Section: Community Medicine

Original Research Article

A CASE CONTROL STUDY TO FIND OUT CHILD FEEDING PRACTICES RESPONSIBLE FOR SEVERE ACUTE MALNUTRITION AMONG UNDER FIVE YEARS OF CHILDREN AT VARANASI

Rituparna Ray[1]

[1]*Assistant Professor, Department of Community Medicine, ESIC Medical College and Hospital, Pandeypur, Varanasi, Uttar Pradesh, India.*

Received *: 29/01/2026*
Received in revised form *: 16/03/2026*
Accepted *: 01/04/2026*

Corresponding Author:
Dr. Rituparna Ray,
Assistant Professor, Department of Community Medicine, ESIC Medical College and Hospital, Pandeypur, Varanasi, Uttar Pradesh, India.
Email: drrituparna333@gmail.com

DOI: 10.70034/ijmedph.2026.2.25

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 137-141

ABSTRACT

Background: Severe Acute Malnutrition (SAM) remains a major public health problem among under-five children in developing countries. Inappropriate child feeding practices play a crucial role in the development of malnutrition during early childhood. The aim is to identify and evaluate child feeding practices associated with Severe Acute Malnutrition among children under five years of age.

Materials and Methods: This was a hospital-based case-control study conducted at the Nutritional Rehabilitation Centre of Pandit Deendayal Upadhyay Hospital, Pandeypur, Varanasi. The study was carried out over a period of 8 Months May 2025 to December 2025, at Pundit Deendayal Upadhyay Hospital, Varanasi.

Results: Analysis of breastfeeding practices among the study participants revealed significant differences between cases and controls. Among the 50 cases with Severe Acute Malnutrition (SAM), only 20 (40%) children received early initiation of breastfeeding within one hour of birth, compared to 40 (80%) of the 50 controls ($p<0.001$), Exclusive breastfeeding for the first six months was observed in 18 (36%) cases and 35 (70%) controls ($p<0.001$), showing a significant protective effect of exclusive breastfeeding. Partial breastfeeding was more common among cases, reported in 25 (50%) children versus 12 (24%) controls ($p=0.001$). Children who were not breastfed at all included 7 (14%) cases and 3 (6%) controls, but this difference was not statistically significant ($p=0.18$).

Conclusion: Suboptimal child feeding practices are major determinants of Severe Acute Malnutrition. Strengthening awareness and education regarding appropriate infant and young child feeding practices is essential to reduce the burden of malnutrition among under-five children.

Keywords: Severe Acute Malnutrition, Under-five Children, Child Feeding Practices, Case-Control Study, Breastfeeding, Complementary Feeding, Dietary Diversity, Public Health.

INTRODUCTION

Severe Acute Malnutrition (SAM) is a critical public health issue affecting millions of children under five years of age worldwide, particularly in low- and middle-income countries. It is defined by the World Health Organization (WHO) as a weight-for-height/length below −3 standard deviations of the WHO child growth standards, a mid-upper arm circumference (MUAC) less than 115 mm, or the presence of bilateral pitting edema.[1] SAM significantly increases the risk of morbidity and mortality among children, contributing to nearly half of all under-five deaths globally.[2] Despite global efforts to reduce malnutrition, its prevalence remains alarmingly high, especially in countries like India, where a substantial proportion of children are affected.[3]

Child feeding practices, particularly during the first two years of life, play a pivotal role in determining a

child's nutritional status, growth, and survival. Optimal Infant and Young Child Feeding (IYCF) practices recommended by the World Health Organization include early initiation of breastfeeding within one hour of birth, exclusive breastfeeding for the first six months, timely introduction of complementary feeding at six months, and continued breastfeeding up to two years and beyond.[4] However, inappropriate feeding practices such as delayed initiation of breastfeeding, early cessation of exclusive breastfeeding, and improper complementary feeding remain widespread in many developing regions.

