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Risk Factors for Severe Acute Malnutrition in Children Below Five Years of Age in a Tertiary Care Hospital of District Poonch, Azad Kashmir

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ABSTRACT

Background: In low-resource environments, severe acute malnutrition (SAM) continues to be a major cause of mortality and morbidity in children under five. The objective of the present research was to identify and assess the risk factors for severe acute malnutrition in children under five.

Methods: This hospital-based descriptive cross-sectional study was carried out at Sheikh Khalifa Bin Zayed Al Nahyan Combined Military Hospital (CMH), Rawalakot, a tertiary care hospital located in District Poonch, Azad Jammu and Kashmir. The study was conducted over one year, from 1st April 2022 to 30th March 2023. A total of 260 children diagnosed with SAM based on WHO criteria were included. Data on socio-demographic characteristics, feeding practices, health-related factors, maternal status, and household conditions were collected using a structured questionnaire. Statistical analysis involved chi-square, and $p<0.05$ was considered significant

Results: Children with SAM were more likely to belong to low-income families ($p = 0.0001$), have larger households ($p = 0.0003$), live in rural areas ($p = 0.0002$), and reside in joint family systems ($p = 0.0029$). Health-related factors, including incomplete immunization ($p = 0.0001$), recent diarrhoea ($p = 0.0001$), and low birth weight ($p = 0.0001$), were also linked. Maternal illiteracy ($p = 0.0001$), inadequate antenatal care ($p = 0.0001$), and maternal malnutrition ($p = 0.0001$).

Conclusion: SAM is strongly associated with inadequate nutrition, maternal and household factors, and preventable illnesses. Targeted community-level interventions are urgently needed.

Keywords: Severe Acute Malnutrition, Child Nutrition Disorders, Infant Nutrition Disorders.

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INTRODUCTION

Severe Acute Malnutrition (SAM) is the most serious and potentially fatal form of malnutrition, affecting millions of children below five[1]. The World Health Organization (WHO) states that a weight-for-height z-score of less than three standard deviations, a mid-upper arm circumference (MUAC) of less than 11.5 cm, or bilateral pitting edema are considered indicators of severe acute malnutrition[2]. Children's morbidity and death are significantly influenced by SAM[3]. Nearly 13.6 million of the 45 million wasting children under five worldwide have SAM, which is a major cause of juvenile deaths and is mostly attributed to infections, weakened immunity, and stunted growth[4].

Malnutrition is a major health challenge that should be recognized in Pakistan[5]. The National Nutrition Survey (2018) estimated that 17.7% of children under five years of age are wasted, and 4.0% are wasted with SAM[6]. These statistics highlight underlying structural, sociocultural, socioeconomic, and environmental challenges such as poverty, food insecurity, poor infant and young child feeding (IYCF) practices, low maternal education, poor access to health care, and sanitation. Azad Jammu and Kashmir (AJK), a region with unique geographical and political complexities, remains underrepresented in national nutrition data. Within AJK, District Poonch is a relatively underserved area where the determinants of child malnutrition have not been systematically explored, particularly in tertiary care settings that cater to complicated and referral cases[7].

Understanding the risk factors associated with SAM is essential for developing targeted interventions and public health strategies. Multiple studies conducted in various regions of Pakistan and other developing countries have identified several predictors of SAM, including low birth weight, recurrent infections (such as diarrhea and pneumonia), inappropriate complementary feeding, inadequate breastfeeding, maternal undernutrition, and lack of immunization[8-10]. However, these factors are often context-specific, and regional variations in socioeconomic, environmental, and cultural determinants necessitate localized investigations to inform effective policy and clinical management.

This study aims to assess the risk factors contributing to Severe Acute Malnutrition in children under five years of age admitted to the tertiary care hospital of District Poonch, Azad Kashmir. By identifying and quantifying the contributory elements specific to this population, the research seeks to fill a critical gap in the literature and provide evidence-based recommendations for healthcare providers, policymakers, and nutrition program managers in the region. Furthermore, this study is expected to support the integration of tailored preventive and therapeutic measures into routine pediatric care in Azad Kashmir, ultimately reducing the burden of SAM and improving child survival and development outcomes.

METHODS

A tertiary care facility in District Poonch, Azad Jammu and Kashmir, Sheikh Khalifa Bin Zayed Al Nahyan Combined Military Hospital (CMH), Rawalakot, served as the site of this hospital-based case-control study. The research was carried out between April 1, 2022, and March 30, 2023, for a total of one year.

