

## **Risk Factors and Clinical Profile of Severe Acute Malnutrition in Infants below 6 Months of Age: A Prospective Observational Study**

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### **Abstract**

**Background:** A public health issue of epidemic proportions is acute malnutrition. Prioritising effective exclusive breastfeeding by the mother or another carer should be a priority for feeding infants under 6 months old who have severe acute malnutrition. The purpose of this study is to investigate the numerous risk factors and determinants of severe acute malnutrition in infants below 6 months of age as defined by WHO growth reference standards.

**Methods:** At SKMCH, Muzaffarpur, Bihar, a prospective observational study was conducted. 44 infants under the age of six months in total visited the pediatrics department inpatient and outpatient OPD the six-month period from March 2022 to August 2022. A study was conducted to determine clinical characteristics and risk variables.

**Results:** In our study of 44 children, we found that 17 (38.63%) of the infants were between the ages of 2-3 months, followed by 15 (34.09%) who were under 2 months, and the remaining 12 (27.28%) were between the ages of more than 3 and less than 6 months. 28(63.40%) were females. 40 (90.90%) were born to young, uneducated housewives (21-23 years old) who gave birth to them.

**Conclusion:** Young maternal age, low maternal education levels, and low family socioeconomic position all contributed to risk. But other elements, such as the size of the family, the baby's birth order, the length of breastfeeding, the consumption of top milk, such as cow or buffalo milk, mixed feeding, the mode of feeding, and the impact of NRC registration, also have a significant impact on severe malnutrition in young children under the age of six months. Furthermore, one of the perceived risk factors for severe malnutrition in infants younger than six months old is the absence of exclusive breastfeeding. Maternal education and knowledge of newborn feeding procedures must be a top priority for concerned health programmes.

**Keywords:** Malnutrition, Below 6 months, Top milk, LRTI, Sepsis

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## Introduction

The most important health issue affecting children worldwide in the twenty-first century is malnutrition, which is far more common in poorer nations like India. Malnutrition causes a lot of child deaths every day, either directly or indirectly. Most of these deaths can be avoided with the right care and nutritional therapy [1]. A distinct kind of severe malnutrition is known as severe acute malnutrition (SAM). The highest morbidity and death rates among malnourished children are caused by this severe and potentially fatal form of malnutrition in children [2] In 2015, SAM affected over 19 million children under the age of five worldwide [3].

This unique classification has been suggested by the World Health Organisation (WHO) for detecting and treating children with severe malnutrition. Any of the following conditions is considered a sign of severe acute malnutrition. I) a weight below -3 standard deviations (SD or Z score) of the median WHO growth reference for height/length ii) having bipedal nutritional edoema, or iii) having an upper arm circumference in the age range of 6 months to 59 months that is less than 115 mm [4].

Children with SAM make up the vast majority (over 90%) of the population in south and south-east Asia as well as Sub-Saharan Africa. India has the highest percentage of chronically malnourished children in the world and is responsible for 20% or more of all under-five deaths each year. Additionally, 2.1 million Indian children do not live to see their first birthday [5].

According to the National Family Health Survey 4 (NFHS-4) data from 2015–2016, 6.2% of children under the age of five in Assam and 7.4% of malnourished children throughout India are seriously wasted (weight for height < -3 SD) [6]. These youngsters are considered to have severe

acute malnutrition since wasting is a sign of acute malnutrition.

An improved result is linked to better clinical characterization, triage, and proper treatment of problems upon admission, as well as nutritional therapy and targeted supportive treatment as stated in the WHO guideline [7]. Each location or region has a unique clinical profile of severe acute malnutrition.

Understanding the child health profile in various locations would help to enable optimal targeting and prioritising of intervention and resource allocation because the underlying clinical causes, comorbidities, and health system architecture vary in different locations and nations [8].

The study objective is to identify risk factors and the clinical characteristics of severe malnutrition in infants less than 6 months.

## Material and Methods

44 infants between the ages of 1 month and 6 months who visited the inpatient and outpatient OPD of the paediatrics department at Sri Krishna Medical College and Hospital in Muzaffarpur, Bihar, from March 2022 to August 2022 were the subjects of this prospective observational study. The parents of the included subjects gave their written approval.

The patient's comprehensive clinical profile resulted from a thorough anthropometric examination, analysis of related risk factors, and analysis of comorbidities. Newborns less than 6 months who met the inclusion criteria for severe malnutrition, which included having a weight-for-length ratio of less than <3 SD (for newborns with lengths more than 49 cm) and/or bilateral pitting edoema, were included in the study.

