

Original Research Article

DETERMINANTS OF SEVERE ACUTE MALNUTRITION AMONG CHILDREN 6-59 MONTHS OF AGE

Saksham Kaushal¹, Parveen Bhardwaj², Jiyalal³

¹Junior Resident, Department of Pediatrics, IGMC Shimla, Himachal Pradesh, India.

²Professor and Head, Department of Pediatrics, IGMC Shimla, Himachal Pradesh, India.

³Assistant Professor, Department of Pediatrics, IGMC Shimla, Himachal Pradesh, India.

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Corresponding Author:

Dr. Saksham Kaushal

Junior Resident, Department of Pediatrics,
IGMC Shimla, Himachal Pradesh, India.
Email: sakshamkaushal78@gmail.com

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ABSTRACT

Background: Severe acute malnutrition (SAM) remains a major public health problem among children under five years of age, particularly in developing regions. It is associated with increased morbidity, mortality, and long-term developmental consequences. Understanding the socio-demographic, nutritional, and healthcare-related determinants is essential for designing preventive and therapeutic strategies.

Materials and Methods: A hospital-based cross-sectional observational study was conducted in the Department of Pediatrics at Indira Gandhi Medical College, Shimla, over a year after obtaining approval from Institutional Ethical committee, IGMC, Shimla. 77 children aged 6–59 months with SAM, diagnosed as per World Health Organization criteria, were included using purposive sampling. Data on socio-demographic characteristics, feeding practices, morbidity, and environmental factors were collected using a pretested proforma. Anthropometric measurements were recorded, and statistical analysis was performed using MS Excel and Epi Info software.

Results: The mean age of children was 25.12 ± 16.42 months, with the majority belonging to the 24–59 months age group. Females constituted 55.84% of the population, and most children (98.7%) were from rural areas. A high proportion of parents had primary-level education. Exclusive breastfeeding was reported in 96.1% of children, and complementary feeding was initiated in most cases. Environmental factors like unsafe drinking water (85.71%) and improper waste disposal (83.12%) were prevalent. Recent history of diarrhoea and respiratory infections was observed in one-fourth of children. Findings confirmed severe malnutrition, with mean weight-for-height Z-score of -3.73 ± 0.8 .

Conclusion: SAM in children is influenced by socio-demographic, environmental, and health-related factors. Improving sanitation, ensuring safe drinking water, strengthening maternal education, and management of infections are crucial for reducing SAM.

Keywords: Severe acute malnutrition, children, socio-demographic factors, feeding practices, environmental factors.

INTRODUCTION

Malnutrition is a pervasive yet often under-recognised public health challenge that continues to contribute significantly to childhood morbidity and mortality, particularly among children aged six months to five years. It arises from deficiencies, imbalances, or inadequate intake of essential macronutrients and micronutrients, leading to a spectrum of conditions including underweight, stunting, and wasting. Among these, severe acute

malnutrition (SAM) represents the most critical form, characterised by extreme nutritional deprivation and high risk of mortality, affecting approximately 6.4% of children under five globally. The World Health Organization defines malnutrition as a cellular imbalance between nutrient supply and the body's requirements for growth and maintenance, highlighting its biological and functional implications. SAM is clinically identified using anthropometric indicators such as weight-for-height Z score below -3 standard deviations, mid-upper arm

circumference less than 115 mm, or the presence of bilateral pitting edema.^[1-4]

The global burden of malnutrition remains alarmingly high, reflecting both undernutrition and overnutrition across populations. Beyond immediate health risks, malnutrition has long-term consequences, including impaired cognitive development, reduced educational achievement, and decreased economic productivity, thereby affecting individuals and societies across generations.^[5,6] In India, childhood malnutrition continues to be a major public health concern. According to the National Family Health Survey-5 (2019–2021), 7.7% of children under five suffer from severe wasting, while 35.5% are stunted and 19.3% are wasted, indicating widespread nutritional deficits. Even in relatively better-performing states such as Himachal Pradesh, the burden remains considerable, with significant proportions of children affected by wasting, stunting, and underweight.^[6,7]

The etiology of severe acute malnutrition is complex and multifactorial. Socioeconomic determinants such as poverty, low household income, food insecurity, and large family size play a central role by limiting access to adequate and diverse nutrition. In addition, inappropriate infant and young child feeding practices, including lack of exclusive breastfeeding, delayed or early introduction of complementary feeding, and poor dietary diversity, significantly contribute to nutritional deficits during critical growth periods. Healthcare-related factors, including recurrent infections like diarrhoea and respiratory illnesses, inadequate immunization, and limited access to healthcare services, further exacerbate the risk of SAM.^[8-10] Environmental and maternal factors also significantly influence child nutrition. Poor sanitation, unsafe drinking water, and inadequate hygiene practices increase susceptibility to infections, thereby worsening nutritional status.^[8] Maternal education, nutritional status, and caregiving practices are equally important, as they directly affect feeding behaviours and healthcare utilization.^[12,13]

The study aimed to identify the various factors contributing to severe acute malnutrition in children aged 6–59 months. Therefore, this study was conducted to analyse the socio-demographic, nutritional, and healthcare-related factors associated with the occurrence of severe acute malnutrition, with the intent of understanding the underlying determinants and facilitating the development of targeted interventions for prevention and effective management in this vulnerable age group.

