

Research Article**Infant and Young Child Feeding Practices as Determinants of Severe Acute Malnutrition Among Under-Five Children****Meghashree N1, Laxmiprasad2, Basavantaraya3***

1Assistant Professor, Department of Pediatrics, Kodagu Institute of Medical Sciences, Madikeri, Karnataka-571201, India

2Senior Resident, Department of Pediatrics, Kodagu Institute of Medical Sciences, Madikeri, Karnataka-571201, India

3Senior Resident, Jagannath gupta institute of medical sciences and hospital, Buita, Raypur, West Bengal-700137, India

*Correspondence: Dr Basavantaraya, Senior Resident, Jagannath gupta institute of medical sciences and hospital, Buita, Raypur, West Bengal-700137, India. Email: roybasavant@gmail.com

Abstract

Objective: To examine the relationship between infant and young child feeding practices and severe acute malnutrition in under five children.

Methodology: This study was undertaken as a cross-sectional study among 760 children aged between 6 months to 5 years with severe acute malnutrition visiting the Out Patient department and admitted in In Patient department, Department of Pediatrics at Kodagu Institute of Medical Science, Madikeri, Karnataka. Children that met World Health Organization (WHO) criteria for SAM were included in the study. The information of the socio-demographic, maternal, birth, and infant and young child feeding (IYCF) were taken from a previously designed structured questionnaire. All the anthropometric parameters were noted following the WHO protocol and statistical analysis was done with SPSS software Version 26.0.

Results: In all 760 SAM children, maximum were from 12-23 months age group (41.4%) with 56.7% females. Most of the children were rural (59.7%). Majority of mothers (63.3%) was a housewife and 33.42 % had completed high school

education. The majority of children, 71.3%, was born vaginally and 47.1% were 2nd children. Most of the children (87.2%) had been breastfed for 7-12 months, while 21.58% had started complementary feeding before 6 months and 78.42% of the children had started complementary feeding at or above 6 months. Results show that when it comes to infant feeding practices, maternal education, and socioeconomic factors, all these play an important role with respect to severe acute malnutrition in under 5 children.

Conclusion: Severe acute malnutrition is a product of poor infant and young child feeding practices. Improper breastfeeding and complementary feeding practices along with low maternal education, rural living and negative socioeconomic status play a major role in child malnutrition. Increasing promotion of breastfeeding, timely and appropriate complementary feeding and conducting maternal nutrition education are critical interventions to alleviate severe acute malnutrition.

Keywords: *Severe acute malnutrition (SAM); Infant and young child feeding (IYCF); Exclusive breastfeeding (EBF); Complementary feeding (CF); Under five*

children (U5); Mother education (ME); Nutritional rehabilitation centre (NRC).

Introduction

Malnutrition continues to be one of the most pressing public health issues amongst children under the age of five, globally. It is a significant cause of childhood morbidity and mortality, and there are long-term implications on physical growth, cognition development, school performance, work productivity and quality of life. Undernutrition in childhood is also associated with an elevated risk for infectious disease and is a risk factor for chronic non-communicable disease in later life. Severe acute malnutrition (SAM) remains a huge challenge, especially in low- and middle-income countries including India despite significant advances in health service provision and nutrition interventions [1]. SAM is the most extreme form of malnutrition in children and is associated with a significantly greater risk of morbidity and mortality as the undernutrition impairs the body's immunity, making children susceptible to severe infections like pneumonia, diarrhoea, malaria and measles [3,10]. Severe acute malnutrition occurs in about 16 million children worldwide and, if not managed promptly and properly, these children have an almost 9-fold increased risk of death [8,10].

