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Original Research Article

Study of Risk Factors Associated with Severe Acute Malnutrition in under Five Children (6–59 Months) Attending Pediatrics OPD at MGM Medical College and Hospital, Jamshedpur, Jharkhand

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Conflict of interest: Nil

Abstract:

Background Malnutrition affects 41% of children under 5 in developing countries, causing significant economic burdens. Severe acute malnutrition (SAM) children have a nine-fold higher mortality risk than those without malnutrition.

Aims: The study aimed to identify risk factors for SAM in children aged 6 to 59 months attending Pediatrics OPD at MGM Medical College and Hospital in Jamshedpur, Jharkhand, India.

Methods and Material: We conducted a hospital OPD-based case-control study on 6-59-month-old children with SAM, as defined by WHO. Cases had a weight-for-height z-score of less than -3SD with or without edema of both feet and/or MUAC less than 11.5 cm, while controls had a weight-for-height z-score of more than -2SD and MUAC ≥ 13.5 cm. We collected a total of 70 samples and examined predictor-outcome relationships using chi-square tests.

Results: The majority of cases (62.8%) and controls (72%) were from low SES families. Risk factors for SAM included low birth weight (<2.5 kg) (77.1%), inadequate calorie intake (65.75%), underweight mother (BMI <18.5) (45.7%), and below primary education (48.5%) of parents.

Conclusions: Low SES, low birth weight, inadequate calorie intake, an underweight mother, and a lower education level are key risk factors for SAM, necessitating a multi-sectorial approach for fighting against SAM.

Keywords: Children, low birth weight, socioeconomic status (SES), risk factors, severe acute malnutrition (SAM).

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Introduction

Severe acute malnutrition (SAM) is a prevalent global health issue affecting children under five year's old.[1] Globally, malnutrition is linked to approximately 3 million deaths annually. [2] Malnutrition is responsible for 50% of all child deaths worldwide and 11% of total global disability-adjusted life years.[3] Acute malnutrition is responsible for over 50% of childhood mortality in children under 5, with severe malnourished children experiencing nine times higher mortality rates than healthy children.[4] Globally, nearly 20 million children are severely and acutely malnourished. Around one million children under the age of 5 die annually from SAM [5,6]. India's 57 million children are severely malnourished, contributing to over 50% of deaths in the 0-4 age group and 40% of under-5 stunted due to severe malnutrition.[7]

SAM is caused by insufficient dietary intake, lack of breastfeeding, respiratory and gastrointestinal infections, poor environmental conditions, lack of

sanitation, and poor purchasing power, leading to chronic morbidity and mortality.[8,9] Though India has markedly improved in health and living condition but still far behind in achieving the target for child mortality.

Child malnutrition is a significant public health issue that requires early intervention for economic development and social well-being. In India, although malnutrition is well-documented, there is limited information on risk factors. This study aimed to identify risk factors and determinants among children aged 6 to 59 months attending the Pediatrics OPD of MGM Medical College Hospital in Jamshedpur, Jharkhand, India.

Subjects and Methods:

A hospital OPD-based case-control study was conducted on children aged 6 to 59 months at MGM Medical College Hospital, Jamshedpur, Jharkhand, for malnutrition or other issues. Cases (SAM) had a weight for height Z-scoreless than -3SD, edema of both feet, and/or MUAC less than 11.5 cm, while controls had a weight for height Z-score more than -2SD and MUAC ≥ 13.5 cm. [10]. As per a previous study with an odds ratio of 4.67 for SAM among children who were not exclusively breastfed from birth to 6 months of age[11] and 11.13% prevalence of not breastfed among the control group[12], the sample size is estimated at 35 cases and 35 controls. For each identified case-one control was taken, matched for age (± 2 months), gender and locality within the following two weeks. We fixed two days in a week, e.g. Tuesday and Thursday. Every week on Tuesday and Thursday in OPD we examined all children of age between 6 and 59 months for SAM until we completed the sample size.

The study assessed a child's nutritional status using a 24-hour dietary recall questionnaire, focusing on demography, birth details, diet, and parental risk factors. The amount of food consumed was determined using standard cups, glasses, and paper discs. Nutrients in raw ingredients were calculated using the National Institute of Nutrition's database on "nutritive value of Indian foods."[13]. Manufacturers provided information on the nutrient content of ready-made foods like biscuits and other packed items.