Inadequate breastfeeding practices are among the leading contributors to malnutrition. Early initiation of breastfeeding ensures the intake of colostrum, which is rich in immunological factors and essential nutrients. Failure to initiate breastfeeding early or to maintain exclusive breastfeeding for the recommended duration increases susceptibility to infections such as diarrhea and respiratory illnesses, which in turn exacerbate nutritional deficiencies.[5] Studies have shown that children who are not exclusively breastfed are at a higher risk of developing SAM compared to those who follow recommended feeding practices.[6]

Complementary feeding practices are equally important, as breast milk alone becomes insufficient to meet the nutritional requirements of a growing child after six months of age. The timely introduction of nutritionally adequate, safe, and diverse complementary foods is crucial for preventing malnutrition. However, in many settings, complementary feeding is either introduced too early or too late, and the foods provided are often of poor nutritional quality and inadequate quantity. Low dietary diversity and insufficient feeding frequency further contribute to energy and micronutrient deficiencies, increasing the likelihood of SAM Socioeconomic, cultural, and maternal factors also influence child feeding practices. Maternal education, household income, cultural beliefs, and access to healthcare services play a significant role in determining feeding behaviors. In resource-limited settings, lack of awareness and poor access to nutrition education often lead to suboptimal feeding practices. Additionally, recurrent infections, poor sanitation, and inadequate hygiene practices further compound the risk of malnutrition, creating a vicious cycle between infection and undernutrition.

India bears a disproportionate burden of malnutrition, with national surveys indicating a high prevalence of underweight, stunting, and wasting among children under five years of age. According to the National Family Health Survey (NFHS-5), a significant proportion of children are wasted, reflecting acute malnutrition. Despite various government initiatives and nutrition programs, the persistence of poor feeding practices continues to undermine progress in reducing malnutrition.

Given the multifactorial etiology of SAM, it is essential to identify modifiable risk factors, particularly those related to feeding practices, to design effective interventions. Case-control studies are particularly useful in this regard, as they allow for the comparison of exposures between malnourished and well-nourished children, thereby identifying significant determinants of SAM. Understanding the specific feeding practices associated with SAM can help in formulating targeted public health strategies, improving caregiver awareness, and strengthening existing nutrition programs.

Therefore, the present study aims to identify and evaluate child feeding practices responsible for Severe Acute Malnutrition among under-five children, with the goal of contributing to evidence-based interventions for improving child nutrition and reducing the burden of malnutrition.

The primary aim of this study is to identify and analyze child feeding practices that contribute to the development of Severe Acute Malnutrition (SAM) among children under five years of age. The study specifically seeks to examine factors such as the timing and duration of breastfeeding, initiation and adequacy of complementary feeding, feeding frequency, dietary diversity, and hygiene practices during feeding. In addition, it aims to explore the influence of maternal, socioeconomic, and cultural factors on feeding behaviors. By comparing feeding practices between children with SAM and well-nourished controls, the study intends to determine modifiable risk factors, generate evidence for targeted interventions, and provide recommendations for improving infant and young child feeding practices to reduce the burden of malnutrition in vulnerable populations.

MATERIALS AND METHODS

Study Design: A hospital-based case-control study

Study Setting: Nutritional Rehabilitation centre at Pandit Deendayal Upadhyay Hospital

Study Duration: 8 Months (May 2025 to December 2025)

Study Place: Pandit Deendayal Upadhyay Hospital Pandeypur Varanasi

The study population consisted of under-five children aged 0–59 months who were attending Pandit Deendayal Upadhyay Hospital Pandeypur Varanasi in Varanasi, Uttar Pradesh, India. A total of 100 children were enrolled, including 50 cases diagnosed with Severe Acute Malnutrition (SAM) and 50 age- and sex-matched controls with normal nutritional status. Cases were identified based on WHO criteria for SAM, including weight-for-height z-score < –3 SD, mid-upper arm circumference (MUAC) < 11.5 cm, or presence of nutritional edema. Controls were children without malnutrition, matched by age and gender, who were attending the same facility for routine health check-ups or minor illnesses.

Sample Size: The study included 100 children under five years: 50 cases diagnosed with SAM based on

WHO criteria and 50 age- and sex-matched controls without SAM attending the same hospital.

Inclusion Criteria

- **Cases:** Children aged 6–59 months with SAM (weight-for-height <-3 SD, MUAC <115 mm, or bilateral edema).
- **Controls:** Age- and sex-matched children attending the hospital for minor ailments with normal nutritional status.

Exclusion Criteria

- Children with congenital anomalies, chronic illnesses (e.g., cerebral palsy), or conditions affecting feeding.
- Caregivers who did not consent to participate.

