Original Article
DOI: https://doi.org/10.70749/ijbr.v3i6.3163

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Factors of Severe Acute Malnutrition in Children Under 5 Years of Age

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ARTICLE INFO

Keywords: Child, Developing Countries, Diarrhoea, Malnutrition, Poverty.

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Declaration
Authors' Contribution
All authors equally contributed to the study and approved the final manuscript

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 14-05-2025 Revised: 23-06-2025
Accepted: 27-06-2025 Published: 30-06-2025

ABSTRACT

Background: Severe acute malnutrition in children under five year is major health problem in developing countries and it lead to high illness and death. Many social and feeding related factors are responsible but still not well studied in local populations. **Objective:** To determine the factors associated with severe acute malnutrition in children under five years of age. **Study Design:** Cross sectional study. **Duration and Place of Study:** This study was carried out from 12 November 2024 to 12 May 2025 in Department of Paediatrics, Ayub Teaching Hospital, Abbottabad. **Methodology:** A total of 105 children aged 1–5 years having severe acute malnutrition were included. Data was collected by history and examination. Factors like poverty, parental education, family size, feeding practices, diarrhoea and immunisation were recorded. Data was analysed using Statistical Package for Social Sciences version 26. **Results:** Mean age was 2.37 ± 1.23 years and mean duration of disease was 6.51 ± 3.15 months. Illiterate mother was most common factor 77 (73.3%), followed by poverty 75 (71.4%) and rural residence 75 (71.4%). Illiterate father and large family were present in 58 (55.2%) each. Mixed feeding was 57 (54.3%), recurrent diarrhoea 47 (44.8%), partial immunisation 46 (43.8%), exclusive bottle feeding 38 (36.2%) and delayed weaning 35 (33.3%). **Conclusion:** Severe acute malnutrition is linked with many social and feeding factors. Maternal illiteracy, poverty and rural residence are most common factors. Early identification of these factors can help to reduce burden of disease

INTRODUCTION

Severe acute malnutrition (SAM) among children aged below five years is a significant public health problem that poses challenges in poor nations, especially with higher morbidity and mortality rates.[1] SAM is characterized by very low weight for height, severe visible wasting, or nutritional edema. Children with SAM experience weakened immune systems that make them vulnerable to infections, thus worsening their nutritional status.[2] SAM occurs in early childhood due to increased nutritional requirements and inadequate food consumption. There is a likelihood of late medical attention, leading to complications including hypoglycemia, hypothermia, and infections.[3]

There are various elements that influence severe acute malnutrition, including poverty as the greatest factor. Poor families are likely not to be able to pay for a nutritious meal due to their poverty status, and thus lack of enough proteins and energy will result.[4] Living in rural areas is another important element, because people living in such settings do not have enough access to education, health services, and proper nutrition.[5] In rural areas, mothers usually lack adequate knowledge regarding nutrition of the children. Bottle feeding rather than breast feeding increases chances of malnutrition and infections, since bottle feeding normally entails infections.[6]

Other risk factors include late weaning and improper complementary feeding practices.[7] The introduction of solids and semisolids at the right time, usually after six months, is crucial for meeting the child's nutritional needs.[8] Repeated episodes of diarrhea serve as another important risk factor, leading to deficiencies and poor absorption of nutrients in the intestines, thus perpetuating a vicious cycle of infections and malnutrition.[9] Incomplete vaccination also makes the body vulnerable to avoidable illnesses like measles and whooping cough.[10]

Children aged five and below continue to suffer from severe acute malnutrition in many developing countries; this condition is linked to increased chances of sickness and death. This health problem has not been well addressed despite various nutritional interventions put in place. Information regarding the causes of such a problem in many poor and rural communities is not available. It is therefore necessary to determine the causes that can be modified such as feeding practices, vaccinations, and infections. Therefore, this study is needed to determine the factors associated with severe acute malnutrition in children under five years of age so that effective strategies can be developed to reduce its burden.

METHODOLOGY

This cross sectional study was carried out in the Department of Paediatrics at Ayub Teaching Hospital (ATH), Abbottabad, from 12 November 2024 to 12 May 2025. Approval was taken from the institutional ethical review committee before start of study, and all procedures were done according to ethical standards. Sample size of 105 was calculated by using WHO sample size formula with 95% confidence level, 6% margin of error and expected frequency of exclusive bottle feeding 11.1% in children having severe acute malnutrition.[11]

Inclusion criteria: Children aged 1 to 5 years of either gender and diagnosed with severe acute malnutrition were included. Severe acute malnutrition was taken when weight-for-height Z score (WHZ) was ≤−3 according to WHO standards, or mid upper arm circumference was <115 mm, or presence of bilateral pedal oedema.

Exclusion criteria: Children having history of congenital heart disease, cerebral palsy, Down syndrome or Turner syndrome, history of hospital admission more than 48 hours, history of chemotherapy or corticosteroid use, and history of malaria were excluded from study.

