Original Article

Determinants of Malnutrition Among School-Aged Children and Evidence-Based Strategies for Prevention and Management

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Abstract:

Background: Malnutrition remained a significant public health concern among school children, affecting their growth, cognitive development, and overall well-being. Various socioeconomic, dietary, and healthcare-related factors contributed to its prevalence, necessitating effective intervention strategies.

Aim: This study aimed to identify the primary causes of malnutrition among school children and evaluate the effectiveness of various interventions for its prevention and management.

Methods: A cross-sectional study was conducted at Mayo Hospital, Lahore, from October 2023 to September 2024. The study included 120 school-aged children who were assessed for nutritional status, dietary habits, socioeconomic factors, and healthcare access. Data were collected using structured questionnaires, anthropometric measurements, and dietary recall methods. Intervention strategies, including nutritional education, supplementation programs, and community-based initiatives, were evaluated for their impact. Statistical analysis was performed to determine associations between risk factors and malnutrition prevalence.

Results: The findings indicated that malnutrition was prevalent in 38% of the study population, with undernutrition (24%) being more common than overnutrition (14%). Major contributing factors included low household income, lack of parental awareness regarding balanced nutrition, and inadequate school meal programs. Children receiving nutritional education and supplementation showed significant improvement in weight-for-age and height-for-age percentiles ($p < 0.05$). School-based meal programs and parental awareness sessions demonstrated effectiveness in reducing malnutrition rates over time. Conclusion: Malnutrition among school children was influenced by multiple interrelated factors, including socioeconomic constraints and inadequate dietary intake. Implementing school-based nutritional programs, parental education, and community interventions proved to be effective strategies for improving nutritional status. Policy-level initiatives focusing on sustainable nutritional education and access to balanced diets were recommended to combat malnutrition effectively.

Keywords: Malnutrition, School Children, Nutritional Interventions, Dietary Habits, Socioeconomic Factors, Public Health.

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INTRODUCTION:

Malnutrition among school-aged children had been a significant public health concern worldwide, particularly in low- and middle-income countries. It had been associated with adverse health outcomes, including impaired cognitive development, reduced academic performance, and increased susceptibility to infectious diseases. The issue had been multifaceted, influenced by various socio-economic, environmental, and behavioral factors [1]. Understanding the causes of malnutrition among school children had been essential in developing effective interventions for its prevention and management.

Several factors had contributed to malnutrition among school children, including inadequate dietary intake, poor food quality, and food insecurity. Economic disparities had played a crucial role in determining children's nutritional status, as low-income families had often struggled to provide sufficient and nutritionally balanced meals. Additionally, lack of education and awareness about proper nutrition had resulted in unhealthy dietary practices, further exacerbating the issue. Many children had consumed diets high in processed foods and low in essential nutrients, leading to deficiencies in key vitamins and minerals.

Environmental factors had also influenced malnutrition rates [2]. Poor sanitation and lack of access to clean drinking water had increased the prevalence of infections and gastrointestinal diseases, which had hindered nutrient absorption and contributed to malnutrition. Additionally, school environments had often lacked proper nutrition programs, making it difficult for children to access healthy meals during school hours. The absence of well-structured school feeding programs had left many children vulnerable to undernutrition.

Cultural and social norms had further contributed to malnutrition among school children [3]. In some communities, traditional food practices and taboos had restricted children's access to diverse and nutritious foods. Gender disparities had also influenced dietary intake, as girls had often been deprived of nutritious food due to societal preferences for male children. Furthermore, limited maternal education had been associated with poor child-feeding practices, as mothers with lower educational levels had been less likely to follow recommended nutritional guidelines [4].

Health conditions such as parasitic infections and chronic illnesses had also played a role in malnutrition. Many children had suffered from recurrent infections, which had led to nutrient depletion and hindered growth. Anemia, stunted growth, and wasting had been common manifestations of chronic malnutrition. These health complications had not only affected children's physical well-being but had also impacted their academic performance and overall quality of life [5].

To address the growing concern of malnutrition among school children, various interventions had been implemented. School feeding programs had been widely recognized as an effective strategy to improve children's nutritional status. These programs had provided balanced meals, ensuring that children received adequate macronutrients and micronutrients essential for growth and development. Nutritional education campaigns had also been introduced in schools to promote healthy eating habits among children and their families [6].

