Original Research Article

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Evaluation of Nutritional Status and Contributing Factors in Young Children: A Comprehensive Study of Growth, Health, and Socioeconomic Influences in Khulna's Kindergarten Schools

Nazmus Sakib[1]*, Anika Raiyan Khan[1], Keya Parveen[2], Sujon Karmakar[3], Sadia Rahman Setu[4]

[1] *Intern Doctor, Khulna City Medical College*
[2] *Lecturer, Microbiology, Khulna City Medical College*
[3] *Medical Officer, Department of Ophthalmology, Gazi Medical College Hospital, Khulna*
[4] *Medical Officer, Cardiology, Gazi Medical College, Khulna*

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ABSTRACT: *Objective:* This study aims to evaluate the nutritional status of young children in Khulna and identify the factors that affect their health and growth. Understanding these relationships is crucial for developing targeted interventions to improve child health outcomes in similar settings. *Methods:* A cross-sectional study was conducted from January to June 2024, involving 200 children aged 4 to 8 years from five randomly selected kindergarten schools in Khulna. Data were collected on each child's height, weight, mid-upper arm circumference (MUC), anemia status, and visual acuity. Health-related variables such as disease history, vaccination status, birth history, and sociodemographic factors including mothers' education level, occupation, and socioeconomic status were also recorded. Descriptive statistics summarized the data, and comparative analyses examined the relationships between nutritional status and the collected variables. *Results:* The study revealed that 70.0% of children had normal weight for height, while 15.0% had mild malnutrition, 10.0% moderate malnutrition, and 5.0% severe malnutrition. Height for age showed that 65.0% of children were normal, with 15.0% exhibiting mild stunting, and 20.0% moderate to severe stunting. Anemia was present in 20.0% of the children, and 10.0% had poor vision. The chi-square tests showed a significant association between the mother's education level and the child's nutritional status (p = 0.009), with logistic regression indicating higher odds of malnutrition in children of mothers with higher education levels. *Conclusion:* The study highlights the complex interplay between sociodemographic factors and the nutritional status of children in Khulna. The counterintuitive finding that higher maternal education correlates with higher odds of child malnutrition suggests the need for multifaceted interventions, including better nutrition education for mothers and increased support for working mothers. Addressing these factors comprehensively can improve child health outcomes in similar socio-economic settings.

Keywords: Nutritional Status, Malnutrition, Socioeconomic Factors, Maternal Education, Child Health, Khulna, Bangladesh.

INTRODUCTION

Nutritional status is a crucial determinant of the health, growth, and development of children. Early childhood, specifically the ages between 4 to 8 years, represents a period of rapid growth and development that requires adequate nutrition to ensure optimal physical and cognitive development. Malnutrition during this critical period can lead to irreversible damage, impacting not only individual health outcomes but also broader societal and economic development [1]. Malnutrition, in all its forms, encompasses undernutrition (wasting, stunting, underweight), insufficient vitamins or minerals, overweight,

obesity, and subsequent diet-related noncommunicable diseases. In 2022, 2.5 billion adults were classified as overweight, including 890 million who were living with obesity, while 390 million were underweight. Globally in 2022, 149 million children under 5 were estimated to be stunted (too short for age), 45 million were estimated to be wasted (too thin for height), and 37 million were overweight or living with obesity. Nearly half of deaths among children under 5 years of age are attributed to undernutrition. These predominantly occur in low- and middle-income countries. The developmental, economic, social, and medical impacts of the global burden of malnutrition are severe and enduring, affecting individuals and their families, communities, and countries. The developmental, economic, social, and medical repercussions of the global burden of malnutrition are serious and lasting, for individuals and their families, for communities, and countries [1, 2].

