	9	9
A3	Experimental	9	5
A9	Experimental	9	8
A2	Cross Sectional	8	2
A4	Cohort	11	5
A5	Qualitative	10	10
A6	Qualitative	10	6
A8	Mix Method	5	4
A7	Mix Method	5	3

Result and Discussion

A systematic search identified 185 articles, 176 of which remained after removing duplicates. After excluding 77 irrelevant articles, 99 were re-screened, and 9 met the eligibility criteria. These articles, all by Indonesia, feature research designs including quasi-experimental, cross-sectional, cohort, qualitative, and mixed-methods approaches. The data charting is presented in Table 2. The strength of this review lies in its diverse research design, providing a broader perspective. However, this

diversity complicates comparisons and general conclusions. Quasi-experimental designs offer stronger causality evidence than cross-sectional studies, while cohort studies provide long-term insights but may face selection bias.

Qualitative research adds depth through broader contextual understanding, although it is also limited by subjectivity. Mixed-methods research attempts to integrate quantitative and qualitative data, although the integration procedure is often not thoroughly explained, which can obscure findings. The researchers identified each review article related to the topic of local food utilization for stunting prevention, including the identification of the type of local food used, the method of procedure, the product procured, and the prevention outcome (Table 2. Identification of Local Foods).

Table 2. Theme mapping

Theme	Subtheme	Article	
Types of Local Food	Animal-sourced local food	A1, A3, A4, A6	
	Plant-based local food	A5, A6, A8, A9	
	Local food sources of carbohydrate	A5, A6, A7, A8	
	Local food sourced fruits & vegetables	A2, A5, A7, A9	
	Procedure Method	Deep fried	A3, A5
		Boiled	A2, A3, A5
	Procedure outcomes	Eaten directly	A7
		Variety of procedure Products	A1, A2, A3, A5, A8, A9
		Improved Nutrition knowledge and Education	A1, A2, A6, A7, A9
Stunting Prevention outcomes	Local food utilisation and diversification	A1, A2, A3, A4, A5, A6, A7, A8, A9	
	Improved nutritional status	A1, A3, A4	

Table 2 provides a thematic overview of the types of local foods, their procedures, and their effects on hindering stunting. The table

categorizes local foods into animal protein sources, plant-based proteins, carbohydrates, fruits, and vegetables, linking each category to the corresponding articles.

Types of Local Food

Local foods, including animal proteins (meat, milk, snakehead fish, pomfret, milkfish, and tuna) and plant-based sources (corn, soybeans, almonds, and cashews), are significant models that hinder stunting. In addition, Nadimin et al. (2021), Mahalia & madhani (2022), and Ngais & Rohman (2019) showed that snakehead the growth of children's growth. Sianipar et al. (2021) highlighted dairy and meat models for preventing stunting. Recent research by Picauly et al. (2023) showed that biscuits made by anchovy flour can increase the weight of young children by mean of 0,74 kg in 12 days, making them effective in hindering stunting in East Nusa Tenggara. Fish, an excellent source of animal protein, is particularly beneficial for promoting growth in children. Transforming fish into a variety of food products improves access to high-quality protein (Putri et al., 2023). Research shows fish remains the primary protein source in rural Indonesia, while wealthier groups prefer poultry and red meat (Khusun et al., 2022).

Furthermore, plant-based foods provide an important model to support children's nutrition and growth. Studies by Harahap et al. (2023) and Adriyani et al. (2023) have emphasized plant-based foods such as corn, soybeans, and cassava. Moringa leaves, as explored by Afriza et al. (2023) and Sutrisna et al. (2023), are also effective, increasing toddler height by 2,9 cm in 75 days. The Balanced Nutrition Guidelines highlight the need for a diverse diet, as no single food can supply all necessary nutrients required by the body. (Iswarawanti & Wiradnyani, 2021).

Processing Method

This topic explores various methods for preparing local foods, including boiling, frying, grilling, baking, drying, and consuming them raw, without any specialized procedures.

