Original Research Article

FACTORS CONTRIBUTING TO MALNUTRITION IN UNDER-FIVE CHILDREN: A STUDY FROM RURAL INDORE

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A B S T R A C T

Background: Malnutrition in under-five children is a critical public health concern, particularly in rural India, where socioeconomic factors significantly influence nutritional status. This study aims to identify the factors contributing to malnutrition among under-five children in rural Indore.

Materials and Methods: A cross-sectional study was conducted involving 300 children aged 6 months to 5 years, assessing demographic characteristics, dietary intake, cultural practices, and maternal education. Nutritional status was evaluated using weight-for-age, height-for-age, and weight-for-height z-scores. Statistical analyses, including multivariate logistic regression, were performed to determine the relationship between various factors and malnutrition prevalence.

Results: The study found that 55% of the children were malnourished, with the highest prevalence in the 24–35 months age group (25%). Significant associations were observed between malnutrition and maternal education (p < 0.001) and family income (p < 0.001). Inadequate dietary intake was prevalent, particularly in protein-rich foods (60%) and vitamin A-rich vegetables (55%). Cultural practices, such as delayed introduction of complementary foods (35%) and dietary restrictions, also contributed to malnutrition.

Conclusion: Malnutrition among under-five children in rural Indore is influenced by a combination of inadequate dietary intake, socioeconomic factors, and cultural practices. Targeted interventions addressing these factors, alongside improved maternal education and income, are essential for reducing malnutrition rates in this vulnerable population.

Keywords: Malnutrition, under-five children, dietary intake, socioeconomic factors, rural India, maternal education, cultural practices.

INTRODUCTION

Malnutrition remains a significant public health challenge, particularly in developing regions where under-nutrition affects a considerable proportion of children under five years of age. Globally, malnutrition contributes to 45% of deaths in children under five, underscoring the urgent need for targeted interventions to address its underlying factors.[1] In India, approximately 38% of children under five are stunted, and 21% are wasted, indicating a persistent problem that necessitates comprehensive understanding.[2]

Rural areas, such as Indore, often face unique challenges that exacerbate the risk of malnutrition, including limited access to healthcare, poor dietary practices, and socio-economic constraints.[3] Socio-economic status plays a critical role, as families with lower incomes may lack the resources to provide adequate nutrition, leading to higher rates of under-nutrition.[4] Additionally, maternal education is linked to child nutrition; educated mothers are more

likely to understand the importance of a balanced diet and proper feeding practices.[5]

Environmental factors also influence malnutrition. Poor sanitation and hygiene can lead to infections that hinder nutrient absorption, further complicating nutritional status.[6] Moreover, cultural practices surrounding food and child-rearing can impact dietary choices and the introduction of complementary foods.[7]

The current study aims to investigate the multifaceted factors contributing to malnutrition among under-five children in rural Indore, focusing on socio-economic, dietary, and environmental determinants. Understanding these factors is crucial for developing effective strategies to combat malnutrition and improve child health outcomes in this vulnerable population.[8,9,10]

Given the significance of addressing malnutrition at an early age, this research will contribute to the existing literature by highlighting local challenges and potential interventions tailored to the context of rural Indore. By identifying the specific factors that contribute to malnutrition, stakeholders can implement targeted policies and programs to ensure healthier futures for children in these communities.

MATERIALS AND METHODS

Study Design
This study was a cross-sectional, observational study conducted in rural areas of Indore, Madhya Pradesh, India. The study aimed to assess the factors contributing to malnutrition among children under five years of age. Data were collected over a period of six months, from January 2024 to June 2024.

Study Population
The study included children under five years of age residing in selected rural villages of Indore district. Inclusion criteria were children aged 6 to 59 months whose caregivers consented to participate. Children with severe congenital anomalies or chronic illnesses were excluded, as these conditions could independently affect nutritional status.

Sampling Technique
A multistage random sampling technique was used to select the study population. Initially, villages were randomly selected from the rural areas of Indore. Within each village, households were then systematically sampled to reach the desired sample size. Approximately 300 children were targeted to ensure adequate power for detecting statistically significant differences and associations.

The sample size was calculated based on the prevalence of malnutrition among under-five children in India, estimated at around 38% for stunting according to the NFHS-5 survey. Using a 95% confidence level, a 5% margin of error, and accounting for potential non-response, the required sample size was determined to be 300 children.

Data Collection Tools: Data were collected using a structured questionnaire, which was pretested on a similar population outside the study area to ensure clarity and relevance. The questionnaire consisted of the following sections:

1. **Socio-demographic Characteristics:** Age and sex of the child, Education and occupation of the parents, Family income and household size, Access to healthcare facilities

2. **Anthropometric Measurements:**
- Weight and height/length were measured following standard World Health Organization (WHO) protocols.
- Weight was measured using a digital weighing scale with a precision of 0.1 kg, while height/length was measured using a stadiometer with a precision of 0.1 cm.
- Nutritional status was assessed by calculating Z-scores for weight-for-age, height-for-age, and weight-for-height, based on WHO growth standards.