India is among the countries with the highest level of child undernutrition in the world. The National Family Health Survey (NFHS-5) reports that 32.1% of children under 5 years are underweight, 19.3% wasted and 35.5% suffered from stunting. Despite the pressing need, despite several national nutrition programmes the prevalence of wasting and severe acute malnutrition is very high and is not acceptable. The levels of malnutrition still remain and show the complex interplay of biological, socioeconomic, environmental and behavioural factors that affect children's growth and development [4,7]. The first two years of life are a sensitive stage of child growth and development. Brain development and physical growth are high during this time and so are nutrition needs. Proper Infant and Young Child Feeding (IYCF) is a crucial key to achieving optimal nutritional status, healthy growth and survival. These evidence-based recommendations have been demonstrated to have a significant impact on childhood morbidity, mortality and malnutrition [1,6,10]. The WHO recommends that breastfeeding should be initiated within one hour of birth and exclusive breastfeeding for the first six months before complementary feeding is introduced [10].

Inequitable IYCF practices continue to be one of the leading (modifiable) drivers of

severe acute malnutrition. Poor or inappropriate eating, accompanied by delayed breastfeeding, non-exclusive breastfeeding, early or late complementary feeding, diet inequality and frequency of eating and illness were identified as significant drivers of growth faltering in infancy and primary childhood. Breastfeeding is especially difficult during the 6-24 months window when young children are changing their nutritional needs and can no longer rely on breast milk. Undernutrition and SARSAM can be caused by introduction of complementary foods too early or too late, and provision of low micronutrient bioavailability and/or low nutrient density foods [1,6]. Childhood malnutrition is caused by a variety of factors. The immediate causes include poor food consumption, frequent illness as a child and the underlying causes include food insecurity at household level, lack of education of mother, child care practices, poverty, overcrowding, lack of cleanliness, access to health services and child environment. Infant feeding practices and nutritional status is shaped by socioeconomic factors including family type, birth order, maternal education, maternal occupation, number of siblings or birth order, and their household income [5,6,11-15]. Also, UNICEF argues that some factors would influence nutrition outcomes, including individual, household,

and community-level factors that can all be attributed to childhood malnutrition.

Of these factors, feeding practices for infants and young children (IYCF) are highly relevant and can be changed through maternal education, nutritional counselling, community awareness activities, as well as enabling RHW services. Undernutrition in childhood has always been identified as a problem that needs to be reduced and improving survival is a strategy to bring this about, exclusive breastfeeding, timely initiation of complementary feeding, dietary diversification and feeding during illness has always been identified as effective ways to improve. Preventative interventions are more likely to be effective if implemented at the right time in life to modify inappropriate feeding practices before they result in severe acute malnutrition [6,10]. While the epidemiology and risk factors of severe acute malnutrition have been explored in a few studies, there is little evidence of the effects of infant and young child feeding practices on SAM in children of tertiary care hospitals of North Karnataka. This insight into feeding practices is crucial to designing targeted interventions to enhance peoples' nutritional status and minimise incidence of severe acute malnutrition. Hence, the present study was initiated to assess the infant and young child feeding practice (IYCFP) which could affect the

severe acute malnutrition (SAM) prevalence among children between 6 months and 5 years visiting tertiary care hospital in Raichur, Karnataka.

Aim of the study

To assess effect of Infant and young Child Feeding (IYCF) on severe acute malnutrition (SAM) among children 6 months to 5 years in a tertiary health care setup in Madikeri of Karnataka.

Objective

To examine the relationship between infant and young child feeding practices (exclusive breastfeeding and complementary feeding) and severe acute malnutrition in under five children.

Methodology

It was a cross-sectional study carried out over 2 years period in the Department of Pediatrics, Kodagu Institute of Medical Sciences, Madikeri, Karnataka. Children between 6 months to 5 years of age with severe acute malnutrition (SAM) receiving care in the Pediatric Outpatient Department (OPD) and/or admitted in the pediatric wards during the study period were included. The study included children who met the World Health Organization (WHO) criteria for malnutrition in the acute phase who ranged from 6 months to 5 years old. Parents or primary caregivers accompanying the children were interviewed (following written informed

consent). The study showed 760 children, severely acute malnourished. Before the start of the study a calculation of the number of samples was performed based on the study protocol.