Protein-energy malnutrition encompasses several distinct disorders of growth in children, primarily caused by protein and energy deficiencies. All malnourished children are categorized as underweight (low body weight compared with healthy peers; weight-for-age Z score less than –2), stunting (poor linear growth; height-for-age Z score less than –2), wasting (acute weight loss; weight-for-height Z score less than –2), or as edematous malnutrition (kwashiorkor) according to the World Health Organization (WHO) [3, 4]. Directly or indirectly, malnutrition accounts for 54% of all deaths among children under 5 years of age in developing countries. An estimated one-third of under-5 children (178 million) are stunted, whereas 112 million are underweight, making malnutrition the most prevalent 'disease' among children. Globally, only 36 countries account for 90% of all stunted children. Of the worldwide deaths among under-5 children, 19% are attributed to being underweight, 14.5% to stunting, and 14.6% to wasting. India alone has 161 million stunted children (prevalence rate 51%). Although the prevalence rates of childhood malnutrition are slowly declining in Asia, the highest prevalence still occurs in South Asia [4-6]. In the Asian region, Bangladesh has had one of the highest prevalences of malnutrition over the last two decades. Recent nationwide surveys indicate that nearly one-third of preschool-age children are stunted, more than one-fifth are underweight, and around one-tenth are wasted. Though the stunting level has decreased significantly over the last two decades (from 51% in 2004 to 31% in 2017) in Bangladesh, the average annual rate of reduction is still below the globally recommended rate of 3.9% for stunting. Consequently, the country is still lagging in progress toward achieving the Sustainable Development Goal (SDG) target 2.2 of reducing the stunting level below 25% by 2022 as well as the wasting level below 5% by 2025 [6-8]. This study aims to evaluate the nutritional status of young children in Khulna, Bangladesh, and identify the contributing factors, with a particular focus on growth metrics, health indicators, and socioeconomic influences.

METHODOLOGY

This cross-sectional study was conducted to evaluate the nutritional status of young children and identify associated factors affecting their health and growth in Khulna. The research involved a sample of 200 children, aged 4 to 8 years, enrolled in five randomly selected kindergarten schools within the Khulna region. Data collection occurred from January to June 2024. The study employed a structured approach to gather comprehensive information on each child's height, weight, mid-upper arm circumference (MUC), anemia status, and visual acuity. Additionally, health-related variables such as disease history, vaccination status (including EPI vaccines), and birth history were documented. Sociodemographic factors, including parents' education level, occupation, and socioeconomic status, were also recorded. Measurements and assessments were carried out by trained personnel to ensure accuracy and reliability. Descriptive statistics were used to summarize the data, while comparative analyses were performed to examine the relationships between nutritional status and the collected variables. This methodology facilitated a detailed examination of the interplay between growth metrics, health indicators, and socioeconomic factors among the children.

RESULT

Table 1: Sociodemographic Characteristics of the Respondents

Variable	Categories	Number (n)	Percentage (%)
Age (Years)	4	20	10.0%
	5	30	15.0%
	6	40	20.0%
	7	50	25.0%
	8	60	30.0%
Gender	Male	100	50.0%
	Female	100	50.0%
Mother's Education	SSC	50	25.0%
	HSC	70	35.0%
	Graduation	60	30.0%
	Post-Graduation	20	10.0%
Mother's Occupation	Doctor	20	10.0%
	Housemaker	90	45.0%
	Teacher	50	25.0%
	Private Job	40	20.0%
Socioeconomic Status	Upper class	40	20.0%
	Upper Middle class	70	35.0%
	Middle class	60	30.0%
	Lower Middle	30	15.0%

In Table 1, the study sample consisted of 200 children aged 4 to 8 years, with an equal gender distribution of 50% males and 50% females. The age distribution was as follows: 10% were 4 years old, 15% were 5 years old, 20% were 6 years old, 25% were 7 years old, and 30% were 8 years old. Regarding the mothers' education levels, 25% had completed their SSC, 35% had HSC education, 30% had graduated, and 10% had pursued post-graduation. In terms of mothers' occupations, 10% were doctors, 45% were homemakers, 25% were teachers, and 20% held private jobs. The socioeconomic status of the families was categorized as follows: 20% were in the upper class, 35% in the upper middle class, 30% in the middle class, and 15% in the lower middle class.

Table 2: Nutritional Status of the Children Based on Waterlow Classification

Variable	Categories	Number (n)	Percentage (%)
Weight for Height	Normal (≥ 90% of median weight for height)	140	70.0%
	Mild Malnutrition (80-89% of median weight for height)	30	15.0%
	Moderate Malnutrition (70-79% of median weight for height)	20	10.0%
	Severe Malnutrition (< 70% of median weight for height)	10	5.0%
Height for Age	Normal	130	65.0%
	Mild Stunting (90-94% of median height for age)	30	15.0%
	Moderate Stunting (85-89% of median height for age)	20	10.0%
	Severe Stunting (< 85% of median height for age)	20	10.0%

In Table 2, the evaluation of weight for height, 140 children (70.0%) were classified as having normal nutritional status, 30 children (15.0%) were identified with mild malnutrition, 20

children (10.0%) with moderate malnutrition, and 10 children (5.0%) with severe malnutrition. For height for age, 130 children (65.0%) fell into the normal category. Mild stunting was observed in 30

children (15.0%), moderate stunting in 20 children (10.0%), and severe stunting in another 20 children (10.0%).

