

Nutritional Status of Children 6 months to 5 years of Age and Its Association with Sociodemographic Factors, Feeding Practices and Antenatal Care of an urban slum area in Lucknow, India

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Abstract

Background: The face of malnutrition among Indian children has undergone a significant transition. While undernutrition remains a challenge, overnutrition and micronutrient deficiencies are emerging problems, particularly in urban settings. Historically, malnutrition in India was synonymous with undernutrition, characterized by stunting, wasting, and severe micronutrient deficiencies. Malnourished children are at higher risk of cognitive impairments and chronic diseases, leading to poor academic performance and lower economic productivity in adulthood. A nuanced understanding of the problem, therefore, helps to address both current and future burdens on healthcare and economic systems. This study assesses an association of Nutritional Status of children 6 months to 5 years of age and its association with sociodemographic factors, feeding practices and antenatal care of an urban slum area. **Material and Methods:** A total of 174 children aged 6 months to 5 years were enrolled and were evaluated for their nutritional status using anthropometry. Demographic, feeding and perinatal history was explored. Weight for height less than -3Z score was considered as severe acute malnutrition (SAM), Z-scores in -2 to -3 range were considered as moderate acute malnutrition (MAM). Breastfeeding practices were enquired. An association of nutritional status with breastfeeding practices, perinatal events and demographics was assessed using Chi-square test. **Results:** Mean age of children was 2.53±1.46 years. Majority (55.2%) were boys. Prevalence of SAM and MAM was 8.6% and 19% respectively. Younger age ($p<0.001$), preterm birth ($p<0.001$), antenatal exposure to smoking ($p=0.001$), Lower middle/lower socioeconomic strata ($p<0.001$), lower parental education ($p<0.001$), non-working mother ($p<0.001$), 3 or more siblings ($p<0.001$), lower per-capita income ($p<0.001$), poor personal hygiene ($p<0.001$), lack of pucca house ($p<0.001$), lack of exclusive breastfeeding up to 6 months of age ($p<0.001$), use of formula milk ($p<0.001$), bottle-feeding ($p=0.033$), early complementary feeding ($p=0.047$), inadequate complementary feeding and incomplete vaccination ($p=0.017$) were significantly associated with malnutrition in children. **Conclusion:** Although, majority of patients did not suffer from malnutrition yet malnutrition was associated with a host of modifiable sociodemographic, feeding and antenatal factors.

Keywords: Severe acute malnutrition (SAM), Moderate acute malnutrition (MAM), Sociodemographic factors, Feeding practices, Antenatal factors.

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INTRODUCTION

The face of malnutrition among Indian children has undergone a significant transition. While undernutrition remains challenging, overnutrition and micronutrient deficiencies are emerging problems, particularly in urban settings. Historically, malnutrition in India was synonymous with undernutrition, characterized by stunting, wasting, and severe micronutrient deficiencies. Recent data shows a paradox: while 35% of children under five are stunted, a growing number of urban children are becoming overweight or obese, reflecting the double burden of malnutrition.^[1,2]

This shift can be attributed to several socioeconomic changes, such as rapid urbanization, economic growth, and the rise of nuclear families, leading to altered food habits. Urban and rural children are increasingly exposed to energy-dense, nutrient-poor processed foods, replacing traditional diets. This is coupled with reduced physical activity in urban environments, contributing to childhood obesity. At the same time, marginalized populations still face food insecurity,

leading to a persistence of undernutrition in rural and impoverished urban areas.^[3-5]

For several reasons, studying malnutrition in the context of changing socioeconomic conditions is essential. Firstly, it highlights the importance of policy interventions tailored to the specific needs of diverse populations. For instance, rural children may benefit from programs focusing on food security and micronutrient supplementation, while urban children require initiatives targeting unhealthy food consumption and physical

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inactivity. Additionally, understanding the socioeconomic determinants of malnutrition, such as income disparity, education levels, and access to healthcare can guide more effective public health strategies. Moreover, addressing malnutrition is crucial for breaking the cycle of poverty and ensuring equitable development. Malnourished children are at higher risk of cognitive impairments and chronic diseases, leading to poor academic performance and lower economic productivity in adulthood.^[6] A nuanced understanding of the problem, therefore, helps to address both current and future burdens on healthcare and economic systems.