A questionnaire was created to gather information on socioeconomic status, parent education, employment, mother's age, birth interval, breastfeeding initiation, and exclusive breastfeeding until 6 months, complementary feeding, and parents' chronic illnesses. Children's dietary intake and caregivers' variables were also analyzed.

Data Analysis

The study used Epi-Info software to analyze data from 35 cases and 35 control children aged 6 to 59 months. A chi-square test was used to examine predictor-outcome relationships. Statistical significance was determined by two-sided p-values less than 0.05, indicating statistical significance.

Ethical Consideration

The Institutional Ethic Committee of MGM Medical College, Jamshedpur approved ethical permission, with mothers or caretakers providing written approval after being fully informed.

Results:

The study involved 70 participants, including 35 cases and 35 controls. The socio-demographic characteristics of the populations were as follows: 51.4% male and 48.6% female, 62.9% urban, 31.4% tribal, 68.6% non-tribal, 17.1% tribal, 82.9% non-tribal, 62.9% parents from labour classes, and 80% mothers aged 21-30 and 82.8% in controls. The parents of cases were primary and below in education, while controls had a higher percentage of parents from labour classes. The age range of children was 28-60 months in both cases and controls.[Table-1]

Table 1: Descriptive Statistics of Socio-Demographic characteristics of the study Population

Category	Variable	Case n=35 n[%]	Control n= 35 n[%]	OR	Lower	Upper	x^2	P
Gender	Male	18[51.4%]	18[51.4%]	1.000	0.392	2.553	0.000	1.000
	Female	17[48.6%]	17[48.6%]					
Place of residence	Urban	22[62.9%]	25[71.4%]	0.677	0.248	1.847	0.583	0.445
	Rural	13[37.1%]	10[28.6%]					
Religion	Hindu	27[77.1%]	24[68.6%]				2.710	0.608
	Muslim	5[14.3%]	7[20.0%]					
	Christian	0[0.0%]	1[2.9%]					
	Sikh	1[2.9%]	0[0.0%]					
	others	2[5.7%]	3[8.6%]					
Community	Tribal	11[31.4%]	6[17.1%]	2.215	0.714	6.873	1.942	0.663
	Non Tribal	24[68.6%]	29[82.9%]					
Education of Mother	Illiterate	9[25.7%]	4[11.4%]				7.411	0.192
	Primary	7[20.0%]	4[11.4%]					

	Middle	1[2.9%]	7[20.0%]					
	Secondary	8[22.9%]	9[25.7%]					
	Higher Secondary	4[11.4%]	5[14.3%]					
	Graduate	6[17.1%]	6[17.1%]					
Education of Father	Illiterate	11[31.4%]	4[11.4%]				9.437	0.223
	Primary	6[17.1%]	4[11.4%]					
	Middle	4[11.4%]	7[20.0%]					
	Secondary	5[14.3%]	10[28.6%]					
	Higher Secondary	5[14.3%]	2[5.7%]					
	Graduate	3[8.6%]	6[17.1%]					
	Post-Graduate	1[2.9%]	1[2.9%]					
	Technical Education	0[0.0%]	1[2.9%]					
Parent occupation	Govt. Service	1[2.9%]	0[0.0%]				6.311	0.277
	Private Service	8[22.9%]	15[42.9%]					
	House Work	2[5.7%]	0[0.0%]					
	Skilled Labour	12[34.3%]	8[22.9%]					
	Unskilled Labour	10[28.6%]	11[31.4%]					
	Unemployed	2[5.7%]	1[2.9%]					
Types of family	Nuclear	16[45.7%]	18[51.4%]				2.588	0.278
	Joint	19[54.3%]	15[42.9%]					
	Extended	0[0.0%]	2[5.7%]					
SES[BG Prasad)	I	3[8.6%]	1[2.9%]				4.303	0.367
	II	1[2.9%]	4[11.4%]					
	III	9[25.7%]	5[14.3%]					
	IV	11[31.4%]	14[40.0%]					
	V	11[31.4%]	11[31.4%]					
Age of Child	6-16	11[31.4%]	10[28.6%]				0.114	0.998
	17-27	3[8.6%]	3[8.6%]					
	28-38	7[20.0%]	8[22.9%]					
	39-49	7[20.0%]	7[20.0%]					
	50-60	7[20.0%]	7[20.0%]					
Age of Mother	16-20	4[11.4%]	3[8.6%]				2.269	0.519
	21-25	16[45.7%]	11[31.4%]					
	26-30	12[34.3%]	18[51.4%]					
	31-37	3[8.6%]	3[8.6%]					
OR: odd ratio, x^2*: Chi-Square,* *P: Significance level <0.05*								

The study found that 42.9% of cases had a MUAC less than 11.5 cm, 85.7% were severely underweight, and 51.4% were stunted, contrasting with no stunted children found among controls.