Patients who were older than 1 month but under 6 months old and who refused to provide written informed permission were not included in the trial.

## Results

In our investigation, we found that 12 (27.28%) of the newborns are between the

ages of more than 3 and less than 6 months, while the remaining 17 (38.63%) are between 2 and 3 months old.

**Table 1: Age groups of Infants who suffer from SAM**

Age groups	No. of Infants	Percentage
Below 2 months	15	34.09%
2 to 3 months	17	38.63%
>3 to <6 months	12	27.28%
Total	44	100.00%

**Table 2: Sex distribution of Infants**

Sex	No. of Infants	Percentage
Male	16	36.36%
Female	28	63.40%
Total	44	100.00%

Majority of infants were females.

**Table 3: Age group of mothers whose children suffer from SAM**

Age group	No. of Infants	Percentage
≤20 years	11	25%
21 to 23 years	25	56.81%
24 to 28 years	8	18.18%
Total	44	100.00%

The majority of mothers (56.81%) were between the ages of 21 - 23. This was followed by 11 (25.00%) mothers who were 20 years old or younger, and the youngest mothers, or 8 (18.18%), were between the ages of 24 -28.

The highest percentage of mothers were house wives 40(90.90%). 24 mothers (54.54%) had completed at least their first year of school, followed by 17 mothers (38.63%) who had not completed any formal education, and the remaining 3 mothers (6.81%) had completed their secondary education.

**Table 4: Distribution Based on Mother's Awareness About Child Malnourished Status**

Mother's Awareness About Child Malnourished	Number	Percentage
No	29	65.90%
Yes	15	34.10%
Total	44	100.00%

The majority of mothers (65.90%) did not even know that their child was underweight. Nevertheless, 34.10% of mothers were aware that their child might not be receiving enough breast milk.

**Table 5: Distribution Based on Mother's Awareness whether Child Gets Not Enough Breast Milk**

Mother's Awareness whether Child Gets Not Enough Breast Milk	Number	Percentage
Yes	34	77.27%
No	10	22.73%
Total	44	100.00%

The majority of newborns (77.27%) were not exclusively breastfed. In addition to improper feeding methods like giving them diluted milk or bottle feeding them, they were frequently given top feed.

Cough, diarrhoea, fever, and sepsis were the main symptoms these infants displayed to us; these symptoms were also more prevalent in the top-fed group.

**Table 6: Association between Type of feeding and Diarrhea as a presenting Symptom**

Diarrhoea		Type of feeding			Total
		Exclusive Breast feeding	Mix feeding	Only Top feeding	
No	Number	6	4	3	13
	Percentage	67.8%	39.2%	11.5%	28.2%
Yes	Number	3	6	22	31
	Percentage	32.2%	60.8%	88.5%	71.8%
	Number	9	10	25	44
	Percentage	100%	100%	100%	100%
Chi-square		Value	Df	p-value	Result
		20.559	2	0.000	Significant

p value <0.05 denotes a higher frequency of diarrheal symptoms in infants who exclusively get top milk (88.5%), which is the case in this study. Additionally, it frequently manifests in infants under 6 months old who have severe malnutrition.

## Discussion

44 infants under the age of six months who met the inclusion requirements and met the WHO's definition of severe malnutrition in infants were enrolled in our study.

Data was evaluated to determine risk factors and clinical profiles among the 44 infants who were included in the trial and who suffered from severe malnutrition. Singh D, *et al.* (2014) [9] investigated the course of 108 children under 6 months old who were hospitalised to the Nutritional Rehabilitation Centres (NRC) at a teaching hospital with severe acute malnutrition (SAM). Acute diarrhoea was the most frequent symptom reported by the kids (34.1%), followed by failure to gain weight (26.9%), which was similar to what we discovered in our study.

Coughing and diarrhoea were the most frequent symptoms in infants with severe malnutrition, particularly in those receiving top feed and mix feed. Our study's findings were equivalent to those of Maria BR *et al* [12] study.

In a hospital-based observational prospective study conducted by D Suman *et al.* (2017) [10], all children under the age of five who were admitted to NRC between January 2013 and December 2016 were included. According to the findings, the average age of the admitted children was 17.21±13.94 months, and the majority of them were from lower socioeconomic groups, rural areas, and big families. 9.2% of admissions had patients younger than 6 months. Acute respiratory tract infections and diarrhoea were the most frequent concomitant infections (35.87% and 31.75%, respectively). An important comorbidity was anaemia (74.12%). 3.1 to 1.8 months on average were spent exclusively nursing a baby. Overdiluted cow milk was the most often used supplemental food (92%). The outcomes matched what we discovered in our research.