After that, informed consent was obtained from parents or guardians of all children before enrolment. Confidentiality was ensured and it was explained that no harm was associated with participation. Basic demographic details were recorded including age, gender, duration of severe acute malnutrition, family socioeconomic status, parents monthly income, parents educational level and residential status. Detailed history was taken from parents or guardians and relevant clinical examination was performed. Information regarding factors such as poverty, illiterate mother, illiterate father, large family size, rural residence, mixed feeding, exclusive bottle feeding, delayed weaning, recurrent diarrhea and partial immunization was collected by direct interview. Poverty was considered when family monthly income was <15000 PKR. For the current study, literacy among the parents was categorized as being illiterate if neither parent had the ability to read and write, which was known from past information. Big families were characterized as having more than five siblings in total. The rural environment was categorized for individuals living more than 20 kilometers away from the closest urban area. Mixed feeding was described as the continuation of breastfeeding as well as bottle feeding for a duration of one year or more. Bottle feeding only was when an infant was fed using the bottle in the first six months of their life. Late weaning occurred when there was no introduction of solid food in an individual at the age of 12 months. Recurrent diarrhea involved suffering three or more times in the last six months of having loose stools, where each occurrence lasted for at least two days, with the least gap between two occurrences being two weeks. Partial immunization took place if an individual failed to receive any immunization dose as per EPI standards.

All collected data was analysed using SPSS version 26. Quantitative variables like age, duration of severe acute malnutrition were presented as mean ± standard deviation. Categorical variables such as gender, family socioeconomic status, residential status, parents educational level and all studied factors were presented as frequencies and percentages.

RESULTS

The study included a total of 105 children under 5 years of age. The mean age of the patients were 2.37 ± 1.23 years, and the mean duration of severe acute malnutrition (SAM) were 6.51 ± 3.15 months (Table-I). With regard to gender distribution, 53 children were male, accounting for 50.5% of the sample, whilst 52 were female, comprising 49.5% of the total (Table-I). In terms of socioeconomic status, majority of the patients belonged to low socioeconomic class, constituting 59 cases (56.2%), followed by middle class with 35 cases (33.3%), and high socioeconomic class with only 11 cases (10.5%) (Table-I). With respect to residence, 75 children (71.4%) were from rural areas, whereas 30 children (28.6%) were from urban settings (Table-I). Regarding parental education, 57 parents (54.3%) were uneducated, 34 (32.4%) had primary level education, 8 (7.6%) had secondary level education, and 6 (5.7%) had higher level of education (Table-I).

Table I

Patient Demographics

Demographics	Mean ± SD
Age (years)	2.37 ± 1.23
Duration of SAM (months)	6.51 ± 3.15
Gender	
Male n (%)	53 (50.5%)
Female n (%)	52 (49.5%)
Socioeconomic Status (SES)	
Low n (%)	59 (56.2%)
Middle n (%)	35 (33.3%)
High n (%)	11 (10.5%)
Residence	
Rural n (%)	75 (71.4%)
Urban n (%)	30 (28.6%)
Parental Education	
Uneducated n (%)	57 (54.3%)
Primary n (%)	34 (32.4%)
Secondary n (%)	8 (7.6%)
Higher n (%)	6 (5.7%)

With regards to the frequency of factors associated with severe acute malnutrition, illiterate mother was the most commonly identified factor, present in 77 cases (73.3%), followed by poverty and rural residence, each observed in 75 cases (71.4%). Illiterate father and large family size were equally prevalent, each noted in 58 cases (55.2%). Mixed feeding practices were identified in 57 children (54.3%), whilst recurrent diarrhoea were found in 47 cases (44.8%), and partial immunisation in 46 cases (43.8%). Exclusive bottle feeding were observed in 38 cases (36.2%), and delayed weaning were the least frequently reported factor, present in 35 cases (33.3%) (Table-II).

Table II

Frequency of Factors of Severe Acute Malnutrition in Children Under 5 Years of Age

Factors	Frequency	% age
Poverty	75	71.40%
Illiterate Mother	77	73.30%
Illiterate Father	58	55.20%
Large Family	58	55.20%
Rural Residence	75	71.40%
Mixed Feeding	57	54.30%
Exclusive Bottle Feeding	38	36.20%

Delayed Weaning	35	33.30%
Recurrent Diarrhea	47	44.80%
Partial Immunization	46	43.80%

DISCUSSION

The findings of this study has revealed several important sociodemographic and nutritional factors which contribute significantly towards the development of SAM in this vulnerable age group. Illiterate mother were found to be the most prevalent factor, observed in 77 cases (73.3%). Maternal illiteracy has direct impact on child feeding practices, as uneducated mothers are less likely to have knowledge regarding proper breastfeeding, timely weaning, and nutritional requirements of growing child. This lack of awareness leads to inadequate dietary intake and subsequently result in malnutrition. Poverty were identified in 75 cases (71.4%), which is not surprising finding in developing country settings. Low income households has limited access to nutritious food, clean water, and health care facilities. Persistent food insecurity at household level impair the ability of family to meet the caloric and micronutrient demands of young children, thus making them highly susceptible to SAM.