MATERIALS AND METHODS

This hospital-based cross-sectional observational study was conducted at the Department of Pediatrics, Indira Gandhi Medical College and Hospital, Shimla, Himachal Pradesh from February 2025 to March 2026. Ethical approval has been obtained from the Ethical Approval Committee of Indira Gandhi

Medical College and Hospital, Shimla, Himachal Pradesh.

Study Population: The study population comprised children aged 6–59 months presenting to the outpatient department or admitted to the pediatric wards with severe acute malnutrition (SAM) as defined by World Health Organization criteria. Only children with primary severe acute malnutrition were included in the study. Children with secondary causes of SAM due to underlying chronic systemic illnesses, congenital anomalies, metabolic disorders, or other identifiable medical conditions were excluded. Additionally, children younger than 6 months or older than 59 months, as well as those whose parents or legal guardians refused consent, were excluded from the study. This ensured a well-defined and consented cohort for accurate assessment and analysis of factors associated with primary severe acute malnutrition.

Methodology

A detailed history was obtained using a semi-structured interview schedule (proforma), which included information regarding socio-demographic profile, residential area, age, sex, socioeconomic status assessed by the modified Kuppuswamy scale, perinatal history, feeding practices, immunization status, and dietary history. Anthropometric measurements including weight, length/height, and mid-upper arm circumference were recorded. Recumbent length was measured using an infantometer for children below two years of age, while standing height was measured using a stadiometer for children above two years. Body weight was measured using a digital weighing scale, and mid-upper arm circumference was measured using a standardized three-colour measuring tape. A detailed general physical and systemic examination was performed for all participants, and relevant investigations were carried out wherever indicated. All findings were documented in the predefined proforma, and the collected data were compiled and subjected to appropriate statistical analysis.

Data Analysis

Data analysis was performed by entering collected data into an MS Excel spreadsheet, followed by cleaning to remove errors and ensure accuracy. The dataset was then analyzed using Epi Info software version 7.2.5.0. Qualitative variables were expressed as frequencies along with their corresponding percentages, while quantitative variables were summarized using means and their standard deviations, allowing for clear interpretation and comparison of study findings across relevant variables in the dataset.

RESULTS

The present study was a cross-sectional observational study conducted in the Department of Pediatrics at IGMCH Shimla to identify factors contributing to severe acute malnutrition among children aged 6–59 months, including a total of 77 affected children. The

median age was 23 months (IQR 11–36) with a mean of 25.12 ± 16.42 months, and nearly half (49.35%) belonged to the 24–59 months age group, followed by 25.97% in 6–11 months and 24.68% in 12–23 months. Females constituted 55.84% and males 44.16% of cases. The vast majority (98.7%) were from rural areas. Most children (90.91%) belonged to families not classified below the poverty line. Maternal education was predominantly at the primary level (96.1%), with minimal illiteracy (1.3%), and similarly, most fathers (88.31%) had primary-level education. Complementary feeding was initiated at around 7 months in 96.1% of children, with only a

small proportion showing delayed initiation. Most children (74.03%) belonged to families with fewer than five members. Adequate household ventilation was reported in 98.7% of cases. Exclusive breastfeeding was practiced in 96.1% of children, while only 3.9% were not exclusively breastfed. Additionally, complementary feeding was initiated appropriately after 6 months in 96.1% of children, with delayed initiation seen in a small minority, indicating generally favourable reported feeding practices despite the presence of severe acute malnutrition.

Table 1: Distribution of Children According to History of Diarrhoea in the Past Two Weeks

Diarrhoea (Past 2 weeks)	Frequency	%
No	59	76.62%
Yes	18	23.38%
Total	77	100%

A history of diarrhoea in the past two weeks was reported in 23.38% of children. This indicates that nearly one-fourth of children experienced recent diarrhoeal illness, highlighting its potential role as a contributing factor in severe acute malnutrition.

