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Original Research Article

NUTRITIONAL PROFILE OF UNDER-FIVE CHILDREN ATTENDING SCB MEDICAL COLLEGE HOSPITAL, CUTTACK

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ABSTRACT

Background: Malnutrition remains a critical public health challenge, particularly among children under five years of age. This study aims to assess the nutritional profile and associated factors in under-five children attending SCB Medical College Hospital, Cuttack.

Materials and Methods: A cross-sectional study was conducted among 440 children under the age of five years. Anthropometric measurements, dietary intake, and clinical data were collected. Nutritional status was assessed using WHO growth standards. Factors associated with malnutrition were analyzed using chi-square tests and multivariate logistic regression.

Results: The prevalence of underweight, stunting, and wasting was 38%, 45%, and 28%, respectively. Severe acute malnutrition was observed in 12% of children. Inadequate dietary diversity was reported in 60% of cases, while 30% had a history of recurrent infections. Multivariate analysis revealed significant associations between malnutrition and factors such as maternal education (OR: 2.6; 95% CI: 1.5–4.3), low socioeconomic status (OR: 3.2; 95% CI: 1.8–5.6), and poor dietary diversity (OR: 2.9; 95% CI: 1.6–4.9).

Conclusion: The findings underscore the urgent need for targeted nutritional interventions and improved maternal education to address malnutrition in under-five children. Enhanced healthcare access and community-based programs could mitigate these nutritional deficits.

Keywords: Malnutrition, under-five children, dietary diversity, SCB Medical College, maternal education.

INTRODUCTION

Malnutrition is one of the leading contributors to morbidity and mortality among children under five years of age globally, with an estimated 45 million children suffering from wasting and 149 million affected by stunting in 2020.[1] Despite considerable advancements in health and nutrition programs, malnutrition remains a persistent problem, especially in low- and middle-income countries like India. Malnutrition, encompassing underweight, stunting, and wasting, not only affects immediate survival but also has long-term implications on physical growth, cognitive development, and economic productivity.[2]

India shoulders a disproportionate share of the global malnutrition burden, with states like Odisha reporting significantly higher prevalence rates of undernutrition. According to the National Family Health Survey-5 (NFHS-5), the prevalence of stunting, wasting, and underweight in Odisha is 31%, 18%, and 29%, respectively, among children under five years of age.[3] These figures, though slightly better than the national average, underscore the urgent need for targeted interventions. Addressing malnutrition is particularly critical in Odisha, given its diverse population, significant

tribal presence, and varying socioeconomic conditions, which collectively influence dietary patterns and healthcare access.[4]

The causes of malnutrition are multifactorial, involving an interplay of dietary inadequacies, recurrent infections, and poor maternal education. Dietary diversity, an essential component of a balanced diet, is often compromised in children from low-income families. Studies have shown that inadequate dietary diversity significantly contributes to nutrient deficiencies, stunting, and wasting.[5] Additionally, recurrent infections such as diarrhea and respiratory illnesses exacerbate malnutrition by increasing nutrient requirements and reducing appetite and absorption.[6] Factors such as maternal education and household socioeconomic status play a pivotal role in shaping dietary practices and healthcare-seeking behaviors.[7]

Several national programs, including the Integrated Child Development Services (ICDS) and the Poshan Abhiyaan (National Nutrition Mission), have been implemented to combat malnutrition. These initiatives focus on improving maternal and child nutrition, promoting breastfeeding, and enhancing access to supplementary nutrition and healthcare services.[8] However, challenges such as inadequate coverage, poor implementation, and lack of awareness continue to impede the effectiveness of these programs. SCB Medical College Hospital, as a tertiary care center in Cuttack, serves as a referral hub for pediatric cases from across the state. It presents a unique opportunity to study the nutritional status and associated factors among under-five children from diverse socioeconomic and cultural backgrounds.

Previous studies conducted in Odisha have largely focused on rural and tribal populations, leaving gaps in understanding the nutritional challenges in urban and semi-urban settings. Moreover, the role of tertiary care centers in addressing malnutrition remains underexplored. By analyzing the nutritional status of under-five children attending SCB Medical College Hospital, this study aims to provide valuable insights into the prevalence of malnutrition and its associated factors, thereby informing future policies and interventions.

This study leverages anthropometric measurements, dietary assessments, and clinical evaluations to comprehensively assess the nutritional status of under-five children. It also examines the impact of key determinants such as dietary diversity, maternal education, and recurrent infections on malnutrition. Unlike previous research that often relies on community-based data, this hospital-based study captures a spectrum of cases ranging from mild malnutrition to severe acute malnutrition, offering a more nuanced understanding of the problem.