Inclusion criteria

Children in this study were those 6 months to 5 years of age who met World Health Organization (WHO) criteria for severe acute malnutrition (SAM). Severe acute malnutrition as weight-for-height < -3 standard deviations (SD) of the WHO Child Growth Standards or MUAC < 115 mm or moderate/severe wasting, or bilateral nutritional oedema. Children who met with one of these were acknowledged as being eligible for enrolment in the study.

Exclusion criteria

Children were excluded who had the following:

- Chronic systemic illnesses.
- Congenital abnormalities.
- Parents/carers who do not wish to give informed consent.

Data collection

All the data were obtained from caregivers' in-formed consent through a proforma, which had been predesigned as a structured form. Carriers were questioned about socio-demographic, birth, maternal, anthropometric and infant young child (IYC) feeding (IYCF) history and the

material's anthropometric parameters, from this information was recorded.

Special focus was placed on the practices of infant & young child feeding (IYCF) such as "exclusive breastfeeding time" and "continue breastfeeding", and launch of complementary feeding, because these were the parameters of prime interest for the present study. Information on maternal education, maternal employment, birth order, parity, type of family, socioeconomic status, mode of delivery was also gathered as these factors have been shown to have effect on feeding practices and outcomes.

Anthropometric assessment

Anthropometric measurements made based on WHO guidelines. Weight was determined with an electronic calibrated scale. The height was measured by stadiometer in children over two years of age and compared with recumbent length which was measured by an infant meter in children below two years of age. Mid up arm circumference (MUAC) was measured as the circumference at the point halfway between the acromion (shoulder) and olecranon (elbow) processes of the left arm with a non-stretchable measuring tape. It was measured by non-metallic measuring tape in accordance with the standard procedures.

Results

Operational definition

Severe acute malnutrition per WHO definition was a low length-for-age z-score, low weight-for-height z-score, weight loss, or oedema.

- Wt/ht below $-3SD$ of WHO Child Growth Standards.
- MUAC < 115 mm.
- Visible severe wasting.
- Bilateral nutritional oedema.

Assessment of Infant and Young Child Feeding (IYCF) practices comprised a caregiver reported exclusive breastfeeding history, and the age when complementary feeding was started.

Statistical analysis

Collected data, after proper data cleansing and validation were put into Microsoft Excel and then analysed using Statistical Package for Social Sciences (SPSS) Version 26.0. Data of continuous variables were presented as mean $\pm$ standard deviation, while data of categorical variables were presented as frequency and percentage. The association between infant and young child feeding practices and severe acute malnutrition was determined by performing Chi-square test. Statistical significance was taken as a p value < 0.05.

Table 1. Sociodemographic Characteristics of the Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Age (months)	6–11	110	14.5
	12–23	315	41.4
	24–35	153	20.1
	36–47	142	18.7
	48–59	40	5.3
Sex	Male	329	43.3
	Female	431	56.7
Residence	Rural	454	59.7
	Urban	306	40.3

Total of 760 children aged 6 months to 5 years with severe acute malnutrition were included in study. The highest proportion of children belonged to the 12–23 months age group (315; 41.4%), followed by 24–35 months (153; 20.1%) and 36–47 months (142; 18.7%). In all, 110 (14.5%) children were 6-11 months old and 40 (5.3%)

children were the age at 48-59 months. In terms of gender distribution 431 (56.7%) were female and 329 (43.3%) were male. Most of the study population (59.7%) were living in rural and 40.3% in urban areas with higher prevalence of severe acute malnutrition in children living in rural areas.