MATERIALS AND METHODS

This cross-sectional study was carried out between November 2023 and October 2024 in the urban slum area of Career Institute of Medical Sciences and Hospital, Lucknow. Informed consent was taken from the parents of all the patients. This study is approved by the institutional ethical committee (CIMSH/IEC/2023/21). The study's sample size was based on the projected prevalence of malnutrition 35%.^[1] The calculated sample size at a 95% confidence interval and an error allowance of 7.5% was 155. After making contingency provision of 10% the targeted sample size was 170.

Finally, 174 children aged 6 months to 5 years were enrolled in the study. Children with any current, systemic, or chronic illness history were excluded.

At the time of enrolment, the weight of the child was taken by a digital weighing machine, and length (<2 years)/height (>2 years) were measured using an infantometer/stadiometer as per standard guidelines.^[7]

Head circumference, upper segment/lower segment ratio, and mid-upper arm circumference were also assessed. Socioeconomic status was assessed using the Modified Kuppuswamy Scale (updated for January 2024).^[8]

Demographic, breastfeeding, and top-feeding and perinatal history were taken.

Weight for age, length/height for age, and head circumference for age were compared with the WHO Growth charts.

Definitions

- Moderate Acute Malnutrition (MAM): It was identified by moderate wasting (WFH <-2 z-score and > -3 z-score for children aged 0-59 months or MUAC <125 mm and >115 mm for children aged 6-59 months).^[9]
- Severe Acute Malnutrition (SAM): is identified by severe wasting. It was marked by presence of any one of the following:
 - WFH < -3 Z-score
 - MUAC < 115 mm
 - Presence of bilateral pitting edema.^[9]

Statistical Analysis: The data so gathered was analyzed using IBM SPSS 25.0 Software. Chi-square test has been used for comparison purposes.

RESULTS

[Table 1] depicts the general profile and clinical characteristics of the study population. The mean age of children was 2.53±1.46 years, and the majority (55.2%) were boys. 58.6% had birth weight <2.5 kg, 10.3% preterm births. A total of 25.9% had antenatal risk exposure. The majority, 55.2% had an illiterate mother, and 24.1% had an illiterate father. Half of the mothers were working. A slightly more than two-fifth (41.3%) had a per capita monthly income <Rs 1,000/-. There was a dominance of those from nuclear families (81%) and those living in Kacha or shaded houses (79.3%). There was a dominance of those from lower (56.9%) or lower-middle (34.5%) socioeconomic classes. Almost half (48.3%) had more than two siblings, and the majority (74.1%) had poor personal hygiene. Most children (79.3%) were exclusively breastfed up to 6 months. Animal (46.6%) milk was the most common top-fed food. Bottle-feeding was done in 50% cases. In the majority (62.1%), complementary feeding was started after 6 months of age. Adequacy of complementary feeding was recorded in 29.3% cases. The majority (55.2%) had complete vaccination by age [Table 1].

Clinically, pallor (55.2%), frontal bossing (39.7%), large fontanelle (37.9%), and bowing of legs (32.8%) were the most common signs/symptoms of malnutrition. There were 29.3% underweight and 37.9% stunted children [Table 2].

The prevalence of malnutrition was 27.6%. Moderate and severe acute malnutrition were seen in 8.6% and 19% cases, respectively. [Figure 1].

On evaluating the association of different demographic and clinical factors with malnutrition, preterm birth ($p<0.001$), illiterate father ($p<0.001$), non-working mother ($p=0.042$), kaccha house/shade dwelling ($p<0.001$), and lower socioeconomic status ($p<0.001$), more than two siblings ($p=0.001$) and poor personal hygiene ($p<0.001$) were identified as significant sociodemographic predictors; exclusive breastfeeding up to 6 months ($p<0.001$), animal milk as top feed ($p<0.001$), Katori-spoon feeding (37.5%) ($p=0.042$), early start of complementary feeding ($p=0.043$) and inadequate complementary feeding ($p=0.003$) emerged as the nutritional/feeding practices associated with malnutrition. Clinical signs such as Bitot's spot ($p=0.011$), angular stomatitis ($p<0.001$), and Rickets rosary ($p=0.030$) also showed a significant association with malnutrition [Table 3].