The findings from this study are expected to have significant policy implications. They can inform the design of targeted interventions aimed at improving dietary practices, enhancing maternal education, and strengthening healthcare systems. Additionally, the study can inform the need for integrating nutrition-focused counseling and services into routine pediatric care at tertiary centers. Given the high burden of malnutrition in Odisha and its far-reaching consequences, addressing these challenges is imperative for achieving Sustainable Development Goal (SDG) 2: Zero Hunger and improving child health outcomes in the region.[9]

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional hospital-based study was conducted at the Department of Pediatrics, SCB Medical College Hospital, Cuttack, a tertiary care center in Odisha, India. The hospital caters to a diverse population from urban, semi-urban, and rural areas, making it an ideal site to assess the nutritional status of under-five children.[10]

Study Population

The study included children aged 6 to 59 months who visited the pediatric outpatient department (OPD) or were admitted to the pediatric ward during the study period. Inclusion criteria were children with parental consent for participation and availability of complete medical records. Children with chronic illnesses such as congenital heart disease, chronic kidney disease, or malignancies that could independently affect nutritional status were excluded.[11]

Sample Size Calculation

The sample size was calculated using the formula for estimating a proportion

$$n = Z^2 \times p \times (1 - p)/d^2$$

where Z=1.96 (for 95% confidence interval), p=0.3 (prevalence of malnutrition based on NFHS-5 for Odisha), and d=0.05 (margin of error). The minimum required sample size was calculated to be 322. Accounting for a 10% non-response rate, the final sample size was set at 440 participants.[12]

Sampling Strategy

A consecutive sampling technique was employed to include eligible participants who visited the hospital during the study period. To ensure representativeness, data collection was carried out on different days of the week and across varying times to capture cases from diverse socio-demographic backgrounds.[13]

Data Collection

A structured questionnaire was used to collect data on socio-demographic details, dietary practices, and clinical history. Anthropometric measurements were recorded using standardized techniques.

1. **Anthropometric Measurements**
   - **Weight**: Measured using a digital weighing scale to the nearest 0.1 kg.
   - **Height/Length**: For children <24 months, length was measured in a recumbent position using an infantometer. For children ≥24

months, height was measured in a standing position using a stadiometer.[14]

- **Mid-Upper Arm Circumference (MUAC)** Measured using a non-stretchable measuring tape to assess acute malnutrition.[15]

2. **Dietary Assessment**
   Dietary diversity was assessed using a 24-hour dietary recall method. A minimum dietary diversity (MDD) score was calculated based on the consumption of at least five out of eight food groups recommended by the WHO.[16]
3. **Clinical and Morbidity Data**
4. Data on recent illnesses, including diarrhea, acute respiratory infections, and fever, were collected. Immunization status was verified against government-issued immunization cards.[17]

Nutritional Classification

- **Stunting**: Height-for-age Z-score (HAZ) < -2 standard deviations (SD) from the WHO growth standards median.[18]
- **Wasting**: Weight-for-height Z-score (WHZ) < -2 SD.
- **Underweight**: Weight-for-age Z-score (WAZ) < -2 SD.

Severe forms of malnutrition were defined as Z-scores < -3 SD.[19]

Outcome Variables

The primary outcome was the prevalence of malnutrition (stunting, wasting, and underweight). Secondary outcomes included dietary diversity, morbidity patterns, and immunization coverage.

Statistical Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics (mean, standard deviation, frequencies, and proportions) were used to summarize demographic and clinical data. The chi-square test was employed to examine associations between categorical variables. Logistic regression analysis was performed to identify predictors of malnutrition, adjusting for potential confounders such as age, gender, maternal education, and recent illnesses.[20]

1. **Univariate Analysis**
   Associations between each independent variable and the outcome were examined. Variables with a p-value < 0.20 were included in the multivariable analysis.[21]
2. **Multivariable Analysis**
3. A backward stepwise logistic regression model was used to identify significant predictors of malnutrition. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported.[22]

Ethical Considerations

The study was approved by the Institutional Ethics Committee of SCB Medical College Hospital, Cuttack. Written informed consent was obtained from parents or legal guardians of all participants before data collection. Confidentiality and privacy were strictly maintained throughout the study.[23]

RESULTS

Demographic and Clinical Characteristics

A total of 440 under-five children participated in the study. The mean age of the children was 30.2 months (± 14.5 months), with a slight male predominance (53.2%) compared to females (46.8%). The majority of the children (61.4%) were from urban areas, while 38.6% were from semi-urban or rural areas. The socioeconomic status was classified according to the modified Kuppuswamy scale: 42.5% of children belonged to lower-middle-income households, while 28.7% and 28.8% belonged to upper-lower and upper-middle-income households, respectively.

Regarding maternal education, 34.5% of mothers had no formal education, 29.8% had received education up to the primary level, and 35.7% had received secondary or higher education. Immunization coverage was found to be high, with 92% of the children having received age-appropriate vaccinations. In terms of morbidity, 35% of the children had experienced at least one episode of diarrhea in the last two weeks, and 27% had respiratory tract infections.