3. **Dietary Assessment:**
- A 24-hour dietary recall was used to gather information on the child's food intake.
- A food frequency questionnaire was also employed to understand the types and frequency of foods consumed over the past week.

4. **Health and Hygiene Practices:**
- Data on breastfeeding practices, weaning age, and complementary feeding were collected.
- Information on household sanitation, access to clean water, and hand-washing practices was gathered.

5. **Environmental and Cultural Factors:**
- Questions related to cultural beliefs around child feeding and dietary restrictions were included.
- Access to healthcare services and immunization history were also documented.

Data Collection Procedure
Data collection was carried out by a team of trained field workers who were familiar with the local language and customs. Field workers received training on the study protocol, ethical considerations, and use of data collection tools. After obtaining informed consent from the caregivers, face-to-face interviews were conducted in the participants' homes. Anthropometric measurements were taken during these visits, and each measurement was repeated twice for accuracy.

Ethical Considerations
The study was approved by the Institutional Ethics Committee of the participating medical college in Indore. Informed consent was obtained from all caregivers prior to their participation in the study. Data confidentiality was maintained by assigning unique identification numbers to participants, and all data were anonymized during analysis.

Data Analysis
Data were entered into a secure database and analyzed using SPSS (Statistical Package for the Social Sciences) version 26.0. Descriptive statistics were used to summarize socio-demographic characteristics, dietary intake, and health practices.

Nutritional status was categorized based on WHO cut-off points for Z-scores. Bivariate and multivariate analyses were conducted to explore associations between malnutrition and various socio-demographic, dietary, and environmental factors. Chi-square tests and logistic regression analyses were performed, with a significance level set at $p < 0.05$.

Quality Control

To ensure data accuracy, anthropometric tools were calibrated daily, and field workers were supervised during data collection. Double data entry was conducted to minimize transcription errors, and inconsistencies were resolved through data verification.

RESULTS

Table 1: Demographic Characteristics of the Study Population

Variable	Frequency (n)	Percentage (%)
Age (months)		
6–11	45	15
12–23	60	20
24–35	75	25
36–47	70	23.3
48–59	50	16.7
Sex		
Male	160	53.3
Female	140	46.7
Mother's Education		
No formal education	100	33.3
Primary	80	26.7
Secondary	70	23.3
Higher secondary & above	50	16.7
Family Income (per month)		
< 10 000 INR	140	46.7
15000-20000 INR	110	36.7
> 20000 INR	50	16.7

Table 1 presents the demographic characteristics of the study population. The majority of children were in the 24–35 months (25%) and 36–47 months (23.3%) age groups, with relatively fewer in the youngest (6–11 months, 15%) and oldest (48–59 months, 16.7%) categories. Males (53.3%) slightly outnumbered females (46.7%). Regarding maternal education, one-third of mothers (33.3%) had no formal education, while 26.7% had primary, 23.3% had secondary, and only 16.7% had higher secondary or above education. Family income distribution showed that nearly half of the households (46.7%) earned less than 10,000 INR per month, 36.7% fell within the 15,000–20,000 INR range, and only 16.7% had an income above 20,000 INR. This indicates that the study population predominantly belonged to lower-income families with limited maternal education.

Table 2: Nutritional Indicators and Malnutrition Levels

Nutritional Indicator	Normal (%)	Moderate Malnutrition (%)	Severe Malnutrition (%)
Weight-for-age (WAZ)	45	35	20
Height-for-age (HAZ)	50	30	20
Weight-for-height (WHZ)	60	25	15

Table 2: The prevalence of malnutrition is evident across all nutritional indicators, with 55% of children showing some form of malnutrition based on weight-for-age, height-for-age, and weight-for-height metrics. Severe malnutrition is most pronounced in the weight-for-age category, affecting 20% of the children.

Table 3: Dietary Component Intake

Dietary Component	Adequate Intake (%)	Inadequate Intake (%)
Breastfeeding Duration	65	35
Protein-rich foods	40	60
Vitamin A-rich vegetables	45	55
Iron-rich foods	50	50
Frequency of meals (≥ 3/day)	70	30

Table 3: Inadequate intake of key dietary components is common among the children, with 60% lacking sufficient protein-rich foods and 55% not consuming enough vitamin A-rich vegetables. Although breastfeeding duration and meal frequency are adequate for most children, deficiencies in other dietary areas may contribute to malnutrition.

Table 4: Hygiene and Immunization Practices

Practice	Adequate (%)	Inadequate (%)
Access to clean drinking water	55	45
Hand-washing before meals	60	40
Sanitation facilities	50	50
Immunization up-to-date	80	20

Table 4: The study highlights variability in hygiene and immunization practices. While 80% of children are up-to-date on immunizations, only 55% have adequate access to clean drinking water, and half of the children lack proper sanitation facilities, indicating potential risks for infection and malnutrition.

Table 5: Cultural Practices Related to Child Nutrition

Cultural Practice	Frequency (%)
Belief in dietary restrictions for children	30
Use of traditional herbs for nutrition	40
Delayed introduction of complementary foods	35
Preference for certain food types	45

Table 5: Cultural practices that could affect child nutrition are prevalent, with 45% of caregivers showing a preference for certain food types, and 40% using traditional herbs for nutrition. Additionally, 35% of caregivers delay the introduction of complementary foods, which may impact the overall nutritional status of children.

