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Factors Contributing to Malnutrition Among Children Under Five Years Old: A Review

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العوامل المساهمة في سوء التغذية لدى الأطفال دون سن الخامسة: مراجعة

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Abstract:

Malnutrition represents a profound imbalance between essential nutrient intake and the body's physiological needs, serving as a critical public health crisis among children under five years old. This condition is a leading cause of morbidity and mortality in developing nations, particularly within Africa and Asia. The primary objective of this review is to examine and synthesize key factors contributing to malnutrition in early childhood by analyzing evidence from published literature. Methodologically, a comprehensive search was conducted across databases like PubMed and Google Scholar, focusing on determinants in children under five. The findings demonstrate that malnutrition is a multi-factorial phenomenon driven by immediate causes such as inadequate dietary intake and infectious diseases. Furthermore, underlying and basic causes including socioeconomic constraints, poverty, and inadequate maternal education significantly exacerbate nutritional outcomes. Environmental conditions, specifically limited access to clean water and poor sanitation, further increase vulnerability to diseases like diarrhea, which directly impairs nutritional status. The review concludes that addressing these interrelated factors—ranging from food security to maternal care practices—is essential for developing sustainable interventions. Strengthening healthcare systems and improving educational resources for mothers are vital steps toward reducing the global burden of child malnutrition.

Keywords: Malnutrition, Under-five children, Stunting, Wasting, Determinants.

الملخص

يمثل سوء التغذية خللاً عميقاً بين تناول العناصر الغذائية الأساسية والاحتياجات الفسيولوجية للجسم، مما يجعله أزمة صحة عامة حرجة بين الأطفال دون سن الخامسة .وتعد هذه الحالة سبباً رئيساً للمرض والوفيات

في الدول النامية، لا سيما في أفريقيا وآسيا .الهدف الرئيسي من هذه المراجعة هو فحص وتوليف العوامل الرئيسية المساهمة في سوء التغذية في مرحلة الطفولة المبكرة من خلال تحليل الأدلة المستمدة من المؤلفات المنشورة .من الناحية المنهجية، تم إجراء بحث شامل في قواعد البيانات مثل PubMed و Google Scholar، مع التركيز على المحددات لدى الأطفال دون سن الخامسة .أظهرت النتائج أن سوء التغذية ظاهرة متعددة العوامل مدفوعة بأسباب مباشرة مثل عدم كفاية المدخول الغذائي والأمراض المعدية .علاوة على ذلك، فإن الأسباب الكامنة والأساسية بما في ذلك القيود الاجتماعية والاقتصادية، والفقر، ونقص تعليم الأمهات تؤدي إلى تفاقم النتائج التغذوية بشكل كبير .كما تزيد الظروف البيئية، وتحديداً محدودية الوصول إلى المياه النظيفة وسوء الصرف الصحي، من التعرض لأمراض مثل الإسهال، مما يضعف الحالة التغذوية مباشرة .تخلص المراجعة إلى أن معالجة هذه العوامل المترابطة - بدءاً من الأمن الغذائي إلى ممارسات رعاية الأمومة - أمر ضروري لتطوير تدخلات مستدامة .إن تعزيز أنظمة الرعاية الصحية وتحسين الموارد التعليمية للأمهات هي خطوات حيوية نحو تقليل العبء العالمي لسوء تغذية الأطفال.

الكلمات المفتاحية: سوء التغذية، الأطفال دون سن الخامسة، التقزم، الهزال، المحددات.

Introduction

Adequate nutrition is fundamental to healthy growth and development during early childhood. Proper nutrient intake supports physical growth, brain development, and the acquisition of cognitive and motor skills. Conversely, malnutrition during this critical period can lead to long-term adverse consequences, including impaired physical growth, reduced cognitive capacity, and poor academic performance later in life. Evidence suggests that insufficient nutrition in early childhood negatively affects brain regions responsible for fine motor control and cognitive function, increasing the risk of developmental delays and learning difficulties (Chang et al., 2010). Malnutrition refers to a condition in which the body's nutritional needs are not met due to inadequate or imbalanced intake of energy and essential nutrients. It encompasses both under-nutrition, such as wasting and stunting, and over-nutrition, including overweight and obesity. According to the World Health Organization (WHO), malnutrition remains a significant global public health concern, with children under five years of age being the most vulnerable group (WHO, 2013). Beyond its immediate effects, malnutrition is a major contributor to childhood morbidity and mortality worldwide. Children who survive malnutrition often experience long-lasting physical and psychological impairments. The condition is closely associated with insufficient dietary intake, poor food quality, and recurrent infections. In this context, the impact of biological and chemical hazards cannot be overlooked. For instance, parasitic worms represent a substantial threat to global health and economic stability, often exacerbating the nutritional status of vulnerable populations (Alhadad, 2022). Furthermore, environmental factors such as the improper use of pesticides and chemical exposure have been shown to have detrimental impacts on human health, further complicating the nutritional landscape (Alhadad, 2018). The quality and safety of food and water are pivotal in determining nutritional outcomes. Contamination of essential food sources with heavy metals poses a severe risk to child health. Research in Libya has highlighted significant concerns regarding heavy metal content in various dietary staples. For instance, studies have detected heavy metal contamination in infant-specific foods, such as baby formulas in Bani Waleed City (Salem et al., 2025b), and in other vital sources like goat milk (Salem & Salem, 2023). Furthermore, common dietary items like orange juices (Amheisen et al., 2025), canned tuna (Salem, 2025), and date palm fruits (Salem & Mohamed, 2025) have also been identified as potential carriers of heavy metal residues. These contaminants can interfere with nutrient absorption and metabolic processes, leading to chronic nutritional deficiencies.

