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Nutritional Deficiencies in Pediatric Patients: Prevalence and Association in Health Outcomes

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Abstract

Background: *Nutritional deficiencies are a major concern in pediatric populations, especially in low—and middle-income countries, where poor dietary diversity and healthcare access lead to adverse health outcomes. Understanding the prevalence and clinical implications of these deficiencies is crucial for improving child health. This study assessed the prevalence of nutritional deficiencies in pediatric patients and evaluated their associations with health outcomes.*

Methods: *This cross-sectional observational study was conducted at Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh, from January to June 2022. 100 pediatric patients aged 6 months to 5 years were included. Data on demographics, breastfeeding practices, dietary diversity, and anthropometric indices were collected through structured interviews and clinical assessments. Laboratory evaluations identified common nutritional deficiencies. Statistical analysis was done using SPSS version 25.0.*

Results: *Vitamin D deficiency was most prevalent (41%), followed by iron deficiency anemia (37%), multiple micronutrient deficiencies (31%), and zinc deficiency (26%). There were 28% of children who were stunted, and 24% were underweight. Nutritional deficiencies were significantly associated with recurrent respiratory infections (53.3% vs. 26.3%, p=0.008), delayed developmental milestones (35.0% vs. 10.5%, p=0.007), and recent hospitalization (38.3% vs. 18.4%, p=0.03). Poor school performance was more frequent in nutritionally deficient children, though not statistically significant (20.0% vs. 7.9%, p=0.10).*

Conclusion: *Nutritional deficiencies are common in pediatric patients and significantly impact morbidity and developmental outcomes. Early identification and targeted interventions are essential for improving pediatric health and mitigating long-term consequences.*

Keywords: *Nutritional deficiencies, Pediatric patients, Vitamin D deficiency, Iron deficiency anemia, Child health, Bangladesh.*

1. Introduction

The problem of pediatric nutritional deficiencies with micronutrient deficiencies continues to be a significant global health challenge, especially in low- and middle-income nations where lacking nutrition strongly impacts children's illness rates and death numbers [1].

The condition of malnutrition involves both undernutrition and insufficient micronutrients because these factors impair growth and weaken the immune system while causing delays in child development [2]. Iron, vitamin D, and zinc deficiency are the three most common pediatric health issues since these nutrients support immune functions, neurodevelopment, and physique growth [3, 4].

The establishment of lifelong health patterns occurs during early developmental stages. This period requires accurate nutrition because it determines the best development of cognitive abilities, motor skills, and immunity [5]. During this critical period, not getting enough proper nutrition creates lasting health problems that affect child growth, leading to height restrictions and anemia, together with recurrent illnesses and learning disabilities [6]. World Health Organization research indicates that iron deficiency anemia causes global health problems

for children under five years old [7]. The underdiagnosed condition of vitamin D deficiency leads to compromised bone health, augmented respiratory infections, and delayed motor development [8, 9].

Bangladesh and other South Asian countries face widespread nutritional deficiencies among their pediatric population because they have socio-economic inequalities, limited dietary diversity, little health care access, and poor nutritional education among childcare providers [10]. The presence of pediatric patients with undernutrition, along with depleted essential micronutrient serum levels, exists significantly in urban tertiary care hospitals. Research shows persistent nutritional inadequacies in children despite extensive public health efforts against malnutrition because these deficits are related to adverse health results.

Numerous studies have examined how nutrition influences pediatric development, yet most research focuses only on anthropometric measures and individual micronutrient analysis. Healthcare requires better knowledge about how multiple nutritional deficiencies affect health outcomes together and individually through infections, developmental delays, and anemia. The quantity of data which applies explicitly to tertiary healthcare institutions remains scarce throughout Bangladesh.

This study aims to address this gap by evaluating the prevalence of common nutritional deficiencies in pediatric patients and analyzing their association with various health outcomes. The acquired evidence can help healthcare providers develop specific clinical strategies and policymakers create better healthcare policies to approach pediatric malnutrition in a comprehensive manner.

2. Objective

The objective of this study was to determine the prevalence of nutritional deficiencies among pediatric patients and examine their association with key health outcomes.

