Approaches to Address Malnutrition among Children: a Systematic Review

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ABSTRACT

Childhood malnutrition is a major public health problem associated with increased illness and death in children. Its effects may occur early, including disease, disability, and mortality, or persist long term, resulting in impaired cognitive development, higher disease risk, and reduced economic productivity. Malnutrition arises from a complex interaction of nutrition specific factors such as inadequate dietary intake, poor feeding and caregiving practices, and infectious diseases and nutrition sensitive factors, including food insecurity, limited caregiving resources, poor access to health services, and unhealthy living environments. Therefore, reducing childhood malnutrition requires the effective integration of both nutrition-specific and nutrition-sensitive interventions. The purpose of this systematic review is to determine the intervention strategies in addressing childhood malnutrition. The research design used was the Systematic Review method. Science direct, Pubmed, Proquest, Google Scholar was data based which was used in article search. The articles obtained were filtered based on full text, 20 articles were found, and ten articles were analyzed through analysis of objectives, suitability of topics, research methods used, characteristics of respondents, and the results of each article, published 2013-2024, in English and Indonesia. Intervention strategies in addressing malnutrition in childhood could be education, homebased therapy, and nutrition therapy. Education, homebased therapy, and nutrition therapy could manage of malnutrition in childhood.

I. Introduction

Childhood undernutrition encompasses wasting, defined by a weight for height z score (WHZ) below −2 SD; stunting, indicated by a height for age z score (HAZ) below −2 SD; underweight, identified by a weight for age z score (WAZ) below −2 SD; as well as deficiencies or inadequacies in essential micronutrients. (World Health Organization, 2017). According to current World Health Organization (WHO) guidelines, these conditions are collectively referred to as childhood malnutrition and are generally divided into acute and chronic forms. Acute malnutrition is categorized by severity, comprising moderate acute malnutrition (MAM), defined by a WHZ between −3 and −2, and severe acute malnutrition (SAM), identified by a WHZ below −3 and a mid-upper arm circumference (MUAC) of less than 115 mm. In contrast, chronic malnutrition results from prolonged inadequate nutrient intake combined with intergenerational and environmental influences, ultimately leading to impaired linear growth and stunting (UNICEF, 2023).

In 2017, an estimated 155 million children under five years of age were stunted and 52 million were wasted (UNICEF, 2017). Asia and Africa still share the greatest burden of malnutrition, with more than half of all stunted children and two-thirds of all wasted children under five years of age living in Asia, and over one-third of stunted children and a quarter of wasted children living in Africa. In Asia and Oceania, nearly 10% of children under five years of age are at increased risk of death due to wasting (UNICEF, 2019).

Childhood malnutrition is a major public health concern, since it is associated with significant morbidity and mortality (World Health Organization, 2017). The consequences of malnutrition among infants and children can be short-term, such as morbidity, mortality, and disability; or long-term, including impaired cognitive development, increased risk of disease due to either concurrent infections or metabolic disorders, and suboptimal economic productivity. Undernutrition, including stunting, severe wasting, deficiencies of vitamin A and zinc, and suboptimal breastfeeding, has been an underlying cause of approximately one-third of the mortality among children under five years of age (UNICEF, 2019).

Childhood malnutrition is a result of a complex interplay of nutrition specific and nutrition-sensitive factors. Nutrition specific factors include inadequate food and nutrient intake, poor feeding, caregiving, and parenting practices, and burden of infectious diseases (Nirmala K.S et al., 2024). Nutrition-sensitive factors include food insecurity; inadequate caregiving resources at the maternal, household, and community levels; limited access to health services; and unhygienic environment. Improving childhood malnutrition requires effective implementation of nutrition-sensitive as well as nutrition-specific interventions. A systematic review evaluated the effectiveness of approaches to managing malnutrition in children.