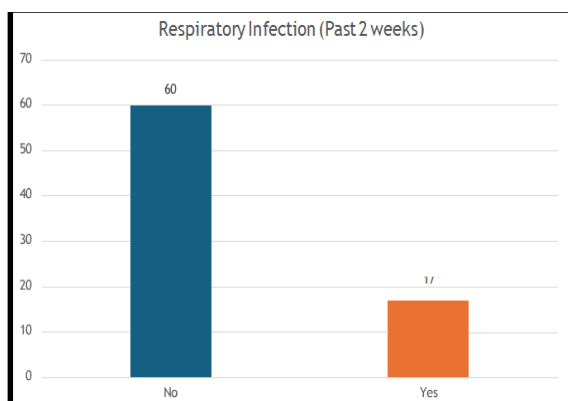


Figure 1: Distribution of Children According to History of Respiratory Infection in the Past Two Weeks

A history of respiratory infection in the past two weeks was reported in 22.08% of children, while 77.92% had no such history. This suggested that one-

fifth of children experienced recent respiratory illness, which may contribute to SAM.

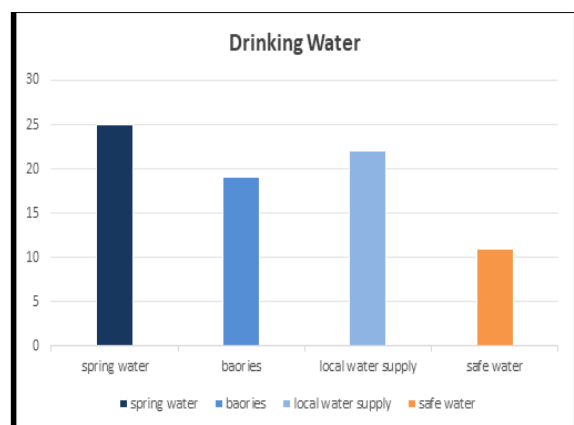


Figure 2: Distribution of Children According to Drinking Water Source

Unsafe drinking water was reported in 85.71% of households (spring water, baories, local water supply). This highlights a high prevalence of unsafe water exposure, indicating a significant environmental risk factor for child health and malnutrition.

Table 2: Distribution of Children According to Immunisation Status

Immunisation	Frequency	%
Yes	76	98.7%
No	1	1.3%
Total	77	100%

Immunisation was reported in 98.7% of children, with only 1.3% not immunised. This indicates very high immunisation coverage among the study

population, suggesting good uptake of vaccination services.

Table 3: Distribution of Children According to Household Waste Disposal Practices

Waste disposal	Frequency	%
Improper	64	83.12%
Proper	13	16.88%
Total	77	100%

Improper household waste disposal practices were observed in 83.12% of households such as open dumping [93.7%] and burning waste in open

[6.25%]. This indicates poor sanitation conditions in the households, which contribute to increased risk of infections and malnutrition.

Table 4: Distribution of Children According to Availing Nutritional Programs

Availing Nutritional programs	Frequency	%
Yes	75	97.4%
No	2	2.6%
Total	77	100%

A total of 97.4% of children were availing nutritional programs, while only 2.6% were not enrolled. This reflects high coverage of nutrition services among the

study population, although malnutrition persisted despite program utilization.

Table 5: Anthropometric Profile of Children

	Mean $\pm$ Std. (overall)	Mean $\pm$ Std. (6-11 months)	Mean $\pm$ Std. (12-36 months)	Mean $\pm$ Std. (37-59 months)
Weight (Kg)	7.98 $\pm$ 2.47	5.63 $\pm$ 0.92	7.68 $\pm$ 1.2	11.8 $\pm$ 1.84
Height (cm)	81.38 $\pm$ 15.1	67.3 $\pm$ 5.8	79.8 $\pm$ 6.7	98.6 $\pm$ 8.9
MUAC (cm)	10.98 $\pm$ 0.83	10.8 $\pm$ 0.9	10.9 $\pm$ 0.8	11.1 $\pm$ 0.7

The anthropometric profile demonstrated increasing mean weight, height, and MUAC. Overall mean values were 7.98 $\pm$ 2.47 kg, 81.38 $\pm$ 15.1 cm, and

10.98 $\pm$ 0.83 cm respectively. The mean weight-for-height Z-score of -3.73 ± 0.8 confirmed severe wasting.

Table 6: Distribution of Children According to Distance of Healthcare Facility from Home

Distance of Health care facility from home	Frequency	%
More than or equal to 5 Km	45	58.44%
Less than 5 Km	32	41.56%
Total	77	100%

A total of 58.44% of children resided ≥ 5 km from a healthcare facility, while 41.56% resided within 5 km. The mean distance was 5.78 $\pm$ 3.71 km, indicating that most of the children faced geographical barriers in accessing healthcare services.