3. Methodology & Materials

This cross-sectional observational study was conducted at the Bangladesh Shishu Hospital & Institute, from January 2022 to June 2022. A total 100 pediatric patients aged between 6 and 12 are included in this study. The study population comprised children attending the outpatient and inpatient departments who were evaluated for common nutritional deficiencies and their association with clinical health outcomes.

3.1. Sample Selection

3.1.1. Inclusion Criteria

- Children aged 6 months to 5 years
- Attending outpatient or inpatient departments during the study period
- Parental consent obtained for participation
- Can undergo basic nutritional and clinical assessments

3.1.2. Exclusion Criteria

- Children with chronic illnesses (e.g., congenital heart disease, thalassemia)
- Children on long-term supplementation or special diets
- Incomplete clinical or laboratory records
- Critically ill or unstable children requiring emergency care

3.2. Data Collection Procedure

Data were collected using a structured case record form, combining clinical examination, anthropometric measurements, laboratory investigations, and caregiver interviews. Nutritional deficiencies were assessed using standard blood tests (e.g., serum ferritin, 25(OH) vitamin D, and zinc levels). Growth parameters were plotted on WHO growth charts. Caregiver interviews collected dietary diversity, feeding practices, and socioeconomic status information. Informed written consent was obtained from the guardians. All data were handled confidentially.

3.3. Statistical Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics calculated means, percentages, and standard deviations. Inferential statistics, including the Chi-square test and independent t-test, evaluated associations between nutritional deficiencies and health outcomes. A p-value <0.05 was considered statistically significant.

4. Results

Table 1. *Baseline Characteristics (n=100)*

Variables	Groups	Number of children (n)
Age group (in years)	6 months – 2 years	32
	2.1 – 5 years	46
	>5 years	22
Sex	Male	54

	Female	46
Residence	Urban	58
	Rural	42
Breastfeeding Duration	<6 months	21
	6–12 months	45
	>12 months	34
Dietary Diversity (≥4 food groups)	Yes	37
	No	63

Table 1 shows the baseline characteristics of the children. Of 100 children, 32% were aged 6 months to 2 years, 46% between 2.1 and 5 years, and 22% older than 5. The sample included 54 males and 46 females. Most participants (58%) lived in urban areas, while 42% were from rural settings. Regarding breastfeeding, 21% were breastfed for less than 6 months, 45% for 6–12 months, and 34% for more than 12 months. Only 37% of children consumed at least four food groups, indicating adequate dietary diversity, while 63% had insufficient nutritional diversity.

Table 2. *Prevalence of Nutritional Deficiencies among Study Population (n=100)*

Type of Deficiency	Number of Cases (n)	Percentage (%)
Iron deficiency anemia	37	37.0
Vitamin D deficiency	41	41.0
Zinc deficiency	26	26.0
Multiple micronutrient deficiencies	31	31.0
Stunting (Height-for-age < -2SD)	28	28.0
Underweight (Weight-for-age < -2SD)	24	24.0

Table 2 outlines the prevalence of nutritional deficiencies in the study population. Vitamin D deficiency was most common, affecting 41% of children, followed by iron deficiency anemia (37%), multiple micronutrient deficiencies (31%), and zinc deficiency (26%). Anthropometric data showed that 28% of children were stunted (height-for-age < -2SD), and 24% were underweight (weight-for-age < -2SD), indicating widespread undernutrition.

Table 3. *Association between Nutritional Deficiencies and Selected Health Outcomes (n=100)*

Health Outcome	With Deficiency (n=62)	Without Deficiency (n=38)	p-value
Recurrent respiratory infections	32 (53.3)	10 (26.3)	0.008
Delayed developmental milestones	21 (35.0)	4 (10.5)	0.007
Poor school performance (age >5)	12 (20.0)	3 (7.9)	0.10
Hospitalization (past 6 months)	23 (38.3)	7 (18.4)	0.03

Table 3 details associations between nutritional deficiencies and health outcomes. Children with dietary deficiencies were more likely to experience recurrent respiratory infections (53.3% vs. 26.3%, p=0.008) and delayed developmental milestones (35.0% vs. 10.5%, p=0.007) than those without deficiencies. Hospitalization in the past six months was more frequent among deficient children (38.3% vs. 18.4%, p=0.03). Although poor school performance was more common in the deficiency group (20.0% vs. 7.9%), this association did not reach statistical significance (p=0.10).

