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PREVALENCE, DETERMINANTS, CONSEQUENCES, AND INTERVENTIONS FOR ADDRESSING MALNUTRITION AMONG SCHOOL-AGED CHILDREN- A REVIEW OF RECENT EVIDENCE

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Abstract
A significant global public health concern is malnutrition, which particularly affects school-age children in low- and middle-income countries (LMICs). Between 2022 and 2025, the ongoing prevalence of stunting, thinness, wasting, overweight, and micronutrient deficiencies among children aged 5–15 years. The Evidence indicates multifactorial determinants of malnutrition, which include socioeconomic disparities, food insecurity, inadequate dietary diversity, infectious diseases, and environmental factors that continue to influence nutritional outcomes. Multiple studies reported a significant association between malnutrition and impaired cognitive development, reduced academic performance, a weak immune system, and long-term risks of chronic illness. School-based interventions such as feeding, micronutrient supplementation, community-based programs, and nutrition education have shown significant benefits but remain unevenly implemented. This review synthesizes findings from 20 studies published between 2022 and 2025, and highlighting key determinants, prevalence patterns, and recommended multisectorial strategies to improve children's health and nutritional status.

Keywords: Malnutrition, micronutrient, deficiencies, supplementation

Introduction

Malnutrition among school-age children remains a critical yet neglected public health issue. Worldwide, millions of children between 5 and 15 years old have been facing nutritional deficiencies that affect physical growth, cognitive development, the immune system, and academic performance. Unlike infants and preschool children, whose nutrition receives significant attention and the school-age children experience unique nutritional challenges that receive relatively little attention. Recent Published Studies (2022- 2025) aim to highlight that both undernutrition and over nutrition are increasing in many regions [1–5]. The rising dual burden reflects structural inequalities, rapid urbanization, climate-related food insecurity, and changes in dietary patterns. School-age children are particularly vulnerable due to higher nutrient requirements during the growth period. Micronutrient deficiencies, particularly anemia, iodine deficiency, vitamin "A" deficiency, and zinc insufficiency, remain highly prevalent [6–10]. The consequences not only affect childhood but also influence adulthood, workforce productivity, chronic disease risk, and educational progress. Therefore, reviewing recent evidence is essential to guide policies and programmatic interventions for this age group.

Methods

This analysis followed a structured approach to identify, evaluate, and synthesize studies on malnutrition among children aged between 5 and 15 years published between January 2022 and January 2025. This study includes Databases such as PubMed, Science Direct, Google Scholar, Web of Science, and Scopus. Keywords were used for search as: 'school-age children,' 'malnutrition,' 'stunting,' 'thinness,' 'micronutrient deficiency,' 'child nutrition,' and 'nutrition intervention.' The inclusion criteria of the study were: 1. original research articles, 2. quantitative assessment of nutritional status, 3. study population between (5–15 years), and 4. Publications between 2022 and 2025. Studies particularly focusing on preschool children and

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editorials excluded from the study. Twenty studies were chosen based on relevance and methodological quality. A thematic synthesis approach was used to categorize results into: prevalence, determinants, consequences, and interventions.

Table 1. Summary of Included Studies

Title	Authors	Year	Journal
• Impact of malnutrition on the academic performance of elementary school children.	AA Zerga et al.	2022	Heliyon / PMC
• School feeding programs for improving the physical and psychological health of school children.	E Kristjansson et al.	2022	Cochrane Review / PMC
• A Systematic Review of School-Based Nutrition Interventions for Promoting Healthy Dietary Practices.	P Chatterjee et al.	2024	Nutrition (open access) / PMC
• Risk Factors of Malnutrition among Inâ€‘School Children and Adolescents.	M Amoadu et al.	2024	International Journal (open access) / PMC
• Undernutrition and associated factors among school-age children with school feeding programs.	DK Meskele et al.	2024	Frontiers in Nutrition
• Cross-Sectional Assessment of Nutritional Status, Dietary Intake, and Physical Activity Levels in Children (6â€“9 Years) in Valencia.	M Morales-SuÃ¡rez-Varela et al.	2024	Nutrients

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• Prevalence of undernutrition and associated factors among children (school-age).	T Tesfaye et al.	2024	PLOS ONE
• Suboptimal nutritional status of school-age children in Addis Ababa: dietary associations.	Y Mihretie Adugna et al.	2024	Frontiers in Public Health
• A school-based food and nutrition education intervention (SFNE) â€" randomized/cluster trial outcomes.	V Mogre et al.	2024	BMC Public Health
• Effects of a School-Based Gardening, Nutrition, and Cooking Intervention (Texas Sprouts) â€" metabolic outcomes.	JN Davis et al.	2023	JAMA Network Open
• Feasibility and acceptability of school-based intervention components (mixed methods).	L Lund et al.	2024	Trials / PMC
• Undernutrition among rural school-age children â€" cross-sectional study (India).	P Vastrad et al.	2023	Frontiers in Nutrition
• Influence of diet quality on nutritional status of school-aged children and adolescents in Zanzibar.	FA Said et al.	2023	PLOS ONE
• Regular Family Meals Associated with Nutritional Status of Schoolchildren.	GAL Oliveira et al.	2024	Foods (MDPI)
• Impact of free school lunch program on nutritional status and	L Raveenthiranathan et al.	2024	BMJ Open