II. Methods

The research commenced with a structured literature search. Initially, keyword combinations were developed, and two main elements were used to form search queries related to “Intervention Strategies in Addressing Childhood Malnutrition,” including (1) intervention strategies and childhood malnutrition, and (2) childhood malnutrition and interventions. These search terms were then applied across five databases: Scopus, ScienceDirect, PubMed, ProQuest, and ResearchGate. The final search string used was: (“intervention strategies”) AND (“childhood malnutrition”).

The first stage of screening involved reviewing titles and abstracts. Publications were considered potentially relevant if their titles and abstracts aligned with the review topic. Those meeting the inclusion criteria were selected for full-text assessment. In total, 10 articles were chosen. This type of review required thematic analysis aligned with the study’s objective. The themes were grouped based on the types of intervention strategies used to address childhood malnutrition. Only studies published from 2014 onwards were included. The search was completed on July 10, 2024, resulting in 261 articles after applying the search terms and limits. Additional inclusion and exclusion criteria were applied: studies had to be published in English and involve children with malnutrition. Studies that were solely trial-based without written outcomes were excluded.

III. Results

Under the latest World Health Organization (WHO) recommendations, these conditions are grouped under the general concept of childhood malnutrition, which is classified into acute and chronic forms. Acute malnutrition is stratified by severity into moderate acute malnutrition (MAM), characterized by a WHZ ranging from −3 to −2, and severe acute malnutrition (SAM), defined by a WHZ below −3 along with a mid-upper arm circumference (MUAC) of less than 115 mm. Chronic malnutrition, on the other hand, develops as a result of sustained nutrient deprivation and the combined effects of environmental and intergenerational factors, leading to stunted growth.

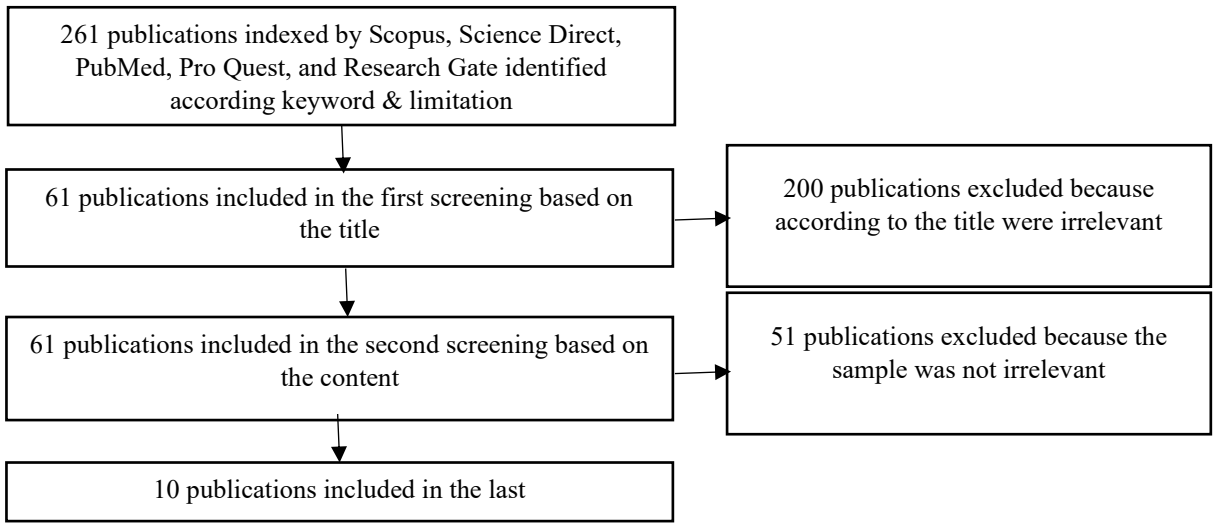

Figure 1. Results and selection procedure

Table 1: The selected publications list

No.	Author(s)
1.	(Lozada-Tequeanes et al., 2024)
2.	(Das et al., 2024)
3.	(Alkhatib & Obita, 2024)
4.	(Irena et al., 2015)
5.	(Nwachan et al., 2024)
6.	(Sawyer et al., 2013)
7.	(Emlek Sert & Bayık Temel, 2020)
8.	(Mahfuz et al., 2020)
9.	(Gelli et al., 2018)
10.	(Kang et al., 2017)