A prospective cohort research on newborns under 6 months old in the Barisal district of Bangladesh was conducted by M. Munirul

Islam *et al.* (2018) [11] in order to identify risk factors for children under 6 months SAM and characterise the clinical and anthropometric outcomes of treatment using current management options. According to the study, the poor uptake of inpatient referrals is the primary cause of the limited practical efficiency of existing treatment techniques. Future therapy plans will probably centre on breastfeeding assistance, although this may not be enough on its own.

The care of severe malnutrition for babies younger than six months old was included to revised recommendations in India in 2014, therefore little is known about the risk factors, co-morbidities, and outcomes of these children [9].

In this study, we discovered that severe malnutrition in infants under six months of age was significantly influenced by characteristics including low maternal age, low socioeconomic position of the family, bigger family size, and mother's educational status. Low birth weight, higher birth order, non-exclusive breastfeeding, breastfeeding length, milk preference, and bottle feeding were all significant predictors of infants developing severe malnutrition before the age of six months.

The evaluation of mothers' knowledge of breast feeding procedures and the value of breast milk was one of the study's primary objectives. The mothers of the subjects who had signed up for the study showed a marked lack of knowledge and awareness regarding the level of malnutrition in their children and whether or not they were providing enough breast milk for them, which again indicates that the mothers are frequently to blame for the malnutrition of infants under the age of six months.

Coughing and diarrhoea were the most prevalent clinical signs upon presentation.

Recurrent LRTI and sepsis were the most frequent clinical problems in our patient cohort that we discovered to be linked to severe undernutrition in infants under 6 months. A few cases of syndromic newborns and congenital cardiac disease were also reported.

## Conclusion

Our findings demonstrate the need of taking maternal risk factors into account when assessing infants who may be at danger. Public health initiatives should focus on mothers' education and understanding of baby feeding practises as the fundamental causes of severe malnutrition in these infants.

Our findings highlight the necessity of including mother education and information about infant feeding practises in programmes that treat severe malnutrition in infants younger than six months, in addition to promoting breastfeeding. One of the considered risk factors for severe malnutrition in infants less than six months is the absence of exclusive breastfeeding.

For an intervention to be successful, a variety of risk factors need to be addressed. The detrimental consequences of top feeding, particularly the use of animal milk, play a crucial role in infants under 6 months old suffering from severe malnutrition.

## References

1. Ashworth A, Khanum S, Jackson A, Schofield C. Guidelines for the inpatient treatment of severely malnourished children. 2003, Geneva: World Health Organization.
2. Caulfield LE, de Onis M, Blossner M, Black RE. Undernutrition as underlying cause of child health associated with diarrhoea, pneumonia and measles. *Am J Clin Nutr.* 2004; 80(1): 193-198.
3. UNICEF. Management of severe acute malnutrition in children: working towards result at scale. New York; 2015.

4. World Health Organization. Guideline: Updates on the management of severe acute malnutrition in infants and children. World Health Organization. 2013.
5. UNICEF Geneva, Switzerland. The state of the world's children 2008. Child survival in Geneva UNICEF flagship report. 2008.
6. International Institute for Population Sciences (IIPS) and ICF 2017. National Family Health Survey (NFHS-4), 2015-16: India, Mumbai. IIPS.
7. Maitland K, Berkley JA, Shebbe M, Peshu N, English M, Newton CR. Children with severe malnutrition, can those at highest risk of death be identified with the WHO protocol? PLoS Med. 2006; 3(12): e 500-10.
8. Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? Lancet. 2003 June 28; 361(9376): 2226-34.
9. Singh, D.K., Rai, R., Mishra, P.C. et al. Nutritional Rehabilitation of Children < 6 mo with Severe Acute Malnutrition. Indian J Pediatr. 2014; 81: 805–807.
10. Das S, Paul DK, Bhattacharya M, Basu S, Chatterjee A, Sen S and Bhakta S. Clinicoepidemiological Profile, Risk Factors and Outcome of Severe Acute Malnutrition Children at the Nutritional Rehabilitation Centre of a Tertiary Care Centre in Eastern India- A 4 Years Experience. Adv Res Gastroentero Hepatol 2017; 5(2): 555659.
11. Munirul Islam M, Arafat Y, Connell N, et al. Severe malnutrition in infants aged <6 months-Outcomes and risk factors in Bangladesh: A prospective cohort study. Matern Child Nutr. 2019;15(1): e12642.
12. Maria Beatriz R. do Nascimento, Marco A. et al. Breastfeeding Medicine. Apr 2010.79-85.