Data Collection

A pre-tested structured questionnaire collected information on:

- Socio-demographic characteristics (age, sex, parental education, family income)
- Birth history (birth weight, gestational age)
- Breastfeeding practices (initiation, duration, exclusivity)
- Complementary feeding (age of introduction, food diversity, frequency)
- Illness history (diarrhea, respiratory infections)

Anthropometric measurements were performed according to WHO guidelines using calibrated scales and MUAC tapes.

Statistical Analysis: Data were analyzed using SPSS version. Continuous variables were expressed as mean ± standard deviation (SD), categorical variables as percentages. Chi-square test determined associations between feeding practices and SAM. Logistic regression identified independent predictors of SAM. Statistical significance was set at $p<0.05$.

RESULTS

Table 1: Distribution of Study Participants by Age and Gender

		Cases (n=50)	Controls (n=50)	Total (n=100)
Age Group (Months)	0–6	5	6	11
	7–12	8	10	18
	13–24	12	14	26
	25–36	10	8	18
	37–48	7	6	13
	49–59	8	6	14
Gender	Male	28	26	54
	Female	22	24	46

Table 2: Breastfeeding Practices

Feeding Practice	Cases (n=50)	Controls (n=50)	p-value
Early Initiation (<1 hr)	20	40	<0.001
Exclusive Breastfeeding ≥6 months	18	35	<0.001
Partial Breastfeeding	25	12	0.001
Not Breastfed	7	3	0.18

Table 3: Complementary Feeding Practices

Practice	Cases (n=50)	Controls (n=50)	p-value
Complementary Feeding Started <6 months	20	5	<0.001
Complementary Feeding Started at 6 months	25	35	0.04
Complementary Feeding Started >6 months	5	10	0.27
Adequate Feeding Frequency (≥3/day)	12	33	<0.001

Table 4: Dietary Diversity

Dietary Diversity Score	Cases (n=50)	Controls (n=50)	p-value
Low (≤3 food groups)	35	12	<0.001
Medium (4–5 food groups)	12	25	0.02
High (≥6 food groups)	3	13	0.01

Table 5: Hygiene and Feeding Practices

Practice	Cases (n=50)	Controls (n=50)	p-value
Handwashing before feeding	15	40	<0.001
Properly cleaned utensils	20	42	<0.001
Feeding with leftover/stored food	30	10	<0.001
Open storage of complementary foods	25	8	<0.001

Age distribution among cases showed that 5 children (10%) were aged 0–6 months, 8 (16%) were 7–12 months, 12 children (24%) were 13–24 months, 10 children (20%) were 25–36 months, 7 children (14%) were 37–48 months, and 8 children (16%) were 49–59 months. Among controls, 6 children (12%) were 0–6 months, 10 children (20%) were 7–12 months, 14 (28%) were 13–24 months, 8 children (16%) were 25–36 months, 6 children (12%) were 37–48 months, and 6 children (12%) were 49–59 months. Regarding gender, among cases, 28 children (56%) were male and 22 children (44%) were female, while among

controls, 26 children (52%) were male and 24 children (48%) were female.

Analysis of breastfeeding practices among the study participants revealed significant differences between cases and controls. Among the 50 cases with Severe Acute Malnutrition (SAM), only 20 (40%) children received early initiation of breastfeeding within one hour of birth, compared to 40 (80%) of the 50 controls ($p<0.001$), Exclusive breastfeeding for the first six months was observed in 18 (36%) cases and 35 (70%) controls ($p<0.001$), showing a significant protective effect of exclusive breastfeeding. Partial breastfeeding was more common among cases, reported in 25 (50%) children versus 12 (24%) controls ($p=0.001$). Children who were not breastfed at all included 7 (14%) cases and 3 (6%) controls, but this difference was not statistically significant ($p=0.18$).

Analysis of complementary feeding practices among the study participants revealed significant associations with Severe Acute Malnutrition (SAM). Among the 50 cases, 20 (40%) children received complementary feeding before six months of age, compared to only 5 (10%) controls ($p<0.001$), but this difference was statistically significant Complementary feeding started at six months was observed in 25 (50%) cases and 35 (70%) controls ($p=0.04$). but this difference was statistically significant Feeding initiated after six months was reported in 5 (10%) cases and 10 (20%) controls, but this difference was not statistically significant ($p=0.27$). Adequate feeding frequency of at least three times per day was reported in only 12 (24%) cases compared to 33 (66%) controls ($p<0.001$) but this difference was statistically significant.