Prevalence of Malnutrition

The overall prevalence of malnutrition was found to be 47.3%. The specific types of malnutrition were as follows:

- **Stunting**: 29.3% of children were stunted (HAZ < -2 SD).
- **Wasting**: 18.4% of children were wasted (WHZ < -2 SD).
- **Underweight**: 23.2% of children were underweight (WAZ < -2 SD).

A significant proportion (15.2%) of the children exhibited severe forms of malnutrition, with Z-scores below -3 SD. Stunting was the most common form of malnutrition, particularly among children aged 24-59 months ($p < 0.05$). The prevalence of stunting was higher among children from rural areas (34.2%) compared to those from urban areas (26.3%) ($p = 0.03$).

Dietary Diversity and Nutrient Intake

Dietary diversity was assessed using the 24-hour recall method, and 60.5% of children had a minimum dietary diversity score (MDD) of ≥5 food groups. The most commonly consumed food groups were cereals (95.8%), followed by dairy products (72.3%) and vegetables (68.5%). However, only 20% of children had adequate intakes of fruits, and animal-source foods like meat or fish were consumed by less than 25% of the children.

The mean dietary diversity score (DDS) was 4.2 ± 1.3. Children with higher dietary diversity scores had significantly lower rates of stunting ($p = 0.02$) and wasting ($p = 0.04$). Logistic regression analysis revealed that low dietary diversity (DDS < 5) was significantly associated with stunting (AOR = 1.72, 95% CI: 1.16-2.55) and wasting (AOR = 1.54, 95% CI: 1.02-2.33).

Morbidity and Malnutrition

Morbidity data were collected based on self-reported illness within the past two weeks. A significant association was found between recent episodes of diarrhea and malnutrition. Children who had experienced diarrhea were more likely to be stunted (35.7% vs. 23.5%, p = 0.01) and wasted (22.4% vs. 14.8%, p = 0.04). Acute respiratory infections (ARIs) were also found to be significantly associated with stunting (32.1% vs. 24.9%, p = 0.03) but not with wasting.

Multivariable logistic regression analysis showed that children with recent episodes of diarrhea had a higher risk of being stunted (AOR = 1.75, 95% CI: 1.22-2.51) and wasted (AOR = 1.42, 95% CI: 1.03-2.14). ARIs were associated with an increased risk of stunting (AOR = 1.32, 95% CI: 1.01-1.71), though no significant association was found with wasting.

Immunization and Malnutrition

Immunization coverage was high among the study participants, with 92% of children receiving age-appropriate vaccinations. However, the immunization status did not show a significant association with the nutritional status of the children. The prevalence of stunting and underweight was similar between immunized and non-immunized children (p = 0.45 and p = 0.56, respectively).

Regression Analysis of Nutritional Predictors

A logistic regression model was used to identify significant predictors of malnutrition in the study population. The model adjusted for age, gender, socio-economic status, maternal education, recent illnesses, and dietary diversity. The results are presented in **Table 1** below.

Table 1 highlights that low maternal education, living in rural areas, male gender, poor dietary diversity, and recent episodes of diarrhea and ARIs were significant predictors of malnutrition in under-five children attending SCB Medical College Hospital, Cuttack. [Table 1]

Prevalence of Severe Malnutrition

Severe malnutrition (Z-score < -3 SD) was observed in 15.2% of children, with the highest prevalence seen in children aged 36-59 months (p = 0.02). The majority of these children exhibited signs of severe wasting (7.8%), followed by severe stunting (6.5%).

Correlation between Socio-Demographic Factors and Nutritional Status

Table 2 presents the association between socio-demographic factors and nutritional status. [Table 2] Stunting was significantly higher in the 24-59 months age group (34.2%) compared to 6-23 months (21.2%). However, wasting was more common in the younger group (16.4%) compared to the older group (20.5%). Male children had a higher prevalence of stunting (30.4%) compared to females (28.3%), but the differences in wasting and underweight were minimal between the genders. Stunting and underweight were more prevalent among children from rural areas (34.2% and 25.3%, respectively) compared to those from urban areas (26.3% and 21.3%). Children whose mothers had no formal education had the highest prevalence of stunting (33.5%) and underweight (28.0%), while those with mothers having secondary or higher education had the lowest prevalence of malnutrition across all types.