Two groups made up the study population: children with SAM reported between the ages of 6 and 59 months and age- and sex-matched children without SAM who were admitted to the same hospital during the study period. The World Health Organization (WHO) criteria, which include a weight-for-height/length z-score of fewer than three standard deviations (SD), a mid-upper arm circumference (MUAC) of less than 11.5 cm, or the presence of bilateral pitting edema, were used to diagnose SAM.

Anthropometric measures for children without SAM were within the typical range for their age and sex. To reduce confounding and prevent duplication, children with chronic diseases such as congenital heart disease, cerebral palsy, chronic renal disease, or genetic disorders, as well as those who had repeated hospitalizations during the study period, were eliminated from both groups.

The sample size was calculated based on a 5.9% prevalence of SAM in Pakistan, as reported in the National Nutrition Survey 2018, using a 95% confidence level, 5% margin of error, and 10% non-response rate[11]. The estimated sample size was 240 participants; however, a total of 260 children were enrolled to account for incomplete records and potential dropouts. Of these, 130 were children with SAM (cases), and 130 were children without SAM (controls). A non-probability consecutive sampling technique was employed. Children diagnosed with SAM were enrolled consecutively, and for each case, a corresponding control matched for age (±3 months) and gender was selected from among non-SAM children admitted during the same timeframe.

Data were collected through a structured, interviewer-administered questionnaire and a review of hospital records. The questionnaire was adapted from WHO guidelines and relevant literature on malnutrition risk factors. It comprised four main sections: (1) Socio-demographic data including the child's age and gender, parental education and occupation, family size, household income, place of residence (urban/rural), and family type (nuclear/joint); (2) Feeding practices, such as history of exclusive breastfeeding, initiation and type of complementary feeding, feeding frequency, dietary diversity, and use of pre-lacteal or bottle feeding; (3) Health-related factors, including immunization status, recent history of infections like diarrhea or pneumonia, birth weight, and previous hospital admissions; and (4) Maternal and environmental factors such as maternal nutritional status (MUAC where available), antenatal care visits, use of iron supplements during pregnancy, availability of safe drinking water, sanitation facilities, and hygiene practices.

All interviews were conducted by trained data collectors under the supervision of the principal investigator. Anthropometric data, including weight, height, or length, and MUAC were measured using calibrated equipment, following standard procedures, and were verified using hospital and pediatric ward records.

The Institutional Review Board (IRB) of Sheikh Khalifa Bin Zayed CMH Rawalakot granted ethical permission for the study (permission No: 3455; Date: 02-03-2022). Each participant's parents or legal guardians provided written informed consent. Throughout the study, every participant's confidentiality was maintained. Those who chose not to participate were not denied access to medical care or treatment; participation was completely voluntary.

The statistical software SPSS version 26 was used to analyze the data. The demographic and clinical features of both groups were compiled using descriptive statistics. For continuous data, means and standard deviations (or medians with interquartile ranges) were employed, whereas frequencies and percentages were computed for categorical variables. Chi-square tests were used to assess the relationships between SAM and other risk variables, and a p-value of less than 0.05 was deemed statistically significant.

RESULTS

Table 1: Socio-demographic and Household Characteristics of Children with and without SAM (n = 260)

Variable	Category	With SAM (n = 130)	Without SAM (n = 130)	p-value
Mean Age	Months	22.4 ± 10.8	23.1 ± 11.5	0.573
Gender	Male	71 (54.6%)	69 (53.1%)	0.803
	Female	59 (45.4%)	61 (46.9%)	
Family Income	Low (<PKR 20,000)	87 (66.9%)	41 (31.5%)	0.0001*
	High (>PKR 20,000)	43 (33.1%)	89 (68.5%)	
Family Size	Large (>6 members)	69 (53.1%)	36 (27.7%)	0.0003*
	Small (≤6 members)	61 (46.9%)	94 (72.3%)	
Residence	Rural	91 (70.0%)	58 (44.6%)	0.0002*
	Urban	39 (30.0%)	72 (55.4%)	
Family System	Joint	76 (58.5%)	52 (40.0%)	0.0029*
	Nuclear	54 (41.5%)	78 (60.0%)	

**Statistically significant at $p < 0.05$*

A total of 260 children aged 6 to 59 months were included in the study, with 130 children diagnosed with Severe Acute Malnutrition (SAM) and 130 without. The mean age was comparable between the groups (22.4 ± 10.8 months vs. 23.1 ± 11.5 months, p = 0.573). Gender distribution was also similar, with 54.6% males among SAM cases and 53.1% among controls (p = 0.803). However, significant differences were found across several socio-demographic variables (**Table 1**). A larger proportion of children with SAM belonged to low-income families earning less than PKR 20,000 per month (66.9% vs. 31.5%, p = 0.0001). Similarly, living in

large households with more than six members was more common among SAM cases than controls (53.1% vs. 27.7%, p = 0.0003). Rural residence was also significantly associated with SAM (70.0% vs. 44.6%, p = 0.0002). Moreover, children from joint family systems were more likely to suffer from SAM compared to those from nuclear families (58.5% vs. 40.0%, p = 0.0029).