No.	Title	Population	Intervention	Comparison	Outcome	Time
1.	Effectiveness and Implementation of a Text Messaging mHealth Intervention to Prevent Childhood Obesity in Mexico in the COVID-19 Context: Mixed Methods Study (Lozada-Tequeanes et al., 2024)	Population 494 (intervention group 230, comparison group 264)	NUTRES is an mHealth BCC strategy designed to prevent childhood overweight/obesity. It achieves this by disseminating SMS text messages to PCs of children under 5 years, as well as to health personnel operating within primary unit services in 2 Mexican states		Of the total 494 PCs enrolled in NUTRES, 334 persisted until the end of the study, accounting for 67.6% (334/494) participation across both groups. A majority of PCs (43/141, 30.5%, always; and 97/141, 68.8%, sometimes) used the SMS text message information. Satisfaction and acceptability toward NUTRES were notably high, reaching 98% (96/98), with respondents expressing that NUTRES was "good," "useful," and "helpful" for enhancing child nutrition. Significant differences after the intervention were observed in PA knowledge, with social interaction favored (CG: 8/135, 5.9% vs IG: 20/137, 14.6%; P=.048), as well as in HF practice knowledge. Notably, sweetened beverage consumption, associated with the development of chronic diseases, showed divergence (CG: 92/157, 58.6% vs IG: 110/145, 75.9%; P=.003). In the difference-in-differences model, a notable increase of 0.03 in knowledge regarding the benefits of PA was observed (CG: mean 0.13, SD 0.10 vs IG: mean 0.16, SD 0.11; P=.02). PCs expressed feeling accompanied and supported, particularly amidst the disruption of routine health care services during the COVID-19 pandemic.	> 36 weeks

2.	Efficacy of Zinc Fortified and Fermented Wheat Flour (EZAFFAW): A randomized controlled trial protocol (Das et al., 2024)	1000 participants. Individuals will be randomly assigned in the four groups (red, blue, green, and black) through a computer-generated random number list. A statistician will assign the individuals into four groups by a computer-generated list and would then assign color codes (red, blue, green, black) without knowing which color belongs to which group. This randomization will be stratified on gender and age (10–13 years, 14-19years, 20–40 years old) and adjusted for serum zinc, BMI, zinc deficiency and HbA1C.	Group 1: fermented high zinc wheat flour flatbread Group 2: unfermented high zinc wheat flour flatbread Group 3: zinc fortified (post-harvest) wheat flour flatbread Group 4: low zinc wheat flour flatbread	Group 1: fermented high zinc wheat flour flatbread Group 2: unfermented high zinc wheat flour flatbread Group 3: zinc fortified (post-harvest) wheat flour flatbread Group 4: low zinc wheat flour flatbread	Primary outcomes will include serum zinc concentration and metabolic markers, while secondary outcomes include anthropometric measurements, blood pressure, and dietary intake	The meal would be served once a day, six days a week for six months
3.	Comparison of home-based therapy with ready-to-use therapeutic food with standard therapy in the treatment of malnourished Malawian children: a controlled, clinical effectiveness trial	1178 malnourished children	Home-based therapy with ready-to-use therapeutic food (RUTF)	Standard therapy	Children who received home-based therapy with RUTF were more likely to achieve a weight-for-height z score >-2 than were those who received standard therapy	December to April
4.	Comparison of the efficacy of a solid ready-to-use food and	70 malnourished children	Receive 3 meals containing either	Receive 3 meals containing	RTUF can be used efficiently for the	6 times