Table 2. Maternal Characteristics of the Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Mother's occupation	Housewife	481	63.3
	Labour	251	33.0
	Private job	7	0.9
	Other work	21	2.8
Mother's education	High school	254	33.42
	Illiterate	232	30.52
	Middle school	192	25.26

	Primary school	42	5.52
	PUC	40	5.28

The results of Assessment of maternal characteristics revealed that 481(63.3%) of the mothers were housewives and 251(33.0%) were laborer. However, few mothers were in private jobs (0.9%, 7) or other occupations (2.8%, 21). In terms of education, 254 (33.42%) mothers had attended high school, 232 (30.52%) illiterates while 192 (25.26%) had received

middle school education. The mothers who had primary school education and pre-university education (PUC) were 42 (5.52%) and 40 (5.28%) of the study population, respectively. These results show that one-third of mothers were high school educated, but a good proportion were not well educated

Table 3. Birth Characteristics of the Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Mode of delivery	Normal vaginal delivery	542	71.3
	Lower segment caesarean section (LSCS)	218	28.7
Birth order	First	255	33.6
	Second	358	47.1
	Third	94	12.4
	Fourth	46	6.1
	Seventh	7	0.9
Number of children in the family	One	146	19.2
	Two	417	54.9
	Three	144	18.9
	Four	33	4.3
	Five	6	0.8
	Seven	14	1.8

Of the 760 children included in the study, most were born vaginally (542; 71.3%) with the remainder having been born by LSCS (218; 28.7%). Birth order was analysed and 358 (47.1%) children were second-born while 255 (33.6%) were first born. Those children born third and fourth were 12.4% and 6.1% of the children and those born seventh were 0.9% of the

children. As for family size, over half of the children (417; 54.9%) belonged to families with two children, 146 (19.2%) were from a single-child family and 144 (18.9%) were from a family with three children. A total of 33 (4.3%), 6 (0.8%) and 14 (1.8%) families were the 4th, 5th and 7th child families, respectively.

Table 4. Exclusive Breastfeeding Practices among Children with Severe Acute Malnutrition

Duration of Exclusive Breastfeeding	Frequency (n)	Percentage (%)
0–3 months	10	1.3
4–6 months	80	10.5
7–12 months	663	87.2
13–18 months	7	0.9
Total	760	100.0

Numbers of exclusive breastfeeding practices showed that most of the children (663; 87.2%) have been exclusively breastfed for 7-12 months. There were a smaller percentage of breastfed children 4 - 6 months (80; 10.5%) and only 10 (1.3%) breastfed children 0 - 3 months. Only 7 (0.9%) children were seen still

breastfeeding after 13-18 months. These results suggest that the most common breastfeeding period was 7-12 months among children with severe acute malnutrition and very short or breastfeeding for more than 36 months were relatively rare in the study group.