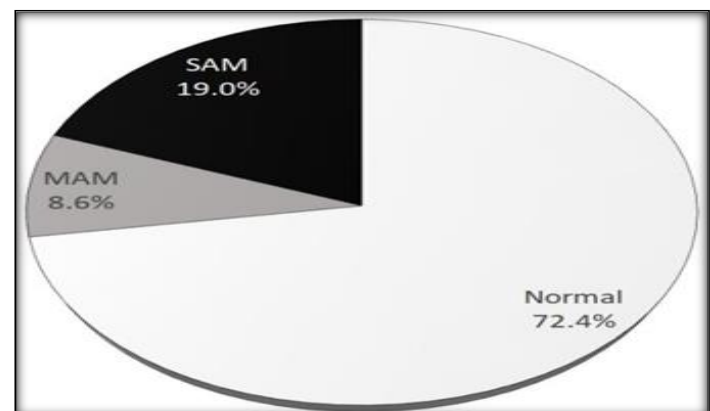


Figure 1: Distribution of cases according to Nutritional Status of Children.

Table 1: General Profile and Characteristics of Study Population

SN	Characteristic	Statistic
1.	Mean age±SD (Range) years	2.53±1.46 (1-6)
2.	Boys:Girls	96 (55.2%); 78 (44.8%)
3.	Low birth weight (<2.5 kg)	102 (58.6%)
4.	Preterm birth	18 (10.3%)
5.	Antenatal risk exposure	45 (25.9%)
6.	Illiterate mother	96 (55.2%)
7.	Illiterate father	42 (24.1%)
8.	Working mother	87 (50.0%)
9.	Per capita monthly income <1,000	72 (41.3%)
10.	Nuclear:Joint family	141 (81.0%); 33 (19.0%)
11.	Type of House	
	Kachcha	69 (39.7%)
	Pucca	36 (20.7%)
	Shade	69 (39.7%)
12.	Socioeconomic status	
	Upper class	-
	Upper Middle	15 (8.5%)
	Lower Middle	60 (34.5%)
	Lower	99 (56.9%)
13.	More than two siblings	84 (48.3%)
14.	Poor personal hygiene	129 (74.1%)
13.	Exclusive breastfeeding upto 6 months	138 (79.3%)
14.	Type of topfeeding	
	Animal	81 (46.6%)
	Formula	48 (27.6%)
	Mixed	45 (25.9%)
15.	Bottle/Katori-Spoon feeding	87 (50.0%); 87 (50.0%)
16.	Start of complementary feeding at >6 months	108 (62.1%)
17.	Adequacy of complementary feeding	51 (29.3%)
18.	Complete vaccination by age	96 (55.2%)

Table 2: Clinical Profile and Nutritional Status

SN	Finding	Statistic
1.	Clinical Profile	
	Pallor	96 (55.2%)
	Bitots spot	33 (19.0%)
	Angular stomatitis	42 (24.1%)
	Bowing	57 (32.8%)
	Rickets/Rosary	45 (25.9%)
	Scrubetic/Rosary	30 (17.2%)
	Frontal bossing	69 (39.7%)
	Large fontanelle	66 (37.9%)
2.	Underweight	51 (29.3%)
3.	Stunting	66 (37.9%)

Table 3: Association of Malnutrition with different sociodemographic and clinical factors

SN	Factor	Malnutrition (n=48)	Normal (n=126)	Statistical significance 'p' value
1.	Age <3 years	36 (75.0%)	87 (69.0%)	0.441
2.	Boys	24 (50.0%)	72 (57.1%)	0.397
3.	Low birth weight (<2.5 kg)	24 (50.0%)	78 (61.9%)	0.154
4.	Preterm birth	15 (31.3%)	3 (2.4%)	<0.001
5.	Antenatal risk exposure	9 (18.8%)	36 (28.6%)	0.186
6.	Illiterate mother	27 (56.3%)	69 (54.8%)	0.860
7.	Illiterate father	27 (56.3%)	15 (11.9%)	<0.001
8.	Working mother	18 (37.5%)	69 (54.8%)	0.042
9.	Per capita monthly income <1,000	15 (31.3%)	75 (59.6%)	0.001
10.	Nuclear family	39 (81.3%)	102 (81.0%)	0.964
11.	Kaccha House/Shade	48 (100.0%)	90 (71.4%)	<0.001
12.	Lower Socioeconomic class	45 (93.8%)	54 (42.9%)	<0.001
13.	More than two siblings	33 (68.8%)	51 (40.5%)	0.001
14.	Poor personal hygiene	48 (100%)	78 (61.9%)	<0.001
13.	Exclusive breastfeeding up to 6 months	48 (100%)	90 (71.4%)	<0.001
14.	Type of top feeding			
	Animal	39 (81.3%)	42 (33.3%)	<0.001