The study revealed a strong association between dietary diversity and Severe Acute Malnutrition (SAM). Among the 50 cases, 35 (70%) children had low dietary diversity, consuming three or fewer food groups, compared to 12 (24%) controls ($p<0.001$), but this difference was statistically significant Medium dietary diversity (4–5 food groups) was observed in 12 (24%) cases and 25 (50%) controls ($p=0.02$) but this difference was not statistically significant ,High dietary diversity, defined as consumption of six or more food groups, was seen in only 3 (6%) cases versus 13 (26%) controls ($p=0.01$) but this difference was not statistically significant.

Hygiene and feeding practices were significantly associated with Severe Acute Malnutrition (SAM) in the study population. Among the 50 cases, only 15 (30%) children practiced hand washing before feeding, compared to 40 (80%) controls ($p<0.001$) but this difference was not statistically significant., Proper cleaning of feeding utensils was observed in 20 (40%) cases versus 42 (84%) controls ($p<0.001$) but this difference was not statistically significant.. Feeding with leftover or stored food was reported in 30 (60%) cases compared to 10 (20%) controls ($p<0.001$), and open storage of complementary foods was noted in 25 (50%) cases versus 8 (16%) controls ($p<0.001$) but this difference was not statistically significant.

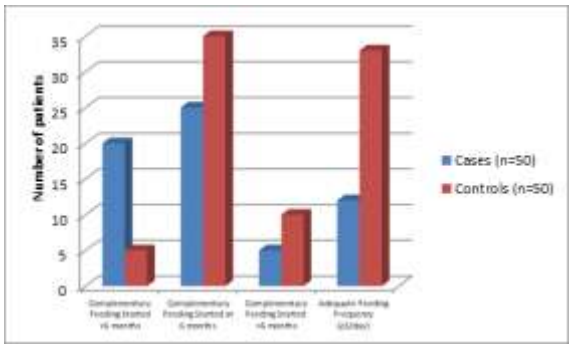

Figure 1: Complementary Feeding Practices

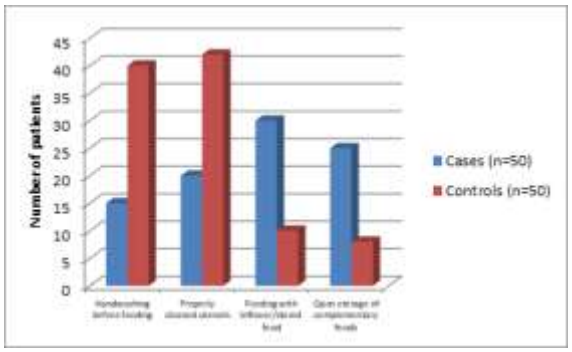

Figure 2: Hygiene and Feeding Practices

DISCUSSION

Severe Acute Malnutrition (SAM) continues to be a significant public health challenge in low- and middle-income countries, often arising from suboptimal feeding practices and poor dietary diversity.[7,8] In our study, breastfeeding practices emerged as a key determinant of nutritional status. Delayed initiation of breastfeeding and non-exclusive breastfeeding were observed to be associated with SAM, highlighting the protective effect of early and exclusive breastfeeding. These findings are consistent with Edmond et al., who reported that early initiation of breastfeeding reduces neonatal mortality and morbidity,[9] and Arifeen et al., who found that exclusive breastfeeding decreases the risk of infections and undernutrition among children.[10] Similarly, Jones et al. emphasized that partial or inadequate breastfeeding practices increase susceptibility to malnutrition and infectious diseases.[11] Complementary feeding practices were also significantly associated with nutritional outcomes. Early introduction of complementary foods and inadequate feeding frequency were risk factors for SAM, whereas timely introduction at six months provided a protective effect. Dewey and Adu-Afarwuah demonstrated in their systematic review that both early and late introduction of complementary foods, combined with insufficient feeding frequency, compromise growth and immunity.[12] Onyango et al. similarly reported that inappropriate complementary feeding practices are

strongly linked to the development of acute malnutrition in children.[13] Dietary diversity was a major determinant of child nutrition in our study. Low dietary diversity was linked to higher prevalence of SAM, while higher diversity appeared protective. Checkley et al. found that children consuming fewer food groups are more prone to growth faltering and wasting.[14] Ruel and Menon also reported that limited dietary diversity significantly increases the risk of undernutrition among children under five.[15] These studies support our observation that ensuring a varied diet is essential for preventing severe malnutrition.