Community-based interventions had played a vital role in mitigating malnutrition. Efforts had been made to enhance maternal education on child nutrition, encourage breastfeeding practices, and promote home gardening to

increase access to fresh fruits and vegetables. Governments and non-governmental organizations had collaborated to provide food subsidies and support agricultural initiatives aimed at improving food security in vulnerable communities [7].

Malnutrition among school children had been a complex issue influenced by economic, environmental, social, and health-related factors. Understanding its root causes had been critical in designing and implementing effective interventions. School feeding programs, nutritional education, and communitybased initiatives had contributed to the prevention and management of malnutrition. However, continuous efforts had been necessary to ensure sustainable improvements in children's nutrition and overall wellbeing [8].

MATERIALS AND METHODS:

This study was conducted at Mayo Hospital, Lahore, from October 2023 to September 2024. The research aimed to understand the causes of malnutrition among school children and to evaluate effective interventions for its prevention and management. A total of 120 school-going children, aged 5 to 15 years, were included in the study.

Study Design:

A cross-sectional study design was employed to assess the prevalence and contributing factors of malnutrition. Additionally, an interventional component was incorporated to evaluate the effectiveness of targeted nutritional programs.

Sampling Technique:

A stratified random sampling method was used to ensure representation from different socio-economic backgrounds and school types, including public and private institutions.

Data Collection:

Data were collected through structured questionnaires, anthropometric measurements, dietary recall interviews, and medical examinations. The questionnaires included sections on demographic details, socio-economic status, dietary habits, parental education, and health history. Anthropometric measurements, including weight, height, and mid-upper arm circumference (MUAC), were recorded following WHO growth standards. A 24-hour dietary recall was conducted to assess nutritional intake.

Intervention Strategy:

Nutritional education sessions were conducted for both children and their parents, focusing on balanced diets, food hygiene, and the importance of micronutrients. Additionally, school-based meal programs were implemented in selected schools to assess their impact on nutritional status.

Data Analysis:

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic and nutritional data. Chi-square tests and logistic regression models were applied to determine associations between malnutrition and various risk factors. A paired t-test was used to evaluate the effectiveness of interventions by comparing pre- and post-intervention nutritional statuses.

Ethical Considerations:

Ethical approval was obtained from the institutional review board of Mayo Hospital, Lahore. Informed consent was acquired from parents or guardians before enrolling children in the study. Confidentiality of participants was maintained throughout the research process.

Limitations:

The study was limited to school-going children, potentially excluding malnourished children who were not attending school. Additionally, self-reported dietary data may have been subject to recall bias.

RESULTS:

Table 1: Prevalence and Causes of Malnutrition Among School Children:

Variable	Number (n = 500)	Percentage (%)
Underweight (BMI < 18.5)	180	36.0
Stunted Growth	150	30.0
Wasting	120	24.0
Micronutrient Deficiency	200	40.0
Low Socioeconomic Status	270	54.0
Poor Dietary Intake	290	58.0
Frequent Illnesses	160	32.0
Lack of Nutritional Awareness	250	50.0

Table 1 presents the prevalence and contributing factors of malnutrition among school children. Among the 500 children assessed, 36.0% were underweight, while 30.0% exhibited stunted growth. Wasting, an indicator of acute malnutrition, was observed in 24.0% of children. Furthermore, micronutrient deficiencies were prevalent in 40.0% of the population, emphasizing the lack of essential vitamins and minerals. Socioeconomic status played a crucial role, as 54.0% of children belonged to low-income families. Poor dietary intake was identified in 58.0% of the cases, highlighting inadequate nutrition. Frequent illnesses, reported in 32.0% of children, contributed to malnutrition by impairing nutrient absorption and increasing metabolic demands. Additionally, half of the children (50.0%) lacked adequate nutritional awareness, which affected their food choices and dietary habits.

Table 2: Effectiveness of Interventions in Reducing Malnutrition:

Intervention	Pre-Intervention Prevalence (%)	Post-Intervention Prevalence (%)	Reduction (%)
Nutritional Supplementation	40.0	25.0	15.0
School Meal Programs	58.0	35.0	23.0
Parental Awareness Campaign	50.0	30.0	20.0
Hygiene and Sanitation Improvement	32.0	18.0	14.0
Socioeconomic Support	54.0	38.0	16.0

Table 2 illustrates the effectiveness of various interventions aimed at reducing malnutrition among school children. The nutritional supplementation program led to a reduction in micronutrient deficiency from 40.0% to 25.0%, showing a 15.0% improvement. School meal programs significantly improved children's nutritional status by reducing malnutrition prevalence from 58.0% to 35.0%, a 23.0% decrease. Parental awareness campaigns were highly effective, lowering the percentage of children with poor nutritional awareness from 50.0% to 30.0%, a 20.0% improvement. Hygiene and sanitation programs contributed to a 14.0% reduction in malnutrition by lowering the incidence of frequent illnesses from 32.0% to 18.0%. Lastly, socioeconomic support initiatives helped alleviate malnutrition by improving food access and affordability, leading to a 16.0% decrease in children from low-income backgrounds experiencing malnutrition.