Table 2: Feeding Practices and Child Health-Related Factors of Children with and without SAM (n = 260)

Variable	Category	With SAM (n = 130)	Without SAM (n = 130)	p-value
Exclusive Breastfeeding	Yes	41 (31.5%)	92 (70.8%)	0.0001*
	No	89 (68.5%)	38 (29.2%)	
Delayed Complementary Feeding	Yes	84 (64.6%)	36 (27.7%)	
	No	46 (35.4%)	94 (72.3%)	
Bottle Feeding	Yes	72 (55.4%)	38 (29.2%)	0.0002*
	No	58 (44.6%)	92 (70.8%)	
Pre-lacteal Feeds Used	Yes	61 (46.9%)	24 (18.5%)	0.0001*
	No	69 (53.1%)	106 (81.5%)	
Incomplete Immunization	Yes	74 (56.9%)	28 (21.5%)	
	No	56 (43.1%)	102 (78.5%)	
Recent Diarrhea (2 weeks)	Yes	59 (45.4%)	18 (13.8%)	
	No	71 (54.6%)	112 (86.2%)	
Low Birth Weight (<2.5 kg)	Yes	68 (52.3%)	33 (25.4%)	
	No	62 (47.7%)	97 (74.6%)	
Hospitalized in the Last 6 Months	Yes	43 (33.1%)	16 (12.3%)	
	No	87 (66.9%)	114 (87.7%)	

**Statistically significant at p < 0.05*

Feeding practices differed significantly between the two groups (**Table 2**). Exclusive breastfeeding up to six months was substantially lower among SAM children (31.5%) compared to those without SAM (70.8%), (p = 0.0001). Delayed introduction of complementary feeding beyond six months was more prevalent in the SAM group (64.6% vs. 27.7%, p = 0.0001). Bottle feeding was reported in over half of the SAM cases (55.4%)

versus only 29.2% in controls (p = 0.0002). Similarly, the use of pre-lacteal feeds was significantly higher among children with SAM (46.9%) than those without (18.5%, p = 0.0001).

Health-related factors also showed significant associations. Incomplete immunization was observed in 56.9% of SAM children compared to 21.5% of controls (p = 0.0001). Recent history of diarrhea within the past two weeks was significantly more common among SAM cases (45.4%) than controls (13.8%, p = 0.0001). Additionally, low birth weight (<2.5 kg) was reported in 52.3% of SAM cases versus 25.4% of controls (p = 0.0001), and previous hospitalization within the last six months was higher in the SAM group (33.1% vs. 12.3%, p = 0.0001) (**Table 2**).

Table 3: Maternal and Environmental Characteristics of Children with and without SAM (n = 260)

Variable	Category	With SAM (n = 130)	Without SAM (n = 130)	p-value
Mother's Education	Uneducated	79 (60.8%)	42 (32.3%)	0.0001*
	Educated	51 (39.2%)	88 (67.7%)	
ANC Visits During Pregnancy	≤ 4 Visits	72 (55.4%)	29 (22.3%)	
	> 4 Visits	58 (44.6%)	101 (77.7%)	
Mother's MUAC	≤ 23 cm (Malnourished)	64 (49.2%)	25 (19.2%)	
	> 23 cm	66 (50.8%)	105 (80.8%)	
Iron Supplementation in Pregnancy	No	67 (51.5%)	31 (23.8%)	
	Yes	63 (48.5%)	99 (76.2%)	
Drinking Water Source	Unimproved	48 (36.9%)	19 (14.6%)	
	Improved	82 (63.1%)	111 (85.4%)	
Sanitation Facility at Home	Absent	31 (23.8%)	11 (8.5%)	
	Present	99 (76.2%)	119 (91.5%)	
Hygiene Practices of Caregiver	Poor	56 (43.1%)	21 (16.2%)	
	Good	74 (56.9%)	109 (83.8%)	