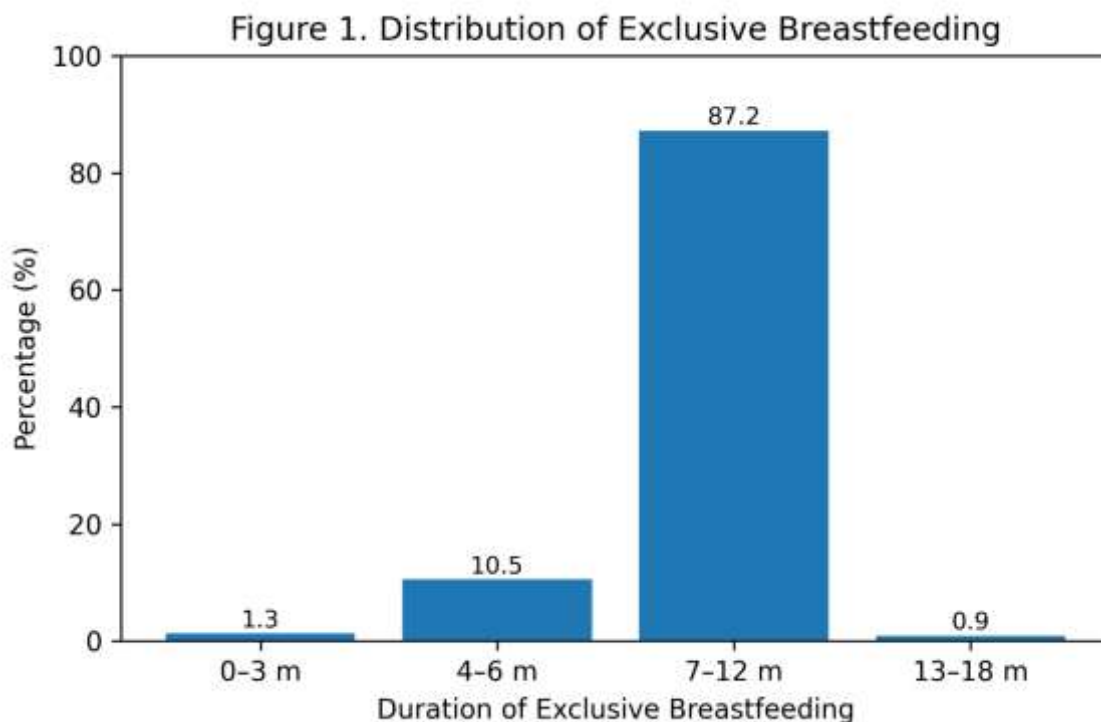


Figure 1: Distribution of Exclusive Breastfeeding among Children with Severe Acute Malnutrition

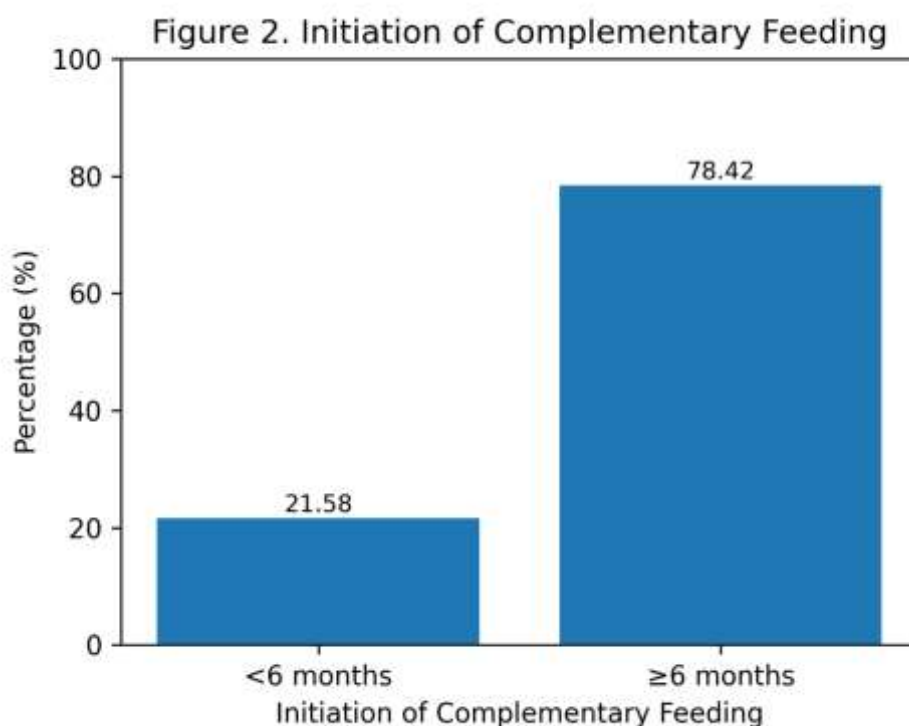
Table 5. Initiation of Complementary Feeding

Initiation of Complementary Feeding	Frequency (n)	Percentage (%)
Before 6 months	164	21.58
At/after 6 months	596	78.42
Total	760	100.0

In respect of complementary feeding practice, 164 (21.58%) children were taken complementary foods before 6 months while majority (596; 78.42%) started complementary feeding at or after 6

months. Consequently, almost 80% of the study participants started complementary feeding at 6 months or older and about 20% started complementary foods earlier than recommended.