These factors interact in a complex cycle in which illness exacerbates nutritional deficiencies, while poor nutritional status increases susceptibility to diseases (Black et al., 2008). This

susceptibility is often manifested in increased risks of bacterial infections. Studies conducted in Libyan laboratories have emphasized the importance of isolating and identifying bacteria in patients, particularly those suffering from urinary tract infections, to determine effective antibiotic sensitivity patterns (Aloraibi et al., 2025; Hsin et al., 2025). Additionally, understanding the biological environment, including the role of various fungal microorganisms and their characterization, is essential in the broader study of health and environmental interactions (Lamma et al., 2019).

Severe acute malnutrition represents the most critical form of under-nutrition and is characterized by extreme wasting or the presence of nutritional edema. Children affected by this condition have depleted fat and muscle reserves, placing them at a significantly increased risk of death if not promptly treated (Fabiansen et al., 2010). International frameworks, such as those proposed by the United Nations Children's Fund (UNICEF), classify the causes of malnutrition into basic, underlying, and immediate causes, providing a comprehensive approach for understanding and addressing the problem (UNICEF, 2015).

2. Methodology

2.1 Literature Search Strategy

This review was conducted through a comprehensive examination of peer-reviewed articles and a systematic search of published scientific literature focusing on factors associated with malnutrition among children under five years of age. Reports published by international organizations, such as the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), were also utilized. Relevant studies were identified by searching multiple electronic databases, including PubMed, Google Scholar, and ProQuest. Keywords such as "child malnutrition," "undernutrition," "stunting," "wasting," "determinants," and "children under five" were used to ensure comprehensive coverage of the topic. The search primarily focused on studies conducted in developing countries, with a particular emphasis on regions in Africa and Asia.

2.2 Inclusion Criteria

Studies were included in this review if they met the following criteria:

a) They examined children specifically under five years of age.
b) They investigated determinants or risk factors associated with malnutrition.
c) They reported clinical or statistical outcomes related to undernutrition (stunting, wasting, underweight) or over-nutrition (overweight, obesity).
d) They were published in English as peer-reviewed articles or credible institutional reports.

2.3 Exclusion Criteria

Studies were excluded from the review if they:

a) Focused on populations older than five years of age.
b) Did not directly address malnutrition-related factors or determinants.
c) Were editorials, letters to the editor, or opinion-based publications.
d) Lacked sufficient methodological detail or clear statistical evidence.

2.4 Data Synthesis

Data from the selected studies were extracted and synthesized narratively. To facilitate a systematic and logical analysis, determinants of malnutrition were classified into direct, underlying, and basic causes, strictly following the UNICEF conceptual framework (UNICEF, 2015). This approach ensures a holistic understanding of how individual, household, and societal factors interlink to influence child nutrition.

3. Global Status of Malnutrition among Children under Five

Despite increased global awareness, malnutrition remains a persistent challenge in many developing countries. Although effective interventions exist, deficient implementation, limited

resources, and weak health systems continue to hinder progress (World Bank, 2014). Globally, millions of children under five are affected by malnutrition in its various forms. While recent data indicate a gradual reduction in stunting prevalence, the absolute number of affected children remains high, particularly in South Asia and sub-Saharan Africa.

At the same time, the prevalence of childhood overweight and obesity has increased, resulting in a double burden of malnutrition in many low- and middle-income countries (Caballero et al., 2017). Undernutrition is associated with a substantial proportion of deaths among children under five. Protein–energy malnutrition continues to significantly impair child growth and development, especially in regions with high poverty rates and food insecurity (WHO, 2000). Severe acute malnutrition remains prevalent and contributes to millions of preventable child deaths annually (Fabiansen et al., 2010). Long-term evidence indicates that early-life malnutrition can have lasting effects on physical health, cognitive development, and socioeconomic outcomes later in life, with potential intergenerational consequences (Victora et al., 2008).

4. Causes and Factors Contributing to Malnutrition among Under-Five Children

4.1 Direct Causes

Direct causes of malnutrition operate at the individual level, primarily through the interaction of inadequate dietary intake and disease, creating a synergistic cycle where each condition exacerbates the other (UNICEF, 1998).