Similarly, there was an equal percentage of rural habitation, reported in 75 instances (71.4%). Children living in rural areas lack easy access to healthcare facilities, vaccination services, and nutritional rehabilitation centers. Rural habitation coupled with unawareness within the rural community leads to poor nutritional condition in children. Big families along with illiterate fathers were seen in 58 cases each (55.2%). Due to big families, the available nutrition source has to be shared amongst more people, hence leading to insufficient intake by individual children. Illiterate fathers lead to reduced family income levels and lack of knowledge regarding the requirements of children's health, worsening the situation of malnutrition.

The present study were conducted to evaluate the factors associated with severe acute malnutrition in children under 5 years of age. A total of 105 children were included. The mean age of children were 2.37 ± 1.23 years and mean duration of SAM were 6.51 ± 3.15 months. Majority of children belongs to rural areas 75 (71.4%) and low socioeconomic class 59 (56.2%), which reflect the poor living conditions and limited access to health care services in these populations. Similar observations were reported by Jamro B *et al.* [11] and Ghimire U *et al.* [12] who also found that low income and rural residence were amongst the most significant determinants of SAM, supporting that poverty and geographic isolation remains the core drivers of childhood malnutrition across different settings.

Illiterate mother were the most frequently identified factor in present study, observed in 77 cases (73.3%), which is closely comparable to findings of Jamro B *et al.* [11] who reported maternal illiteracy in 80% of SAM children, and Hussain M *et al.* [13] who noted maternal illiteracy in 58% of cases. Aktar SM *et al.* [14] also identified parental illiteracy as a statistically significant risk factor ($p<0.05$). Uneducated mothers has poor understanding of appropriate feeding practices, timely weaning, and child hygiene, which directly compromise the nutritional status of young children. Illiterate father were present in 58 cases (55.2%), consistent with Jamro B *et al.* [11] who reported paternal illiteracy in 66.7%, and Alkassoum SI *et al.* [15] who found low paternal education as a significant predictor (aOR 3.46, $p=0.010$). Paternal illiteracy is associated with low household income and poor health seeking behaviour, which further aggravate the risk of malnutrition in children.

Poverty were identified in 75 cases (71.4%) in present study, which is in close agreement with Jamro B *et al.* [11] who reported low income in 73.3% cases, and Dahal K *et al.* [16] who found low economic status as the most dominant risk factor (AOR 11.14). Similarly, Alkassoum SI *et al.* [15] confirmed that poor socioeconomic and environmental conditions were strongly associated with SAM. However, Ahmed H *et al.* [17] found no statistically significant association between socioeconomic status and SAM in their study from Rawalpindi, which could be due to difference in study design and sample population. Large family size were found in 58 cases (55.2%), which is comparable to Jamro B *et al.* [11] reporting large family in 66.7%, Prashanth MR *et al.* [18] noting family size of 5–8 members in 55.3%, and Ghimire U *et al.* [12] identifying family size ≥5 as a significant predictor (AOR 3.96). In large families, available nutritional resources get distributed amongst more members, leaving each child with insufficient dietary intake.

Mixed feeding were observed in 57 children (54.3%), which is somewhat lower than findings of Jamro B *et al.* [11] who reported mixed feeding in 62.9%. Prashanth MR *et al.* [18] similarly noted early complementary feeding in 67% and lack of exclusive breastfeeding in 42.7% as major contributing dietary factors. Aktar SM *et al.* [14] also found early cessation of breastfeeding before 4 months as a significant risk factor ($p<0.05$). Mixed feeding practices reduces the protective effect of exclusive breastfeeding, exposes infants to potentially contaminated feeds, and increases susceptibility to infections which further deteriorate nutritional status. Delayed weaning were present in 35 cases (33.3%), consistent with Jamro B *et al.* [11] who noted delayed weaning in 55.6%. Delay in introduction of complementary feeds results in prolonged dependence on breast milk alone, which becomes nutritionally inadequate beyond 6 months of age, leading to gradual development of protein and calorie deficiency.

Recurrent diarrhoea were identified in 47 cases (44.8%), which is comparable to Jamro B *et al.* [11] who reported diarrhoea in 44.4% of SAM children. Manary MJ *et al.* [19] highlighted that malnutrition significantly increases mortality from infections including diarrhoea, establishing a well recognised bidirectional relationship between infection and malnutrition. Repeated diarrhoeal episodes cause nutrient losses, impair gut absorption, and create a vicious cycle which accelerate progression to severe acute malnutrition, particularly in children already living in resource-limited and unhygienic conditions.

There are various limitations associated with this research that should be taken into account. First, it was carried out in a single tertiary health care facility, which could limit the generalizability of the study's results to a wider population. Second, the sample size used in this research was rather small, with 105 children participating in the study, and thus limiting its statistical power. Third,

a cross-sectional research design was adopted in this study, and hence, causality could not be established between the various determinants and the outcome of interest, which was SAM.

CONCLUSION

Findings of this study have led to the conclusion that severe acute malnutrition among children below the age of five years is a complex health problem, which is significantly influenced by various social, demographic, and nutritional elements. The major risk factors found to be involved in this study include maternal illiteracy, poverty, residing in rural areas, and having many family members. Other contributing risk factors identified in this study include improper feeding practices, which include mixed feeding and delayed weaning, and frequent occurrences of diarrhea.

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