Original Article

Growth and Developmental Outcomes Following Sensory Stimulation and Structured Play Therapy in Children with Acute Malnutrition: A Prospective Observational Study

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Abstract

Background: Developmental delay is a common but often under-recognized consequence of severe acute malnutrition (SAM) and moderate acute malnutrition (MAM). The World Health Organization recommends integrating psychosocial stimulation with nutritional rehabilitation; however, evidence regarding its routine implementation in Nutritional Rehabilitation Centres (NRCs) in India remains limited. The objective is to evaluate the growth and developmental outcomes of children with acute malnutrition receiving routine nutritional rehabilitation along with sensory stimulation and structured play therapy. **Material and Methods:** This prospective observational study was conducted at the Nutritional Rehabilitation Centre, Department of Pediatrics, Bangalore. Eighty children aged 2–60 months with SAM or MAM were enrolled and followed from admission to six months after discharge. Anthropometric measurements (weight, height/length, and mid-upper arm circumference) and developmental status across gross motor, fine motor, cognitive, receptive language, expressive language, social-emotional, and self-help domains were assessed at admission, discharge, and at 1, 3, and 6-month follow-up visits using the National Centre of Excellence developmental milestone checklist. Statistical analysis included McNemar, and paired t-test. **Results:** The mean age of participants was 21.22 ± 14.22 months, and 65% were males. Significant improvements were observed in weight, height/length, and mid-upper arm circumference during follow-up ($P<0.05$). The proportion of children with severe wasting decreased from 51.2% at admission to 3.8% at six months. Developmental delays were most prevalent at admission in the cognitive (88.8%), fine motor (86.3%), and receptive language (82.5%) domains. Progressive improvement was observed across all developmental domains during follow-up, with the greatest improvement noted in gross motor and fine motor development. Two children with persistent developmental delay across all domains were subsequently diagnosed with autism spectrum disorder and referred for specialized care. **Conclusion:** Significant improvements were observed over the follow-up period among children receiving routine nutritional rehabilitation that included sensory stimulation and structured play therapy. Incorporating caregiver-led developmental stimulation into routine NRC services may facilitate optimal recovery and should be strengthened within facility- and community-based management programs.

Keywords: Severe acute malnutrition; Moderate acute malnutrition; Child development; Play therapy; Rehabilitation, Nutritional; Developmental delay.

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Introduction

Childhood malnutrition remains a major public health challenge and is a leading cause of morbidity and mortality among children under five years of age. It encompasses several forms, including undernutrition, micronutrient deficiencies, overweight, and obesity. Among these, undernutrition, manifested as wasting and stunting, continues to pose a significant global health burden.[1] In 2020, an estimated 45.4 million children under five years of age were wasted, while 149.2 million were stunted worldwide.[2] Undernutrition accounts for nearly 45% of all deaths among children younger than five years and contributes to more than 15% of Disability-Adjusted Life Years (DALYs) lost globally. According to the National Family Health Survey-4 (2015–2016), 7.5% of Indian children under five years of age (approximately 9.5 million) had severe acute malnutrition (SAM), while 21% were wasted and 38% were stunted.[3]

The consequences of childhood malnutrition extend beyond impaired physical growth and include increased susceptibility to infections, delayed recovery from illness, disability, and mortality. Long-term effects include impaired neurodevelopment, poor educational attainment, reduced cognitive performance, diminished economic productivity, and an increased risk of chronic non-communicable diseases later in life.[4] Early childhood is a critical period for brain development, and nutritional deficiencies during this stage may result in

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irreversible structural and functional changes in the developing brain. These alterations adversely affect motor, language, cognitive, and socio-emotional development, thereby compromising future learning potential and overall quality of life.[5]

Children with severe acute malnutrition frequently exhibit apathy, poor responsiveness, and reduced interaction with caregivers and their environment. Such behavioural changes may further limit caregiver–child interaction and opportunities for sensory and emotional stimulation, thereby perpetuating developmental delays. Nutritional rehabilitation alone may therefore be insufficient to achieve optimal developmental recovery.