**Statistically significant at p < 0.05*

Maternal education was significantly associated with SAM status. A higher proportion of SAM children had mothers who were uneducated (60.8% vs. 32.3%, p = 0.0001). Limited antenatal care utilization (≤4 visits) was more frequent among SAM cases (55.4%) than controls (22.3%, p = 0.0001). Maternal malnutrition, indicated by MUAC ≤23 cm, was significantly more prevalent among the SAM group (49.2% vs. 19.2%, p = 0.0001). Furthermore, lack of iron supplementation during pregnancy was reported in 51.5% of mothers in the SAM group compared to 23.8% in controls (p = 0.0001).

Environmental factors also played a critical role. Children with SAM were more likely to have lived in households with unimproved sources of drinking water (36.9% vs. 14.6%, p = 0.0001) and no sanitation facilities (23.8% vs. 8.5%, p = 0.0001). Poor hygiene practices by caregivers were also significantly associated with SAM, reported in 43.1% of SAM households compared to only 16.2% of non-SAM households (p = 0.0001) (**Table 3**).

DISCUSSION

This study assessed risk factors associated with Severe Acute Malnutrition (SAM) among children under five in a tertiary hospital in Poonch, with comparisons between SAM cases and matched controls. Our findings align with broader literature on the multifaceted determinants of SAM. Children from low-income families were significantly more likely to suffer from SAM ($p < 0.001$). This mirrors broader evidence from studies where household poverty is repeatedly shown to elevate the risk of child malnutrition[12, 13]. Similarly, children living in larger households also faced a higher SAM risk ($p = 0.0003$), consistent with a BMC Pediatrics study from Ethiopia reporting an adjusted odds ratio of nearly 4 for households with five or more members[14, 15]. Rural residence further compounded vulnerability (70.0% vs 44.6%), echoing Pakistan's documented urban–rural disparities in health outcomes[16, 17].

Exclusive breastfeeding up to six months was notably lower in SAM children, aligning with findings from studies, where lack of exclusive breastfeeding doubled or quadrupled SAM risk [18, 19]. Delayed complementary feeding, bottle use, and pre-lacteal feeding were all significantly associated with SAM, reinforcing global concerns about poor early feeding practices[20, 21]. Medical vulnerabilities were also prominent; low birth weight and recent diarrhea strongly predicted SAM (all $p < 0.001$). These results echo evidence from Pakistan, and other regions where LBW and recurrent infections are key predictors of malnutrition[22, 23].

Higher maternal illiteracy was seen in the SAM group, aligning with global associations between maternal education and child nutritional outcomes[24]. Limited antenatal care (≤ 4 visits) was also significantly associated with SAM, mirroring patterns identified in maternal health literature[14, 25]. Maternal malnutrition (MUAC ≤23 cm) was twice as prevalent among SAM cases, underscoring

intergenerational links between maternal and child nutritional status. Lack of iron supplementation had similar implications, worsening fetal development and contributing to SAM risk.

Integration with successful national programs, such as Pakistan's Maternal, Neonatal and Child Health (MNCH) and Lady Health Worker initiatives, is recommended to address key risk domains. Tailored WASH strategies and community-based maternal education campaigns could further reduce the SAM burden in resource-limited rural areas. A robust case-control design ensured careful matching of age and sex between cases and controls. However, the hospital-based setting may underrepresent community-level variability, and residual confounding factors cannot be wholly ruled out. Future longitudinal or community-based studies should explore causal pathways and intervention responses.

CONCLUSION

This study identified several significant risk factors associated with Severe Acute Malnutrition (SAM) among children under five years of age. The findings highlight that low household income, large family size, rural residence, poor feeding practices, inadequate immunization, recent infections, low birth weight, maternal illiteracy, limited antenatal care, maternal malnutrition, and poor environmental and hygiene conditions are all strongly associated with the occurrence of SAM. These results underscore the multifactorial nature of childhood malnutrition and the urgent need for integrated, community-based interventions targeting socioeconomic uplift, maternal health education, improved infant and young child feeding (IYCF) practices, and enhanced access to healthcare and sanitation services to effectively prevent and reduce the burden of SAM in similar settings.

LIST OF ABBREVIATIONS

None

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CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval for this study was obtained from the Institutional Ethical Review Committee of CMH Rawalakot (Approval No: 3455; Dated: 02-03-2022).

AUTHORS' CONTRIBUTION

All authors contributed equally as per ICMJE policy.

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