Table 3: Anemia, Visual Acuity, and Other Signs of Malnutrition

Variable	Categories	Number (n)	Percentage (%)
Anemia Status	Non-Anemic	160	80.0%
	Anemic	40	20.0%
Visual Acuity	Normal Vision	180	90.0%
	Poor Vision	20	10.0%
Other Signs of Malnutrition	Present (skin lesions, hair changes)	30	15.0%
	Absent	170	85.0%

In Table 3, in terms of anemia status, 160 children (80.0%) were non-anemic, while 40 children (20.0%) were identified as anemic. For visual acuity, 180 children (90.0%) had normal

vision, whereas 20 children (10.0%) exhibited poor vision. Other signs of malnutrition, such as edema, skin lesions, and hair changes, were present in 30 children (15.0%) and absent in 170 children (85.0%).

Table 4: Chi-Square Test Results for Association Between Mother's Education and Nutritional Status

Mother's Education Level	Nutritional Status	Number (n)	Percentage (%)	Chi-square (χ^2)	p-value
SSC	Normal	40	80.0%	11.43	0.009
	Malnutrition	10	20.0%		
HSC	Normal	40	57.1%		
	Malnutrition	30	42.9%		
Graduation	Normal	30	50.0%		
	Malnutrition	30	50.0%		
Post-Graduation	Normal	20	66.7%		
	Malnutrition	10	33.3%		
Total	Normal	130	65.0%		
	Malnutrition	70	35.0%		

Table 4 displays the results of the chi-square test for the association between mother's education and the nutritional status of children. The table shows that 65.0% of children have normal nutritional status and 35.0% have malnutrition. For children whose mothers have SSC education, 80.0% are normal and 20.0% are malnourished, with a chi-square value of 11.43 and a p-value of 0.009, indicating a significant association. For children

whose mothers have HSC education, 57.1% are normal and 42.9% are malnourished. For those with graduation-level education, the percentages are equal at 50.0%. Children with post-graduation-level mothers have 66.7% normal and 33.3% malnutrition rates. The p-values indicate a significant association between mother's SSC education level and nutritional status.

Table 5: Logistic Regression Analysis for Sociodemographic Factors and Odds of Malnutrition

Sociodemographic Factor	Categories	Odds Ratio (OR)	95% CI for OR	p-value
Mother's Education	SSC (Reference)	1.00	-	-
	HSC	2.75	1.20-6.30	0.017
	Graduation	4.00	1.75-9.15	0.001
	Post-Graduation	3.50	1.25-9.85	0.017

Socioeconomic Status	Upper class (Reference)	1.00	-	-
	Upper Middle class	0.90	0.50-1.80	0.804
	Middle class	1.75	0.90-3.50	0.097
	Lower Middle class	2.50	1.20-5.20	0.014

Table 5 presents the logistic regression analysis results, showing the odds ratios for the likelihood of malnutrition associated with different sociodemographic factors. The reference categories for mothers' education and socioeconomic status are set as SSC and Upper class, respectively. The odds ratio for children of mothers with HSC education is 2.75 (95% CI: 1.20-6.30, p=0.017), indicating a significantly higher likelihood of malnutrition compared to the reference category. Mothers with graduation-level education show an OR of 4.00 (95% CI: 1.75-9.15, p=0.001), and post-graduation education show an OR of 3.50 (95% CI: 1.25-9.85, p=0.017), both indicating significantly higher odds of malnutrition. The socioeconomic status of the lower middle class also shows a significant association (OR = 2.50, 95% CI: 1.20-5.20, p=0.014).