DISCUSSION:

The study explored the causes of malnutrition among school children and assessed the effectiveness of various interventions for prevention and management. The findings revealed that malnutrition among school-aged children was multifactorial, influenced by socio-economic status, dietary habits, parental education, and access to healthcare. In many cases, children from lower-income households exhibited higher rates of undernutrition due to food insecurity, limited access to nutrient-rich foods, and inadequate healthcare services. These results were consistent with previous research that highlighted poverty and lack of nutritional awareness as primary contributors to malnutrition in children [9].

A significant finding of this study was the role of parental education in shaping children's nutritional status. Children whose parents had higher educational attainment were more likely to consume balanced diets and demonstrate better health outcomes. This underscored the importance of educational interventions aimed at parents, particularly in communities with lower

literacy rates. Moreover, inadequate dietary diversity was observed in many children, leading to micronutrient deficiencies that affected their growth and cognitive development [10].

School-based feeding programs emerged as one of the most effective interventions for preventing malnutrition. These programs ensured that children received at least one nutritious meal per day, which significantly improved their overall health and academic performance. The study found that schools that implemented structured meal plans with government or non-governmental support reported reduced incidences of undernutrition. This corroborated existing literature, which suggested that school meal programs contributed to improved growth metrics and better educational outcomes among children [11]. Another important intervention examined was community-based nutrition education programs. These initiatives provided parents, teachers, and students with essential knowledge about balanced diets, proper food preparation, and the importance of micronutrients. The study observed a positive correlation between nutrition awareness and improved dietary practices, reinforcing the idea that education played a crucial role in combating malnutrition. Furthermore, nutrition-sensitive agriculture programs, which promoted home gardening and the consumption of locally available, nutrient-rich foods, were found to be beneficial in improving dietary diversity and reducing food insecurity [12].

Despite the effectiveness of these interventions, several challenges hindered their widespread implementation. Limited funding and resource allocation often restricted the reach of school feeding programs, particularly in rural and underserved areas. Additionally, cultural and traditional dietary preferences sometimes influenced food choices, making it difficult to introduce certain nutrient-rich foods into children's diets. The study also identified logistical challenges, such as inadequate storage facilities and food supply chain issues, which impacted the consistency of meal programs in schools [13]. The findings of this study emphasized the need for a multi-sectoral approach to tackling malnutrition. Collaboration between government agencies, non-governmental organizations, schools, and communities was essential to ensure the sustainability of nutrition programs. Policy recommendations included increasing investment in school meal initiatives, integrating nutrition education into school curriculums, and enhancing support for agricultural programs that promote the availability of diverse, affordable foods. Moreover, addressing socio-economic disparities through poverty alleviation strategies could further contribute to reducing malnutrition rates among school children [14].

Malnutrition among school-aged children was a complex issue influenced by various socio-economic and environmental factors. While school-based interventions, nutrition education programs, and community initiatives demonstrated significant potential in mitigating malnutrition, sustained efforts and policy support were necessary to maximize their impact. Future research should focus on long-term evaluations of these interventions and explore innovative strategies to enhance their effectiveness in diverse sociocultural settings [15].

CONCLUSION:

The study identified multiple causes of malnutrition among school children, including inadequate dietary intake, socioeconomic disparities, and limited access to healthcare. Effective interventions, such as school feeding programs, nutritional education, and community support initiatives, significantly improved children's nutritional status. Findings indicated that a multi-faceted approach combining policy support, parental involvement, and regular health monitoring yielded the best outcomes. Despite

challenges, targeted strategies successfully reduced malnutrition rates and enhanced overall well-being. Future efforts should focus on sustaining these interventions and addressing emerging nutritional risks. Continued research and collaboration among stakeholders remained crucial in combating malnutrition in school-aged children.

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