Boiling is used to procedure local foods such as moringa leaves, fish, corn, sweet potatoes, torbangun leaves, spinach, water spinach, and cassava, outcoming in simple everyday dishes (Afriza et al., 2023; Mahalia &

Ramadhani, 2022; Ngais & Rohman, 2019; Harahap et al., 2023; Sianipar et al., 2021; Khotimah et al., 2023; Adriyani et al., 2023). Frying produces products such as tempeh chips and banana chips from fish, bananas, tempeh, and tofu (Mahalia & Ramadhani, 2022; Harahap et al., 2023; Khotimah et al., 2023; Adriyani et al., 2023). Some local foods, such as bananas, snake fruit, and avocados, can be consumed directly (Harahap et al., 2023; Khotimah et al., 2023). Meanwhile, drying is applied to moringa leaves, which are processed into powder for innovations, such as pudding, ice cream, and biscuits (Afriza et al., 2023).

Although boiling is a popular cooking method, steaming can be a superior option for certain local foods. Steaming is more effective in retaining carbohydrate content than boiling, making it a preferable choice for preserving the nutritional value of these foods (Andersson et al., 2022).

Processed Outcomes

The utilization of local foods has led to the creation of various procedural products, such as protein-based biscuits (Nadimin et al., 2021); moringa leaf clear soup (Afriza et al., 2023); snakehead fish floss (Mahalia & Ramadhani, 2022); avocado seed chips and brownies (Harahap et al., 2023); and mocaf flour, tofu, tempeh, and moringa cake (Adriyani et al., 2023) (Naelasari, 2022). These innovations support food diversification and prevention of stunting, highlighting the importance of a balanced and varied diet. Pratiwi (2023) highlights the importance of utilizing and diversifying local foods to prevent stunting in Indonesia. Local foods, such as corn, tuna, sweet potato, and catfish products, are used to enhance nutritional intake and support food security.

Beyond these local food innovations, Central Java has seen the creation of various food products made using locally sourced ingredients, highlighting the significance of utilizing and diversifying local foods to fight stunting. Examples include "Kukis Pimpe," a cookie made by banana and tempeh flour in Boyolali; "Nugget Lekor," a catfish and moringa leaf nugget by Sragen; and "Dimsum Lele," a catfish-based siomay by Wonosobo. These products underscore the value of harnessing local resources to improve the nutritional outcomes (Paratmanitya & Aprilia, 2022).

Stunting Prevention Outcomes

A review of articles indicates that the utilization of local foods holds great potential for preventing stunting through an integrated approach. Nadimin et al. (2021) highlighted the importance of nutritious local snacks, such as snakehead fish biscuits, combined with nutritional education for mothers as an effective strategy. Afriza et al. (2023) confirmed that utilizing moringa leaves in a clear soup was positively associated with stunting prevention. Mahalia and Ramadhani (2022) and Ngais and Rohman (2019) supported the consumption of snakehead fish and other protein-rich fish, such as pomfret and tuna, to improve children's weight and decrease the chance of stunting. Additionally, Harahap et al. (2023) and Sianipar et al. (2021) emphasized the importance of dietary diversification by utilizing local foods, such as cassava, bananas, corn, and tubers. Khotimah et al. (2023) stressed the need for ongoing education to raise public awareness about stunting prevention. Adriyani et al. (2023) outlined the potential of developing local resources, such as cassava and soybeans, into highly nutritious functional foods.

Finally, Naelasari (2022) showed that training in local food procedures, such as making moringa tempeh cakes, effectively enhances mothers' understanding of stunting prevention. Combining these diverse approaches could provide an important model for reducing the pace of stunting in Indonesia. According to Samosir et al. (2023), diversity of local foods is an important model for hindering stunting.

Conclusion

Utilizing locally sourced foods has proven to be an effective strategy for combating stunting and improving children's nutrition. A range of local foods, such as animal-derived products, moringa leaves, nuts, tubers, and fresh fruits, have shown promise in reducing stunting pace.

Nevertheless, there are challenges associated with transforming local foods into procedural goods. To address these challenges, there is a need for innovative methods for local food procedures that can create products suitable for large-scale production, cost-effectiveness, and extended shelf life. Examples

of such innovations include the development of cork fish protein flour and cassava mocaf flour, which allow for the creation of a variety of appealing snacks such as protein-rich biscuits.

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