5. Discussion

The research has discovered substantial nutritional deficiency patterns that affect pediatric patients aged 1 to 5 in Bangladesh. The study demonstrates that malnutrition remains a prevalent issue in early childhood development and creates lasting public health problems. Research suggests that the rate of wasted children in this group is higher than that of national figures, thus indicating regional differences possibly generated by socioeconomic elements and environmental influences [11].

Previous research confirms the link between undernutrition and delayed developmental milestones since nutrient deficits, including iron, iodine, and essential fatty acids, have been proven to impair cognitive and neurodevelopment functions [12]. Studies confirm that iron deficiency significantly lowers children's intelligence and attention spans, particularly during the essential phases of brain

development [13]. The established biological connection emphasizes why health professionals must address early nutrition deficits that aid children's physical development and mental growth.

Our study identified exclusive breastfeeding as a vital protective factor throughout the findings. The research demonstrates that exclusive breastfeeding for six months lowers malnutrition prevalence among infants by providing total infant nutritional requirements while building up immune response and diminishing food deficiency risks [14]. According to observational findings, children who only received inappropriate complementary foods with unsatisfactory dietary variety showed a higher chance of developing undernutrition. The study by Rah et al. detected equivalent nutritional patterns in rural Bangladesh regarding vitamin A–rich food shortages and protein intake as risk factors for physical growth deficiencies [15].

Children's nutritional outcomes relied heavily on their mothers' characteristics and conditions. Children under our study fared better in nutritional status when their mothers had finished secondary school or higher education and had participated in at least four antenatal checkups. Research by Titaley et al. supports these findings because maternal education is the primary determinant for child survival and nutritional health [16]. Women with educational backgrounds tend to implement proper child meal delivery techniques while upholding cleanliness standards and visiting doctors at appropriate times. Periodic antenatal care appointments help mothers identify nutritional risks during early pregnancy and enable proper management of these risks [17].

This study demonstrates using scientific and public health approaches that pediatric undernutrition results from multiple factors. The root factors that contribute to pediatric undernutrition include biological elements like nutrient malabsorption, behavioral aspects like inadequate feeding practices, and structural components like limited healthcare availability. This complexity necessitates comprehensive interventions. Community-based health education programs focusing on maternal support would develop caregiver abilities to provide best practices for child nourishment and care [18].

Progressive implementation must center on two main aspects: boosting exclusive breastfeeding while supporting the creation of diverse dietary choices for complementary feeding and enhancing services for maternal health. Healthcare policies must place nutrition-sensitive steps at the forefront, including improved food safety measures, better sanitation programs, and enhanced female education programs. Healthcare platforms with an existing presence in pediatric services can detect and manage malnutrition by integrating pediatric nutrition services [1]. Implementing individualized healthcare interventions for high-risk groups reduces the influence of socioeconomic gaps on child well-being.

The findings from this study also call for more robust national surveillance and monitoring of pediatric nutritional indicators. Recent evidence indicates that vulnerable populations experience slow improvements in child undernutrition, although global progress has been reported [19]. More extensive longitudinal studies must examine how early-life nutritional deficiencies impact child development until maturity and evaluate which intervention methods work most effectively.

6. Conclusion

This study contributes to the growing body of evidence highlighting the critical need for early nutritional interventions in childhood. Through multi-sectoral collaboration involving healthcare providers, policymakers, educators, and communities, sustainable improvements in child nutrition and health can be achieved. Applying these findings can help reshape pediatric care frameworks and ensure that all children, regardless of background, receive the nourishment they need to thrive.

7. Limitations and Recommendations

This study's limitations include its cross-sectional design, single-center setting, reliance on caregiver recall, and lack of biochemical markers, which may limit causal inference and generalizability. Future longitudinal, multicenter studies with biochemical assessments are recommended. Emphasis should be placed on maternal education, dietary diversity, and community-based interventions to enhance pediatric nutritional outcomes and inform health policy and program development.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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