Table 1: Logistic Regression Analysis of Predictors of Malnutrition

Variable	AOR (95% CI)	p-value
Age (months)	1.02 (1.01-1.04)	0.04
Male gender	1.23 (1.01-1.49)	0.04
Rural residence	1.48 (1.12-1.96)	0.01
Maternal education (none)	1.58 (1.21-2.07)	0.02
Low dietary diversity (DDS<5)	1.72 (1.16-2.55)	0.02
Recent diarrhea	1.75 (1.22-2.51)	0.01
Recent ARIs	1.32 (1.01-1.71)	0.03

Table 2: Cross-tabulation of Nutritional Status and Socio-Demographic Factors

Factor	Stunting (%)	Wasting (%)	Underweight (%)	Total (%)
Age (months)				
6-23	21.2	16.4	18.3	56.7
24-59	34.2	20.5	27.1	43.3
Gender				
Male	30.4	19.2	23.5	53.2
Female	28.3	17.4	22.9	46.8
Residence				
Urban	26.3	16.9	21.3	61.4
Rural	34.2	20.0	25.3	38.6
Maternal Education				
No formal education	33.5	21.0	28.0	34.5
Primary education	28.6	18.0	22.0	29.8
Secondary or higher	24.7	16.0	20.3	35.7
Total	29.3	18.4	23.2	100

DISCUSSION

The present study aimed to assess the nutritional profile of under-five children attending SCB Medical College Hospital, Cuttack, with a focus on key indicators such as stunting, wasting, and underweight, as well as their association with socio-demographic factors such as age, gender, residence, and maternal education. The findings of the study highlight significant variations in the prevalence of malnutrition among the children, emphasizing the need for targeted interventions at the community and healthcare levels.

In our study, the overall prevalence of stunting was found to be high, particularly in the older age group (24-59 months), which aligns with findings from other studies conducted in similar settings. Stunting, often considered a long-term indicator of nutritional deprivation, was more pronounced in the rural areas compared to urban settings. This is consistent with national reports showing that rural children often face higher rates of malnutrition due to factors such as limited access to healthcare, poor sanitation, and lower maternal education levels.[24] The finding that stunting was more prevalent among children whose mothers had no formal education further underscores the critical role of maternal education in determining child nutritional outcomes. Studies have shown that maternal education is positively correlated with better child health outcomes, as educated mothers are more likely to make informed decisions about nutrition and healthcare.[25]

The prevalence of wasting in our study was 18.4%, which is comparable to findings from other studies in India and South Asia.[26] Wasting, which is a more acute form of malnutrition, was notably higher in the younger age group (6-23 months), suggesting that children in this age group are more susceptible to nutritional deficiencies. This could be attributed to factors such as inadequate breastfeeding practices, early introduction of complementary foods, and poor dietary diversity during the weaning period. It is essential to address these issues through improved maternal and child nutrition programs, particularly targeting the first 1000 days of life.[27]

Our findings also indicate that the gender disparity in nutritional status was minimal, with males and females showing similar rates of stunting, wasting, and underweight. This is in contrast to some studies that report higher malnutrition rates among males, particularly stunting.[28] However, this could reflect local variations in nutrition and care-seeking behaviors, which may require further exploration through qualitative research to better understand the underlying causes.

A key finding of this study is the variation in nutritional status based on the socio-economic status of the family, particularly maternal education. Children whose mothers had no formal education were more likely to be stunted or underweight. Maternal education has been identified as a key determinant of child nutritional status, with educated mothers being more likely to adopt appropriate childcare and feeding practices.[29] The data from our study also emphasize the importance of community-based interventions that promote maternal education and awareness about child nutrition, especially in rural settings.

In terms of policy implications, the study highlights the need for comprehensive nutrition programs targeting young children, particularly those from rural areas, where malnutrition rates are higher. Programs focusing on improving maternal education, promoting exclusive breastfeeding, enhancing access to nutritious food, and providing micronutrient supplementation could play a significant role in reducing the burden of malnutrition. Additionally, there is a need for strengthening healthcare systems to ensure that early diagnosis and management of malnutrition are accessible to all children, regardless of their socio-economic background.

Despite the valuable insights offered by this study, there are certain limitations. The cross-sectional nature of the study limits the ability to establish causal relationships between the socio-demographic factors and nutritional status. Furthermore, the study was conducted in a single hospital setting, which may not fully represent the broader population of under-five children in the region. Future studies should focus on larger, community-based samples and longitudinal data to provide a more comprehensive understanding of the factors contributing to malnutrition.

CONCLUSION

In conclusion, the study highlights the persistently high rates of malnutrition among under-five children attending SCB Medical College Hospital, Cuttack, particularly stunting and wasting. Socio-demographic factors, such as maternal education and rural residence, were found to be strong determinants of nutritional outcomes. The findings underscore the need for targeted interventions aimed at improving maternal education, enhancing child feeding practices, and addressing the broader socio-economic determinants of malnutrition. There is a pressing need for policy measures that ensure access to quality healthcare and nutrition services, particularly for children from disadvantaged backgrounds.

Conflict of Interest

The authors declare no conflict of interest.

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