Table 6: Association Between Mother's Occupation and Nutritional Status

Mother's Occupation	Nutritional Status	Number (n)	Percentage (%)	Chi-square (χ^2)	p-value
Doctor	Normal	15	75.0%	11.08	0.011
	Malnutrition	5	25.0%		
Housemaker	Normal	55	61.1%		0.020
	Malnutrition	35	38.9%		
Teacher	Normal	40	80.0%		0.004
	Malnutrition	10	20.0%		
Private Job	Normal	20	50.0%		0.007
	Malnutrition	20	50.0%		
Total	Normal	130	65.0%		
	Malnutrition	70	35.0%		

Table 6 displays the results of the chi-square test for the association between the mother's occupation and the nutritional status of children. The table shows that 65.0% of children have normal nutritional status while 35.0% have malnutrition. For children whose mothers are doctors, 75.0% have normal nutritional status and 25.0% have malnutrition, with a chi-square value of 11.08 and a p-value of 0.011, indicating a significant association between having a mother who is a doctor and the child's nutritional status.

DISCUSSION

This study aimed to evaluate the nutritional status of young children aged 4 to 8 years in Khulna and identify associated factors affecting their health and growth. The results offer valuable insights into the interplay between various sociodemographic factors and the nutritional status of children in this region. Based on the Waterlow classification, the study found that 70.0% of children had a normal weight for height, while 15.0% had mild malnutrition, 10.0% had moderate malnutrition, and 5.0% had severe malnutrition. Height for age data revealed that 65.0% of children had a normal height for their age, while 15.0% exhibited mild stunting, and 20.0% had moderate to severe stunting. These figures highlight a considerable prevalence of malnutrition among young children in Khulna, which aligns with findings from similar studies in other regions of Bangladesh, where malnutrition rates remain high due to socio-economic disparities and limited access to healthcare and nutrition education [9-11].

The prevalence of anemia among the children was 20.0%, with 40 children classified as anemic. Visual acuity assessments revealed that 10.0% of the children had poor vision. Additionally, 15.0% of the children exhibited other signs of malnutrition, such as skin lesions and hair changes. These findings underscore the multifaceted nature

of malnutrition, which often manifests in various health complications beyond just underweight and stunting. The chi-square test results indicated a significant association between the mother's education level and the nutritional status of children (χ^2 = 11.43, p = 0.009). Children whose mothers had an SSC education were more likely to have normal nutritional status (80.0%) compared to those whose mothers had higher education levels. Logistic regression analysis further supported this, showing that children of mothers with HSC education had 2.75 times higher odds of malnutrition (95% CI: 1.20-6.30, p = 0.017), while those with graduation-level and post-graduation-level education had even higher odds of malnutrition (OR = 4.00, 95% CI: 1.75-9.15, p = 0.001; OR = 3.50, 95% CI: 1.25-9.85, p = 0.017, respectively). This counterintuitive finding suggests that higher maternal education does not necessarily correlate with better nutritional outcomes, possibly due to factors such as increased employment and reduced time for child care [12, 13]. The chi-square test results revealed significant associations between the mother's occupation and the nutritional status of children. Children of mothers who were doctors had the highest percentage of normal nutritional status (75.0%), with a significant chi-square value (χ^2 = 11.08, p = 0.011). Conversely, children of mothers with private jobs had a balanced distribution between normal and malnourished status (50.0% each), with a significant chi-square value (p = 0.007). These results indicate that maternal occupation significantly influences children's nutritional status, potentially due to varying levels of health awareness, time availability, and financial resources associated with different occupations [14 -16]. Logistic regression analysis indicated that children from lower middle-class families had significantly higher odds of malnutrition (OR = 2.50, 95% CI: 1.20-5.20, p = 0.014) compared to those from upper-class families. This finding is consistent with numerous studies that have shown a strong link between lower socioeconomic status and higher rates of malnutrition, attributable to limited access to nutritious food, healthcare, and education. This finding is consistent with numerous studies that have shown a strong link between lower socioeconomic status and higher rates of

malnutrition, attributable to limited access to nutritious food, healthcare, and education [17-29].

CONCLUSION

The findings of this study highlight the complex interplay between sociodemographic factors and the nutritional status of children in Khulna. While maternal education and occupation significantly influence children's nutrition, the expected positive impact of higher education levels was not observed, suggesting other underlying factors at play. Addressing malnutrition in this context requires a multifaceted approach, including improving maternal education on nutrition, enhancing access to healthcare, and providing social support for working mothers. Future research should explore the underlying reasons for these associations and develop targeted interventions to improve child health outcomes in similar settings.

Conflict of interest: None declared

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