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academic outcomes â€" India study.			
• Nutritional status and associated factors among school-age children in pastoral communities (Bayle Zone) â€" Scientific Reports.	G Beressa et al.	2025	Scientific Reports
• Integrated Evaluation of Undernutrition, Anaemia, and Intestinal Parasites in Madagascar â€" Children.	G Tapia-Veloz et al.	2025	Children (MDPI)
• Malnutrition intervention programmes for school children in developing countries â€" review with program examples.	S Alawode et al.	2024	MyFoodResearch (open)
• Nutrition in school-age children: a rationale for revisiting priorities.	JM Saavedra et al.	2022	Nutrition Reviews / PMC
• Nutritional Status and Dietary Intake of School-Age Children and Adolescents â€" review (LMICs).	SV Wrottesley et al.	2022	Frontiers / PMC

Results

The examination of twenty studies yielded four primary themes pertaining to malnutrition, encompassing its prevalence, determinants, consequences on health and academic, and efficacy of interventions implemented to address it.

1.Prevalence

Multiple studies show that school- age children are experiencing higher rates of stunting, thinness, wasting, and micronutrient deficiencies [1–7]. Stunting prevalence ranges from 12% to 46%, with the highest levels in rural and conflict-affected communities. Thinness rates vary between 8% and 28%, whereas anemia affected (Up to 60%) of school-age children in certain populations. Notably, several studies shown rising trends in overweight and obesity affecting 5%–19% of school-age children, especially in urban settings [8–12]. This indicates the global trend of dietary transition and reduced physical activity among school-aged populations.

2.Determinants

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The most common determinants included poverty, low parental education level, food insecurity, dietary diversity, meal frequency, poor sanitation, and parasitic infections[13–17]. Environmental factors such as drought, seasonal food shortages, and climate-related disruptions were playing a significant role in several regions. Notably, Gender disparities exist, with girls more likely to experience nutritional deficiencies in some studies [18]. Furthermore, School feeding availability highly influenced nutritional outcomes, highlighting the need for
comprehensive intervention to address these interconnected factors.

3.Consequences

Malnutrition were consistently associated/linked with impaired cognitive performance, reduced academic progress, reduced learning ability, weakened immunity, and delayed physical growth [7, 12, 16]. Long-term consequences which include reduced adult height, economic productivity losses, and elevated risk of chronic diseases.

4.InterventionOutcomes

Evaluations of interventions such as school feeding programs, micronutrient supplementation, nutrition education initiatives, and (WASH) programs showed measurable improvements in dietary intake, hemoglobin levels, BMI-for-age scores, and school attendance rates [5, 14, 17–20]. Despite these positive outcomes, the effectiveness of these interventions has been constrained by inconsistencies in implementation quality, funding, and monitoring in several contexts.

Discussion

The reviewed studies mutually highlight that malnutrition among school-age children is a complex issue with a multidimensional problem shaped by socioeconomic, environmental, and behavioral factors. Evidence underscores the need for nutrition programs that not only focusing on early childhood but also on primary and middle school years.

Stunting and micronutrient deficiencies remain strongly associated with poverty, food insecurity, and inadequate dietary diversity. Several studies address the role of school feeding programs in relieving these challenges, particularly in resource-limited settings [3, 10, 15]. At the same time, emerging overweight trends suggest that interventions must now tackle both under-nutrition and over-nutrition.

The association between malnutrition and reduced cognitive and academic performance, consistently reported across studies, underscores the importance of integrating nutrition with educational policy. A multi-sectorial approach including health, agriculture, sanitation, and education sectors is essential for lasting progress.

Conclusion

Overall, malnutrition among school-age children is a continuous or persistent global health challenge with significant implications for child development and future adult outcomes. The analysis of twenty recent studies highlights significant levels of stunting, thinness, anemia, and micronutrient deficiencies, driven largely by structural socioeconomic inequalities.

Evidence suggested that integration of school feeding programs (WASH) initiatives, and nutrition education can effectively address these challenges. To achieve a noticeable reduction in malnutrition among children sustained investment (funding), comprehensive policies, and routine monitoring to track progress are essential.

Limitations

This review is limited by variability in study design/ methodologies, sample sizes, and nutritional assessment tools, which may impact generalizability. Additionally, some geographic gaps exist with some regions, like Latin America and the Middle East that were

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unrepresented. Lack of detailed biomarker analyses and Variations in reported quality in several studies also constrained the interpretation.

Recommendations

Based on the findings from the reviewed studies, the following recommendations/future efforts are proposed:

- Strengthening and expanding the nutrition based programs in schools.
- Upgrade dietary diversity through the community nutrition initiative.
- promote micronutrient supplementation and routine health screening.
- Upgrade WASH facilities within school environments.
- Promote nutrition-focused educational programs for both parents and children.
- Conduction of longitudinal studies for a better understanding of long-term effects.

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