4.1.1 Inadequate Dietary Intake

Insufficient food consumption or diets lacking essential macronutrients and micronutrients severely compromise physical and cognitive development. Factors such as poor dietary diversity and household food insecurity are significant contributors to stunting and wasting (Black et al., 2008). Moreover, the safety of the diet is paramount; the consumption of contaminated food sources, such as orange juices containing heavy metal residues, can impair metabolic health (Amheisen et al., 2025).

4.1.2 Lack of Breastfeeding

Inadequate breastfeeding practices remain a critical risk factor in developing nations. Early cessation of exclusive breastfeeding or the introduction of inappropriate complementary foods exposes infants to nutritional gaps (De Onis & Blössner, 2003). The quality of breast milk substitutes is also a concern, as some baby formulas have been found to contain heavy metal contamination, posing a direct threat to infant nutrition (Salem et al., 2025b).

4.1.3 Infectious Diseases and Biological Hazards

Infections reduce appetite, impair nutrient absorption, and increase the body's metabolic demands. Common illnesses such as diarrhea, respiratory infections, and malaria are primary drivers of malnutrition (Kinyoki et al., 2015). Furthermore, biological threats like parasitic worms pose a significant global health and economic burden, directly draining the host’s nutrients (Alhadad, 2022). Bacterial infections also play a role; for instance, identifying the antibiotic sensitivity of bacteria causing urinary tract infections is essential for managing the health of malnourished children (Aloraibi et al., 2025; Hsin et al., 2025).

4.1.4 Digestive Disorders and Environmental Toxins

Gastrointestinal conditions like celiac disease impair nutrient uptake (Murray & Lopez, 1996). However, non-biological factors like environmental toxins also degrade digestive health. Exposure to pesticides has documented detrimental effects on human health, potentially disrupting the endocrine and digestive systems (Alhadad, 2018). Furthermore, the role of fungal microorganisms and their biochemical activities, such as laccase production, reflects the complexity of the biological environment affecting health (Lamma et al., 2019).

4.2 Underlying Causes

4.2.1 Poverty and Food Safety

Low household income limits access to high-quality, nutritious food (Haddad et al., 2003). This economic constraint often leads to the consumption of cheaper, potentially contaminated food products. Studies have shown that even common products like canned tuna can contain varying concentrations of heavy metals (Salem, 2025).

4.2.2 Ethnicity and Socioeconomic Disparities

Ethnic disparities often reflect underlying differences in socioeconomic status and access to healthcare, influencing nutritional outcomes and risks of overweight or undernutrition (Freedman et al., 2006).

4.2.3 Inadequate Care and Environmental Health

Caregiving practices, including feeding behavior and health-seeking actions, are vital (Engle et al., 2000). These practices must also account for the safety of local food sources. For example, children in certain regions may be exposed to heavy metals through the consumption of local date palm fruits (Salem & Mohamed, 2025) or goat milk (Salem & Salem, 2023), requiring vigilant caregiving and environmental monitoring.

4.2.4 Poor Water, Sanitation, and Hygiene (WASH)

Limited access to clean water increases exposure to pathogens, particularly those causing diarrheal diseases which are strongly linked to malnutrition (Mshida et al., 2018).

4.3 Maternal Factors

Maternal education and health are significant determinants of a child's nutritional status. Younger or less educated mothers may have limited knowledge regarding appropriate feeding and the risks of environmental contaminants (Horta et al., 2013). Ensuring adequate maternal nutrition during pregnancy is essential for preventing low birth weight and supporting optimal growth (Khan et al., 2011).

4.4 Child-Related Factors

Child-specific factors such as age, gender, and birth weight contribute to the overall risk profile. The transition to complementary feeding is a particularly vulnerable period. Furthermore, low birth weight is a strong predictor of subsequent malnutrition, often linked to the mother's nutritional and environmental exposure during pregnancy (Sah, 2008).

Conclusion

This review demonstrates that malnutrition among children under five years of age is a complex, multifactorial condition resulting from the synergistic interaction of dietary, health-related, socioeconomic, and environmental factors. The evidence synthesized in this study highlights that while inadequate dietary intake and infectious diseases remain immediate causes, underlying factors such as poverty, maternal education, and poor WASH (Water, Sanitation, and Hygiene) conditions play a decisive role in nutritional outcomes. Furthermore, this review expands the traditional understanding of malnutrition by integrating the critical impact of environmental and biological contaminants. The presence of heavy metals in essential food sources—including baby formula, milk, juices, and canned foods—as well as the prevalence of bacterial and parasitic infections, represent significant yet often overlooked determinants of child health. These contaminants not only pose direct toxicological risks but also interfere with nutrient metabolism, thereby exacerbating the global burden of stunting and wasting. Addressing malnutrition effectively requires integrated and multisectoral approaches that go beyond simple food distribution. Strategies must include improving food security, enhancing maternal education, and ensuring access to uncontaminated food and clean water. Moreover, strengthening healthcare systems to monitor heavy metal exposure and provide precise diagnostic tools for infectious diseases is essential. Promoting such comprehensive interventions is vital to reducing child mortality and ensuring the healthy physical and cognitive development of future generations.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

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