Table 6: Relationship between Education/Income Levels and Malnutrition

Variable	Education/Income Level	Malnutrition Prevalence (%)
Mother's Education	No formal education	70
	Primary	50
Family Income	< 10000 INR	65
	15000–20000 INR	45

Table 6 shows a clear link between education and income levels with malnutrition rates in children. Malnutrition prevalence is 70% among children with mothers lacking formal education, compared to 50% for those with primary education. Additionally, 65% of children from families earning less than 10000 INR are malnourished, while only 45% from families earning 15000–20000 INR experience malnutrition. This highlights the impact of lower maternal education and family income on malnutrition prevalence.

Table 7: Multivariate Logistic Regression Analysis of Factors Associated with Malnutrition

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Mother's Education (No formal education)	2.5	1.5–4.0	<0.001
Family Income (< 10000 INR)	3	1.8–5.0	<0.001
Access to Clean Drinking Water (Inadequate)	1.8	1.2–2.7	0.01
Inadequate Protein Intake	2.2	1.4–3.5	<0.001
Use of Traditional Herbs for Nutrition	1.6	1.1–2.4	0.03

Table 7 reveals that children with mothers lacking formal education are 2.5 times more likely to be malnourished, while those from families earning less than 10000 INR have 3.0 times higher odds. Additionally, inadequate access to clean drinking water and protein intake increases malnutrition risk, with odds ratios of 1.8 and 2.2, respectively. The use of traditional herbs is also linked to a 1.6 times higher risk, highlighting the impact of socioeconomic and dietary factors on child nutrition.

DISCUSSION

Malnutrition in under-five children remains a critical public health issue, particularly in rural areas where socioeconomic factors significantly influence nutritional status. This study, conducted in rural Indore, assessed various factors contributing to malnutrition among young children, revealing alarming prevalence rates.

Demographic Characteristics and Nutritional Indicators

The demographic data indicate that children aged 24–35 months are most affected by malnutrition, with 25% of this group exhibiting signs of nutritional deficiency. This finding aligns with previous studies highlighting the vulnerability of children in this age group due to increased nutritional demands during rapid growth phases.[11,12] Furthermore, the nutritional indicators reveal that 55% of the children in this study are malnourished, with significant proportions suffering from severe malnutrition. Such high rates underscore the urgent need for targeted interventions in this demographic.[13,14]

Dietary Intake and Practices

Our study findings illustrate inadequate dietary intake, with particularly low consumption of protein-rich foods (60%) and vitamin A-rich vegetables (55%). These deficiencies are concerning, as they are critical for healthy growth and development.[15,16] The findings from Table 4 highlight that while immunization rates are relatively high (80%), only 55% of families have access to clean drinking water. This indicates a gap in basic sanitation and hygiene practices, which is crucial for preventing infections that exacerbate malnutrition.[17,18] Our study findings similar with previous studies that shows that improved water, sanitation, and hygiene (WASH) practices are essential for reducing malnutrition in children.[19]

Cultural Practices and Their Impact

Cultural beliefs significantly influence dietary habits, as shown in Table 5, where 45% of caregivers expressed preferences for certain food types, potentially limiting the diversity of children's diets.[20] Additionally, 40% reported using traditional herbs for nutrition, which may not provide adequate essential nutrients, thereby contributing to malnutrition.[21] Delays in introducing complementary foods (35%) further exacerbate nutritional deficiencies, as infants require varied diets to meet their growing needs.[22]

Socioeconomic Factors and Malnutrition Prevalence

The relationship between maternal education and family income with malnutrition prevalence is profound, as depicted in Tables 6 and 7. Children with mothers lacking formal education and those from families with lower incomes (less than 10000 INR) have significantly higher rates of malnutrition, reinforcing findings from other studies that emphasize the role of socioeconomic status in child nutrition.[23,24] This underscores the need for policies aimed at improving educational opportunities for women and increasing household incomes to combat malnutrition.[25]

CONCLUSION

This study highlights critical factors contributing to malnutrition among under-five children in rural Indore. Addressing the identified gaps in dietary intake, sanitation practices, and socioeconomic barriers is essential for improving the nutritional status of vulnerable populations. Comprehensive interventions that combine education, access to clean water, and improved dietary practices can significantly mitigate malnutrition and its associated risks.

Limitations

Its cross-sectional design restricts causal inferences between factors and malnutrition. The sample size may not be representative of all rural populations, and self-reported data from caregivers can introduce recall bias. Additionally, the scope of nutritional indicators may overlook important micronutrient deficiencies. The study may not account for all confounding variables, limiting the robustness of its findings. Furthermore, the focus on a specific region may affect the generalizability of results, and cultural biases may influence responses regarding dietary practices. Lastly, the reliance on quantitative measures may miss valuable qualitative insights into caregiver attitudes and behaviors.

Conflict of interest:

The authors declare that there are no conflicts of interest regarding the publication of this study.

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