Figure 2: Distribution of Initiation of Complementary Feeding among Children with Severe Acute Malnutrition



Discussion

Severe acute malnutrition (SAM) in children under 5 years of age remains a Public Health challenge and is mainly due to improper Infant and Young Child Feeding practices (IYCF) and recurrent infections as well as poverty and low education level among mothers, especially in the developing world. The current study showed that IYCF practices are associated with SAM as each one individually affect the nutritional status of children and these factors altogether influence a child's nutritional status. Several previous studies have increased the interest in such findings, which emphasize that SAM is a multi-

faceted condition and its prevention strategies have to be comprehensive [16-22]. The age group 12-23 months had the highest percentage (41.4%) of children with severe acute malnutrition in the current study. The finding suggests that the 2 years of life are the most related to the occurrence of severe acute malnutrition, corresponding to the period in which complementary feeding is introduced, after exclusive breastfeeding. Children are getting wrong kinds of complementary foods and repeated illness which raises the need for them to grow during this time. Jena et al., documented that majority of the children with severe acute malnutrition were below two years of age and Ghimire et al.,

reported that younger age was an important predictor of severe acute malnutrition [23,24]. Bhadoria et al., too showed severe acute malnutrition to be higher among younger children in relation to inappropriate feeding practices and socioeconomic status [25].

Contrary to the present investigation, the study revealed a little higher percentage of female children as compared to male children. However, gender is not likely to be an independent predictor of severe acute malnutrition and the differences seen may be due to differences in access to care, cultural influences, and differences in regional demographic attributes. Demographic factors like age, sex, and religion were also not found to be significant in severe acute malnutrition, as reported by Madhusudhan et al., indicating that socioeconomic factors, feeding practices, and other influential factors rather than sex need to be taken into account in nutritional analyses [26]. The current study had a larger proportion of children from the rural communities, suggesting that severe acute malnutrition is prevalent in rural communities than in urban. In the rural areas families are often food insecure, poor and lack ready access to sanitation and health care services, all of which negatively impact child nutrition. The results were comparable with Madhusudhan et al., who found rural

setting and low socio-economic class as important risk factors for severe acute malnutrition [26]. Bhadoria et al. also found that a lower socioeconomic status and a lower educational achievement of the parents predispose the children to severe acute malnutrition in a significant manner [25].

In the present study another important determinant were maternal education. One third of the mothers were well educated (at or beyond the high school level) but a high percentage had no education or just primary school. Maternal education directly affects breastfeeding practices as well as complementary feeding, hygiene, immunization and health care utilization. Bhadoria et al., found similar results when they showed that females who had parents with less qualification had the highest risk of suffering from severe acute malnutrition [25]. Similarly, Madhusudhan et al., identified maternal illiteracy as an important risk factor for severe acute malnutrition in under 5 years children [26]. Such results indicate that enhancing women's education as well as reinforcing nutrition counselling for both prenatal and postnatal services could significantly contribute to combating childhood malnutrition.

Breastfeeding continues to be the mainstay of infant nutrition and the World Health Organization advises exclusive breast

feeding for infants for the first 6 months, and to continue breastfeeding with suitable complementary foods until 2 years of age or more. The majority of children in this study were breastfeeding for 7–12 months. These children, however, continued to get breastmilk and suffered from severe acute malnutrition, meaning that breastmilk should be supplemented with proper complementary foods and proper childcare practices to help prevent malnutrition. The same was observed by Prashanth et al., where the following dietary parameters were also observed as important risk factors for severe acute malnutrition: lack of exclusive breastfeeding, stopping breastfeeding too early and bottle feeding [27]. Also, Madhusudhan et al., showed there was an inverse association of duration of exclusive breastfeeding with severe acute malnutrition [26]. David et al., have also found that children not fed with exclusive breast milk for six months had significantly higher risk of severe acute malnutrition [28].

Complementary feeding practices form also another key factor determining child nutrition. Findings from the present study revealed that 21.58% of children started complementary feeding before six months of age and the majority started at 6 months or older. However, high prevalence of severe acute malnutrition among these children suggests that the nutritional

quality, adequate quantity, diversity and frequency of complementary foods is crucial too. Conclusion: Similar results were found by Prashanth et al., who determined that feeding complementary foods earlier than 6 months of age was a key dietary factor contributing to severe acute malnutrition [27]. Das et al., also found strong associations between early complementary feeding, not being exclusively breastfed, bottle feeding and severe acute malnutrition [29]. Moreover, Jena et al., highlighted the need to educate the parents about breast feeding and complementary feeding so that childhood malnutrition can be reduced [23].