	a liquid, milk-based diet for the rehabilitation of severely malnourished children: a randomized trial		F100 (n = 35) or RTUF (n = 35)	either F100 (n = 35) or RTUF (n = 35)	rehabilitation of severely malnourished children	
5.	Nutrition Intervention Program and Childhood Malnutrition: A Comparative Study of Two Rural Riverine Communities in Bayelsa State, Nigeria	105 respondents	Nutrition intervention program delivered in a primary health care facility	Standard intervention	Nutrition intervention program delivered in a primary health care facility can positively change nutrition behavior and prevent childhood malnutrition	
6.	Supplementary feeding of malnourished children in northen Iraq	62 primary health care centres	High protein high energy biscuits	Standard intervention	Hight protein biscuits should distributed throughout instead of the mix	7 months
7.	Daily Supplementation With Egg, Cow Milk, and Multiple Micronutrients Increases Linear Growth of Young Children with Short Stature	472 children	Supplemented daily with an egg and 150 mL of milk, and 1 sachet of multiple micronutrient powder	Standard intervention	Daily directly observed milk, egg, and multiple micronutrient supplementation may improve linear growth of stunted children.	90 days
8.	Using a Community-Based Early Childhood Development Center as a Platform to Promote Production and Consumption Diversity Increases Children's Dietary Intake and Reduces Stunting in Malawi: A Cluster-Randomized Trial	60 community-based childcare centers	Standard ECD program with additional activities to improve nutritious food production and behavior change communication to improve diets and care practices for young children	Standard intervention	Preschool children in the intervention group had greater increases in nutrient intakes and in dietary diversity	
9.	Effectiveness of a community-based nutrition programme to improve child growth in rural Ethiopia: a cluster randomized tria	1790 children aged 6 to 12 months (876 in the intervention and 914 in the control areas)	Community-based participatory nutrition promotion (CPNP) programme	Standar intervention	Children in the intervention area showed an 8.1% (P= 0.02) and 6.3% (P= 0.046) lower prevalence of stunting and underweight, respectively, after controlling for differences in the prevalence at enrollment,	2 months

					compared with the control group	
10.	The effects of nutrition and health education on the nutritional status of internally displaced schoolchildren in Cameroon: a randomised controlled trial	160 children	Nutrition education was carried out only with the caregivers of children in the test group	Standar intervention	Nutrition education alone was not effective in improving the nutritional status of the children and should be implemented together with other food-based nutrition interventions to improve the nutritional status of internally displaced schoolchildren in the West and Littoral Regions of Cameroon	Displaced schoolchildren (5–15 years) who were displaced by the on-going sociopolitical crisis in the Northwest and Southwest Regions to primary schools of the West and Littoral Regions of Cameroon and their mothers or caregivers

This systematic review examined intervention strategies for tackling childhood malnutrition by analyzing ten selected studies. The findings indicate that key approaches include nutrition education, home-based nutritional therapy, and clinical nutrition interventions. Nutrition education was shown to significantly decrease the occurrence of malnutrition-related clinical symptoms such as Bitot's spots and anemia-related pallor. Home-based treatment using ready-to-use therapeutic food (RUTF) was linked to improved recovery, with children more likely to reach a weight-for-height z-score above −2. Additionally, nutrition programs implemented within primary healthcare settings were found to effectively promote healthier dietary practices and help prevent malnutrition in children.

IV. Discussion

The findings indicate that key approaches include nutrition education, home-based nutritional therapy, and clinical nutrition interventions.

1. Nutrition education

Nutrition education is one of the main interventions in the management of child malnutrition, as it plays an important role in improving parents' or caregivers' knowledge, attitudes, and behaviors regarding the fulfillment of children's nutritional needs (Maleki et al., 2025). Nutrition education includes understanding exclusive breastfeeding, age-appropriate complementary feeding, the implementation of a balanced diet, and the importance of regular growth monitoring through community-based health services such as Pos Pelayanan Terpadu. Adequate nutritional knowledge helps families select nutritious foods, regulate appropriate meal frequency, and apply responsive feeding practices according to the child's needs (Killion et al., 2024). Therefore, nutrition education functions not only as a promotive and preventive strategy but also as a supportive intervention in the recovery process of children experiencing undernutrition or severe malnutrition.