Table 2 reveals risk factors for SAM, including low socioeconomic groups, primary education level, and parents having multiple children. Infants and mothers-related factors include low birth weight, underweight mother, poor nutrition knowledge, and joint family. Multiple chi-square analysis identified birth weight less than 2.5 kg, low calorie intake, and an underweight mother as risk factors for SAM. Significant variables like religion, tribal and non-tribal, joint family, and poor nutrition knowledge were found to be statistically non-significant when adjusted for cofounders.

Table 2: Risk factors of the study Population

Category	Variable	Case n=35 n[%]	Control n= 35 n[%]	OR	Lower	Upper	x^2	P
Total Protein Intake	Adequate	20[57.1%]	32[91.4%]	0.125	0.032	0.487	10.769	0.001
	Inadequate	15[42.9%]	3[8.6%]					
Total Calorie intake	Adequate	12[34.3%]	2[5.7%]	8.609	1.758	42.164	8.929	0.003
	Inadequate	23[65.7%]	33[94.3%]					
Immunization Status	Complete	31[88.6%]	34[97.1%]				2.138	0.343
	Incomplete	3[8.6%]	1[2.9%]					
	Unimmun-ized	1[[2.9%]	0[0.0%]					
Family History								
Birth order	1	13[37.1%]	24[68.6%]	0.271	0.101	0.729	6.937	0.008
	>1	22[62.9%]	11[31.4%]					
Interval Be-tween Two Siblings	<2 years	10[28.6%]	10[28.6%]	1.000	0.354	2.821	0.000	1.000
	> 2 years	25[71.4%]	25[71.4%]					
Number of Sibling	1	21[60.0%]	23[65.7%]	0.783	0.296	2.068	0.245	0.621
	>1	14[40.0%]	12[34.3%]					
Total Number of Family Member	<5	29[82.9%]	31[88.6%]	0.624	0.160	2.436	0.467	0.495
	>5	6[17.1%]	4[11.4%]					
Parent Related risk factors								
Household TB Contact	Present	2[5.7%]	1[2.9%]	2.061	0.178	23.826	0.348	0.555
	Absent	33[94.3%]	34[97.1%]					
Mother Nutri-tional Knowledge	Good	17[48.6%]	24[68.6%]	0.433	0.163	1.146	2.885	0.089
	Poor	18[51.4%]	11[31.4%]					
Father smokes	Yes	7[20.0%]	3[8.6%]	2.667	0.629	11.306	1.867a	0.172
	No	28[80.0%]	32[91.4%]					
Father alcohol Consumption	Yes	11[31.4%]	2[5.7%]	7.563	1.533	37.298	7.652	0.006
	No	24[68.6%]	33[94.3%]					
Personal History								
Diet	Vegetarian	7[20.0%]	4[11.4%]	1.938	0.512	7.330	0.971	0.324
	Non Vegetar-ian	28[80.0%]	31[88.6%]					
Appetite	Good	[51.4%]	[100.0%]	0.340	0.233	0.494	22.453	0.000
	Poor	[48.6%]	[0.0%]					
Sleep	Adequate	29[82.9%]	33[94.3%]	0.293	0.055	1.566	2.258	0.133
	Inadequate	6[17.1%]	2[5.7%]					
Bowel/Blad-der complain	Yes	[65.7%]	[94.3%]	0.116	0.024	0.569	8.929a	0.003
	No	[34.3%]	[5.7%]					
Anthropometry Measurement								
MUAC in cm	<11.5	15[42.9%]	0[0.0%]	2.750	1.939	3.901	19.091	0.000
	>11.5	20[57.1%]	35[100.0%]					
Head Circum-ference	35-40	3[8.6%]	0[0.0%]				3.600	0.308
	41-46	14[40.0%]	17[51.5%]					
	47-52	16[45.7%]	15[45.5%]					
	53-60	2[5.7%]	1[3.0%]					
Underweight	Normal	1[2.9%]	35[100.0]				66.111	0.000
	Severe Un-derweight	30[85.7%]	0[0.0%]					
	Underweight	4[11.4%]	0[0.0%]					
Stunting	Normal	17[48.6%]	35[100.0%]	0.327	0.221	0.483	24.231	0.000
	Stunting	18[51.4%]	0[0.0%]					
Wasting	Normal	3[8.6%]	35[100.0%]				58.947	0.000
	Severe wast-ing	30[85.7%]	0[0.0%]					