Additionally, birth order and family size, along with mother's occupation, can affect child nutritional status through their impact on resource distribution and the practices of child care. The majority of the children were second born and came from two child families in this study. These findings were corroborated by Prashanth et al., who reported that high age contrasts and number of siblings were social risk factors for severe acute malnutrition [27]. Additionally, Ghimire et al., found household size and food insecurity to be notable indicators of SAM and suggested enhancing the opportunities available for individual households to obtain food through community-based interventions [24].

The results of this study have important implications for public health. To tackle the burden of severe acute malnutrition, promoting exclusive breastfeeding, quality complementary feeding, across-the-board education of maternal nutrition, growth monitoring and enhancing community-based nutrition programmes should be focussed on. Training of frontline health workers should be ongoing in infant and young child feeding (IYCF) practices and nutrition rehabilitation programs will target increasing the quality and quantity of complementary feeding. The present study had the drawbacks of being hospital-based and cross sectional which may limit the generalizability of the findings. Further, information about feeding practices was acquired during the caregiver interview which could be biased when relying on caregivers' memory. However, the use of a relatively large sample size and systematic assessment of feeding practices yields important evidence to inform thinking on determinants of severe acute malnutrition in under-five children. Overall, the present study results show that inadequate IYCFs and mothers' lower education along with inadequate socioeconomic status and rural dwellings are still important factors in severe acute malnutrition. To address severe acute malnutrition and improve child survival, it is vital to increase breastfeeding promotion and improve

complementary feeding practices, promote awareness among mothers about the benefits of breastfeeding and action steps, and tackle the social determinants of health.

Conclusion

The current study has shown that the infant and young child feeding practices are key drivers to understand the issue of severe acute malnutrition in under-five children. Improper breastfeeding and complementary feeding nutrition practices, rural areas, inadequate socioeconomic conditions, and low maternal education did not only play important roles, but they also become significant factors in the prevalence of severe acute malnutrition. The results identify the need for a reinforcement of breastfeeding promotion, timely and appropriate complementary feeding as well as focused on mother's nutrition education within health programmes implemented in communities. If malnutrition is to be tackled in order to reduce the burden of severe acute malnutrition and improve the health of children, an early diagnosis of children in need of intervention is critical.

References

1. World Health Organization. Guideline: Updates on the Management of Severe Acute Malnutrition in Infants and Children. Geneva: World Health Organization; 2013.