Hygiene and feeding practices contributed further to the risk of SAM. Poor hand hygiene, unclean feeding utensils, feeding with leftover foods, and improper storage of complementary foods increase the likelihood of infections, which can exacerbate malnutrition. Black et al. and Jones et al. highlighted that unsafe feeding practices and poor hygiene are important contributors to childhood malnutrition Improving these practices through caregiver education and community interventions can significantly reduce the burden of SAM.

CONCLUSION

This study demonstrates that suboptimal child feeding practices are strongly associated with Severe Acute Malnutrition (SAM) among under-five children. Delayed initiation of breastfeeding, non-exclusive or partial breastfeeding, inappropriate complementary feeding, low feeding frequency, and low dietary diversity were significant contributors to malnutrition. Additionally, poor hygiene and unsafe food handling practices further increased the risk of SAM. Age and gender were not found to be significant determinants in this population.

These findings highlight the urgent need for integrated public health interventions focused on caregiver education, promotion of early and exclusive breastfeeding, timely and adequate complementary feeding, improvement of dietary diversity, and safe feeding practices. Implementation of community-based nutrition programs and behavior change communication strategies can play a pivotal role in preventing SAM and improving child health outcomes.

REFERENCES

1. World Health Organization. WHO child growth standards and the identification of severe acute malnutrition in infants and children: joint statement by the World Health Organization and the United Nations Children's Fund.
2. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, De Onis M, Ezzati M, Grantham-McGregor S, Katz J, Martorell R, Uauy R. Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet. 2013 Aug 3;382(9890):427-51.
3. Iips IC. National family health survey (NFHS-5): 2019-21 India. Mumbai: International Institute for Population Sciences (IIPS). 2021.
4. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year?. The lancet. 2003 Jul 5;362(9377):65-71.
5. Edmond KM, Zandoh C, Quigley MA, Amenga-Etego S, Owusu-Agyei S, Kirkwood BR. Delayed breastfeeding initiation increases risk of neonatal mortality. Pediatrics. 2006 Mar 1;117(3):e380-6.
6. Arifeen S, Black RE, Antelman G, Baqui A, Caulfield L, Becker S. Exclusive breastfeeding reduces acute respiratory infection and diarrhea deaths among infants in Dhaka slums. Pediatrics. 2001 Oct 1;108(4):e67-.
7. Iips IC. National family health survey (NFHS-5): 2019-21 India. Mumbai: International Institute for Population Sciences (IIPS). 2021.
8. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, De Onis M, Ezzati M, Grantham-McGregor S, Katz J, Martorell R, Uauy R. Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet. 2013 Aug 3;382(9890):427-51.
9. Edmond KM, Zandoh C, Quigley MA, Amenga-Etego S, Owusu-Agyei S, Kirkwood BR. Delayed breastfeeding initiation increases risk of neonatal mortality. Pediatrics. 2006 Mar 1;117(3):e380-6.
10. Arifeen S, Black RE, Antelman G, Baqui A, Caulfield L, Becker S. Exclusive breastfeeding reduces acute respiratory infection and diarrhea deaths among infants in Dhaka slums. Pediatrics. 2001 Oct 1;108(4):e67
11. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year?. The lancet. 2003 Jul 5;362(9377):65-71.
12. Dewey KG, Adu-Afarwuah S. Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. Maternal & child nutrition. 2008 Apr;4:24-85.
13. Onyango A, Koski KG, Tucker KL. Food diversity versus breastfeeding choice in determining anthropometric status in rural Kenyan toddlers. International journal of epidemiology. 1998 Jun 1;27(3):484-9.
14. Checkley W, Buckley G, Gilman RH, Assis AM, Guerrant RL, Morris SS, Mølbak K, Valentiner-Branth P, Lanata CF, Black RE, Childhood Malnutrition and Infection Network. Multi-country analysis of the effects of diarrhoea on childhood stunting. International journal of epidemiology. 2008 Aug 1;37(4):816-30.
15. Ruel MT, Menon P. Child feeding practices are associated with child nutritional status in Latin America: innovative uses of the demographic and health surveys. The Journal of nutrition. 2002 Jun 1;132(6):1180-7.