DISCUSSION

The present study was conducted to examine the socio-demographic, nutritional, environmental, and healthcare-related determinants of severe acute malnutrition (SAM) among children aged 6–59 months, a critical public health concern in India. A total of 77 children were included, allowing for comparison with national and international findings and providing insight into contextual risk factors. The median age of affected children was 23 months, with nearly half (49.35%) in the 24–59 months age group, indicating a relatively higher burden among older children compared to studies by Ayana AB, et. al; 2015 and Ambadekar NN, et. al; 2017, reported higher prevalence in younger age groups. Females constituted 55.84% of cases, contrasting with male predominance observed in several studies, suggested possible regional sociocultural influences on care-seeking or survival patterns. A striking 98.7% of children belonged to rural areas, exceeding proportions reported in comparable studies, emphasizing rural vulnerability and potential barriers related to geography and healthcare access.^[8,14]

Socioeconomic and family-related factors showed distinct patterns. Only 9.09% of children were from below poverty line families, differing from previous studies where low socioeconomic status was a dominant determinant. Similarly, only 25.97% belonged to large families, indicated that traditional risk factors such as poverty and family size may not fully explain SAM in this setting. Maternal education was relatively high, with 96.1% having primary-level education, contrasting with high maternal illiteracy reported elsewhere. Bhadoria A, et. al; 2017, suggested that in this region, socio-structural and environmental determinants may outweigh classical socioeconomic indicators.^[10,15]

Nutritional practices revealed unexpectedly favourable trends. Exclusive breastfeeding was reported in 96.1% of children, and timely initiation of complementary feeding was observed in a similar proportion. Ndah T, et. al; 2024 and Ahmed AT, et. al; 2022, identified poor feeding practices as significant contributors to SAM. Despite adherence to recommended practices, the occurrence of SAM indicates that feeding alone may not be sufficient to prevent malnutrition, highlighted the role of other contributing factors such as infection and environmental conditions.^[11,16]

Morbidity-related factors showed that 23.38% of children had recent diarrhoea and 22.08% had respiratory infections. Although lower than proportions reported in other studies, these conditions remain clinically important due to their

role in nutrient loss and increased metabolic demand. Environmental determinants were particularly prominent, with 85.71% of households using unsafe drinking water and 83.12% practicing improper household waste disposal. Ndah T, et. al; 2024 and Chama GC, et. al; 2024, reported in comparable studies, indicated a strong environmental contribution to malnutrition through recurrent infections and poor sanitation. In contrast, household ventilation was largely adequate, suggesting that sanitation and water quality are more critical environmental risks in this setting.^[11,17]

Healthcare access and utilization patterns revealed that 58.44% of children lived more than 5 km from a healthcare facility, indicating significant geographical barriers. While immunization coverage (98.7%) and nutritional program utilization (97.4%) were high, the persistence of SAM despite these services suggested gaps in program effectiveness, quality, or early detection. Distance to healthcare may delay timely intervention, allowing malnutrition to progress to severe stages.^[18]

Anthropometric findings confirmed the severity of malnutrition, with a mean weight-for-height Z-score of -3.73 ± 0.8 and mean mid-upper arm circumference of 10.98 ± 0.83 cm, consistent with WHO criteria for SAM. Nebro AD, et. al; 2019 and Areba AS, et. al; 2024, indicated significant nutritional depletion at presentation. Overall, the study highlighted that SAM in this population is driven by a complex interplay of environmental, healthcare access, and contextual factors rather than solely by traditional socioeconomic or feeding-related determinants, emphasized the need for integrated, region-specific interventions.^[9,10,19]

CONCLUSION

The study concludes that severe acute malnutrition among children aged 6–59 months is a multifactorial condition influenced by socio-demographic characteristics, suboptimal feeding practices, environmental conditions, and infectious morbidity. Factors such as rural residence, unsafe drinking water, poor sanitation, and recent illnesses significantly contribute to its occurrence. Although breastfeeding and timely complementary feeding were largely adequate, environmental risks remained high. These findings emphasize that breastfeeding and immunisation alone are insufficient to prevent malnutrition in absence of adequate nutritional intake and healthy living conditions. Therefore, there is a pressing need for comprehensive community based interventions focusing on nutrition counselling, parental education regarding affordable high protein and energy rich diets, promotion of appropriate complementary feeding practices, hygiene and sanitation improvement, safe drinking water and early identification and management of childhood illness. An integrated multidisciplinary approach is essential to reduce the burden of SAM and improve

overall child growth, development and overall health outcomes.

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