2. Kapil U, Sachdev HPS. Management of children with severe acute malnutrition: a national priority. *Indian Pediatr.* 2010;47(8):651-653.
3. World Health Organization. WHO child growth standards and the identification of severe acute malnutrition in infants and children. Geneva: WHO; 2009.
4. Ministry of Health and Family Welfare, Government of India. National Family Health Survey (NFHS-5), 2019–21. New Delhi: MoHFW; 2021.
5. Wong HJ, Moy FM, Nair S. Risk factors of malnutrition among preschool children in Terengganu, Malaysia: A case-control study. *BMC Public Health.* 2014; 14:785.
6. Ministry of Health and Family Welfare, Government of India. Operational Guidelines on Facility-Based Management of Children with Severe Acute Malnutrition. New Delhi: MoHFW; 2011.
7. Nath A. India's progress toward achieving the Millennium Development Goals. *Indian J Community Med.* 2011; 36:85-92.
8. Severe Acute Malnutrition in India. Drishti IAS. Available from: <https://www.drishtiias.com/daily-updates/daily-news-analysis/severe-acute-malnutrition-in-india>
9. Bhadoria AS, Kapil U, Bansal R, Pandey RM, Pant B, Mohan A. Prevalence of severe acute malnutrition and associated sociodemographic factors among children aged 6 months–5 years in rural Northern India: A population-based survey. *J Family Med Prim Care.* 2017;6(2):380-385.
10. World Health Organization. Pocket Book of Hospital Care for Children: Guidelines for the Management of Common Childhood Illnesses. 2nd ed. Geneva: WHO; 2013.
11. Govender I, Rangiah S, Kaswa R, Nzaumvila D. Malnutrition in children under the age of 5 years in a primary healthcare setting. *S Afr Fam Pract.* 2021;63(1): a5337.
12. May J, Witten C, Lake L, Skelton A. The slow violence of malnutrition. *S Afr Child Gauge.* 2020; 24:45.
13. Clark H, Coll-Seck AM, Banerjee A, et al. A future for the world's children? A WHO–UNICEF–Lancet Commission. *Lancet.* 2020;395(10224):605-658.
14. Kalu RE, Etim KD. Factors associated with malnutrition among under-five children in developing countries: A review. *Glob J Pure Appl Sci.* 2018;24(1):69.
15. Kosaka S, Umezaki M. A systematic review of the prevalence and predictors of the double burden of malnutrition within households. *Br J Nutr.* 2017;117(8):1118-1127.
16. Modjadji P, Madiba S. Childhood undernutrition and its predictors in a rural health and demographic surveillance system site in South Africa. *Int J Environ Res Public Health.* 2019;16(17):3021.

17. Drammneh W, Hamid NA, Rohana AJ. Determinants of household food insecurity and its association with child malnutrition in sub-Saharan Africa: A review of the literature. *Curr Res Nutr Food Sci.* 2019;7(3):610-623.
18. Tette EMA, Sifah EK, Nartey ET. Factors affecting malnutrition in children and the uptake of interventions to prevent the condition. *BMC Pediatr.* 2015; 15:189.
19. Ntenda PAM, Chuang YC. Analysis of individual-level and community-level effects on childhood undernutrition in Malawi. *Pediatr Neonatol.* 2018;59(4):380-389.
20. Momberg DJ, Ngandu BC, Voth-Gaeddert LE, et al. Water, sanitation and hygiene (WASH) in sub-Saharan Africa and associations with undernutrition and governance in children under five years of age: A systematic review. *J Dev Orig Health Dis.* 2021;12(1):6-33.
21. Prashanth MR, Savitha MR, Prashantha B. Risk factors for severe acute malnutrition in under-five children attending nutritional rehabilitation centre of a tertiary teaching hospital in Karnataka: A case-control study. *Int J Contemp Pediatr.* 2017; 4:1721-1726.
22. Madhusudhan K, Rajeev PK, Shireesha A, Ushashree GV. Study of risk factors of severe acute malnutrition (SAM) in children 6 months to 5 years of age and evaluation of effect of micronutrient supplementation (WHO protocol) on serum zinc and magnesium levels: A case-control study. *Int J Contemp Pediatr.* 2017; 4:1198-1205.
23. Jena P, Rath S, Nayak MK, Satapathy D. Study of social and demographic determinants of severe acute malnutrition in children aged 6–59 months in a tertiary care centre of Odisha, India. *Int J Contemp Pediatr.* 2018; 6:46-51.
24. Ghimire U, Aryal BK, Gupta AK, Sapkota S. Severe acute malnutrition and its associated factors among children under five years: A facility-based cross-sectional study. *BMC Pediatr.* 2020;20(1):249.
25. David SM, Pricilla RA, Paul SS, George K, Bose A, Prasad JH. Risk factors for severe acute malnutrition among children aged 6–59 months: A community-based case-control study from Vellore, Southern India. *J Family Med Prim Care.* 2020; 9:2237-2243.
26. Das K, Das S, Mohapatra S. Risk and adverse outcome factors of severe acute malnutrition in children: A hospital-based study in Odisha. *Cureus.* 2021;13(9):e18364.
27. World Health Organization. Exclusive breastfeeding. Available from: https://www.who.int/nutrition/topics/exclusive_breastfeeding/en/