	Wasting	2[5.7%]	0[0.0%]					
Grade of Mal-nutrition	SAM Present	35[100.0%]	0[0.0%]				70.000	0.000
	SAM Absent	0[0.0%]	35[100.0%]					
OR: odd ratio, *x^2: Chi-Square,* *P: Significance level <0.05*								

Discussion:

This study was intended to identify various risk factors for SAM between the ages of 6 and 59 months on an OPD basis. In this study low birth weight (<2.5 kg) was found to be a major risk factor for SAM. A similar conclusion was found by Asthekar SV et. al. (2010) study [14], Mukukuet. al. (2019) study [15], David et. al. (2020) study [16], and Das et. al. (2021) study [17]. The association between malnutrition and LBW has also been found in studies done in three Central Asian Republics [18, 19]. Low birth weight of babies is primarily due to malnourished mothers, which basically depends on socioeconomic conditions. So a child born to a malnourished mother is mostly malnourished since prior to birth and continues to live mostly in the same condition that persists or worsens. Other factors that affect birth weight are being rural or urban, caste, religion, education, and the addiction of the mother to tobacco or alcohol 14. Preterm babies are usually of low birth weight. But in the current study we did not find any significant association between prematurity and SAM. Similar observations had been found in a study done by David et al. [16]. But a study done in Ghana showed that in later life preterm babies were more likely to develop malnutrition [19]. In the current study it showed a statistically significant association between the low BMI (<18.5) of the mother and SAM. Similar findings were noted in the study done by Subramanian et. al. (2010) [20], the study done in Mao Chad (2018) [21], and the study done by David et. al.(2021) [16]. In our study, poor calorie intake has been observed as a significant risk factor for SAM. Similar observations were found in a in a study done in the DRC (Democratic Republic of the Congo) and a study done by David et. al [16]. This may be due to the non-availability of food and faulty feeding practices.

In our study, low socioeconomic status was found to be significantly associated with SAM, finding similar with those of studies from other parts of India, Pakistan, Iran, Vietnam, Ethiopia, and Nepal [22–30]. But David et. al. observed no significant association between SAM and low SES [16]. Behind this, they gave the reason that in Tamil Nadu, the PDS follows the distribution of staple food to every household without seeing whether they fall below or above the official poverty line. In our study parents literacy status was noted to be associated with SAM. Children of parents with an education level below primary were found to be associated with SAM. A similar finding was observed in a study done by Mishra et. al. (2014), in Pakistan and Vietnam [22, 23, 31]. But studies from Ethiopia, Bangladesh, and Gambia observed contrary to our study findings [32-34]. Our study showed no significant association between SAM and no exclusive breast feeding until or after 6 months of age. Similar findings were observed in studies done in Vietnam, Nepal, and other parts of India [25, 30, 35–37], but not in studies in Ethiopia and Chad [28, 32, 38]. In our study, we did not find an association between SAM and immunization status, whether it was complete or incomplete. A similar observation was found in a study done by David et. al. [16], though it was statistically insignificant.

Conclusion

The study identified low birth weight, inadequate calorie intake by children, and low maternal BMI as major risk factors for SAM. Factors like low socioeconomic status, below-primary education, and having multiple children were insignificant. Prevention requires a multi-sectoral approach, including improving economic status, education, health facilities, and screening for SAM.

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All authors conceptualised and designed the study. Dr. Shimpal Shailini Minz, Dr. Durga Tudu, Dr. Mangesh Dorai, and Kuber Chandra Setua helped in data collection. Manish Kumar performed the data entry. Dr. Luguram Tudu and Kumar Vimal performed the statistical analysis. All the authors made contributions toward reviewing, revising, and finalising the manuscript.

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