In practice, the effectiveness of nutrition education can be optimized when it is delivered continuously and involves both families and the wider community. The role of healthcare professionals, community health volunteers, and primary healthcare institutions is essential in providing practical, locally relevant, and easily understood nutritional education (Eyemienbai et al., 2025). Educational approaches combined with mentoring, individual counseling, healthy meal preparation demonstrations, and regular nutritional status monitoring have been shown to be more effective in improving child feeding practices. Therefore, nutrition education should be positioned as an integral component of malnutrition management strategies, as its success not only improves children's current nutritional status but also establishes healthy eating habits that contribute to better long-term health outcomes.

2. Home-based nutritional therapy

Home-based treatment using ready-to-use therapeutic food (RUTF) is an effective strategy in the management of child malnutrition, particularly for children with severe acute malnutrition without medical complications (Fetriyuna et al., 2023). RUTF is an energy-dense therapeutic food enriched with protein, vitamins, and essential minerals needed to accelerate nutritional recovery. This home-based approach allows children to receive continuous nutritional therapy within their family environment under regular supervision from healthcare providers, thereby improving treatment adherence and reducing the need for hospitalization. Several studies have shown that home-based treatment using RUTF is associated with improved recovery outcomes, with children being more likely to achieve a weight-for-height z-score (WHZ) above −2, indicating significant improvement from wasting toward a healthier nutritional status.

The success of home-based RUTF therapy largely depends on active caregiver participation in ensuring proper intake according to the recommended dosage, maintaining food hygiene, and regularly monitoring the child's health condition (Chávez Muñoz et al., 2026). Support from primary healthcare services and community health programs such as Pos Pelayanan Terpadu also plays a crucial role in monitoring growth progress, evaluating treatment response, and providing education on continued healthy feeding practices after therapeutic recovery. In addition to improving body weight and anthropometric outcomes, this approach is considered practical, cost-effective, and suitable for communities with limited access to healthcare facilities. Therefore, home-based treatment using RUTF can serve as an essential component of comprehensive child malnutrition management to promote faster recovery and reduce long-term health complications.

3. Clinical nutrition interventions

Clinical nutrition interventions play a critical role in the management of child malnutrition by providing targeted nutritional support based on the child's clinical condition, severity of malnutrition, and specific nutritional deficiencies. These interventions may include individualized dietary planning, oral nutritional supplementation, micronutrient therapy, enteral feeding, and therapeutic feeding protocols for children with moderate to severe malnutrition. Clinical nutrition interventions are designed not only to restore body weight and improve anthropometric indicators, but also to correct metabolic imbalances, strengthen immune function, and support optimal physical and cognitive development. In children with severe malnutrition, timely clinical nutritional management is essential to prevent complications such as infections, growth failure, and increased mortality risk.(Vilar-Compte et al., 2025)

The effectiveness of clinical nutrition interventions depends on early nutritional assessment, continuous monitoring, and a multidisciplinary approach involving pediatricians, dietitians, nurses, and caregivers. Nutritional screening tools and anthropometric measurements are commonly used to identify malnutrition risk and determine the most appropriate intervention strategy. In addition, caregiver education on feeding practices, dietary diversity, and post-treatment nutritional maintenance is crucial to ensure sustainable recovery. When implemented appropriately, clinical nutrition interventions have been shown to improve nutritional status, accelerate recovery, and enhance long-term health outcomes in malnourished children. Therefore, they remain an essential component of comprehensive child malnutrition management programs.(Mlakar-Mastnak et al., 2024)

V. Conclusion

Education, homebased therapy, and nutrition therapy could manage of malnutrition in childhood.

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