	Formula	9 (18.8%)	39 (31.0%)	
	Mixed	0	45 (35.7%)	
15.	Bottle feeding	18 (37.5%)	69 (54.8%)	0.042
16.	Start of complementary feeding at >6 months age	24 (50.0%)	84 (66.7%)	0.043
17.	Adequacy of complementary feeding	6 (12.5%)	45 (35.7%)	0.003
18.	Complete vaccination by age	24 (50.0%)	72 (57.1%)	0.397
19.	Pallor	27 (56.3%)	69 (54.8%)	0.860
20.	Bitots spot	15 (31.3%)	18 (14.3%)	0.011
21.	Angular stomatitis	21 (43.8%)	21 (16.7%)	<0.001
22.	Bowing	15 (31.3%)	42 (33.3%)	0.794
23.	Rickets Rosary	18 (37.5%)	27 (21.4%)	0.030
24.	Scorbutic Rosary	12 (25.0%)	18 (14.3%)	0.094
25.	Frontal bossing	21 (43.8%)	48 (38.1%)	0.496
26.	Large fontanelle	15 (31.3%)	51 (40.5%)	0.262

DISCUSSION

The present study documented the prevalence of malnutrition as 27.6%; however, in 68.8% of malnourished children, it was severe in nature. We also found a significant association of different sociodemographic factors, reflecting that malnutrition was associated with the underprivileged and socially insecure status of families marked by lower socioeconomic status, low income, a higher number of siblings, poor feeding practices, and inadequate nutrition. Furthermore, malnutrition was generally associated with a poor clinical profile marked by physical signs and symptoms like Bitot's spot, angular stomatitis, and Rickets/rosary. It must be noted that the present study was conducted in a mixed urban/semi-urban population. In our research, we found the prevalence of underweight and stunting to be 29.3% and 37.9% respectively. Compared to this, Abu Rehan et al,^[10] in a recent survey in Uttarakhnad (India) recorded the prevalence of underweight and stunting in a mixed (rural + urban) population to be 37.3% and 43.3% respectively. In their study, undernutrition was also significantly associated with sociodemographic factors like parental education, father's occupation, and family size. Another study conducted in urban slums and rural areas of Maharashtra found the prevalence of underweight and stunting to be 35.4% and 45.9% respectively.^[11] This study also found sociodemographic factors like sex of the child, birth order, exclusive breastfeeding, economic status of the family, type of family, and maternal education to be significantly associated with poor nutritional status of the children. A community-based assessment based on the National Nutrition Monitoring Bureau survey has also found that undernutrition in young children is an important public health problem that is associated with low socio-economic status, illiteracy of the mother, and low birth weight and dietary diversity.^[12] In our study, we also endorse the role of sociodemographic factors in affecting the nutritional status of young growing children.

In the present study, a slightly lower prevalence of malnutrition compared to the national average^{1,2} and in different studies reviewed by us could probably be owing to a large proportion of children from middle (lower and upper middle) socioeconomic classes (43.1%). However, regarding the prevalence of SAM, the present study had a much higher prevalence of 19% than the national average of 7.9%. In an

earlier community-based study from rural areas in the national capital region, the prevalence of SAM was only 2.2%.^[13] It may be noticeable that the problem of malnutrition in urban lower socioeconomic classes is more pronounced than in rural areas.^[10,11] Despite the differences in prevalence of SAM in different studies, their relationship with sociodemographic factors remains unaltered, suggesting the risk of SAM to be manifold higher in underprivileged children as compared to that in well-to-do families. Interestingly, in the present study, we found that malnourished children were particularly more dependent on breastfeeding and had inadequate complementary feeding, too. This implies that scarcities in nutritional intakes, probably due to economic hardships, were responsible for this. The study findings are meaningful; they provide insight into the risk of falling into the severe acute malnutrition category for the underprivileged urban children. One of the study's limitations was the lack of data regarding the utilization of state-sponsored Mother and Child Care facilities by the targeted population. As such, the Indian government runs several integrated child development schemes, but despite these schemes, the huge prevalence of severe acute malnutrition is an issue of investigation.

The findings indicate the need for urgent intervention to reduce the burden of child malnutrition, particularly severe acute malnutrition.

CONCLUSION

Severe acute malnutrition is a major issue of concern, particularly in underprivileged segments of society. The study's findings suggest a need for specific interventions for lower socioeconomic segments of society to avoid the burden of malnutrition.

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Conflicts of interest

There are no conflicts of interest.

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