Evidence suggests that integrating psychosocial and sensory stimulation with nutritional rehabilitation improves developmental outcomes and facilitates recovery among malnourished children.[6] The World Health Organization (WHO) recommends incorporating psychomotor and psychosocial stimulation into the routine management of children with SAM to improve appetite, promote weight gain, and enhance developmental recovery.[7] Studies have shown that combining dietary rehabilitation with structured psychosocial interventions can reduce the adverse developmental consequences of undernutrition and improve cognitive, behavioural, and social development.[8] WHO further recommends initiating sensory stimulation and emotional support during the stabilization phase, followed by age-appropriate structured play activities during the rehabilitation phase to promote favourable long-term neurodevelopmental outcomes.[6]

Although these recommendations have been incorporated into Nutritional Rehabilitation Centres (NRCs), evidence describing growth and developmental outcomes following routine implementation of sensory stimulation and structured play therapy among Indian children with acute malnutrition remains limited. Therefore, the present study was undertaken to assess the growth and developmental outcomes of children younger than five years with moderate acute malnutrition (MAM) and severe acute malnutrition (SAM) receiving routine care at a Nutritional Rehabilitation Centre, and to estimate the prevalence of delayed developmental milestones in these children.

Materials and Methods

This prospective observational study was conducted at the Nutritional Rehabilitation Centre (NRC), Department of Pediatrics, Vani Vilas Hospital, Bangalore Medical College and Research Institute (BMCRI), Bengaluru, India, between August 2022 and January 2024. The study was approved by the Institutional Ethics Committee of Bangalore Medical College and Research Institute. Written informed consent was obtained from the parents or primary caregivers of all participating children before enrolment.

Children younger than five years of age admitted to the NRC with primary severe acute malnutrition (SAM) or moderate acute malnutrition (MAM) were consecutively enrolled. Eligible children were those whose parents or caregivers intended to remain within the study area for at least six months following discharge. Severe acute malnutrition was defined according to the World Health Organization (WHO) criteria as weight-for-height/length <−3 standard deviations (SD), mid-upper arm circumference (MUAC) <11.5 cm, bilateral pitting edema of nutritional origin, or visible severe wasting among children aged 6–59 months. Infants younger than six months were classified as having SAM if their weight-for-age was <−3 SD. Moderate acute malnutrition was defined as weight-for-height/length between −2 and −3 SD or MUAC between 11.5 and 12.5 cm in the absence of bilateral pitting edema. Children with complicated SAM requiring intensive medical management, severe visual or hearing impairment, physical or neurological disabilities interfering with developmental assessment or play activities, or whose parents/caregivers declined consent were excluded.

The sample size was estimated based on the study by Elizabeth and Sathy,[9] considering the mean difference in weight-for-age between the initial and final assessments. Assuming a standard deviation of 4.45, an expected mean difference of 1.0, and a 95% confidence level, the minimum required sample size was calculated to be 76 children; 80 eligible children were ultimately enrolled.

Baseline demographic and clinical characteristics were recorded at admission. Anthropometric assessment was performed using standardized techniques.[10] Body weight was measured using a calibrated electronic pediatric weighing scale. Recumbent length was measured using an infantometer for children younger than two years, whereas standing height was measured using a stadiometer for children aged two years and above. Mid-upper arm circumference was measured using a standardized MUAC tape, and bilateral pitting edema was assessed clinically. Anthropometric indices, including weight-for-age, height-for-age, weight-for-height/length, and MUAC Z-scores, were calculated according to the WHO Child Growth Standards.[11]

All enrolled children received routine medical and nutritional management according to the Facility-Based Care of Severe Acute Malnutrition guidelines issued by the Ministry of Health and Family Welfare, Government of India (2013), and the WHO recommendations for the management of severe acute malnutrition in infants and children.[7,12] As part of the standard NRC protocol, developmental assessment was carried out using the Developmental Milestone Checklist developed by the National Centre of Excellence (NCoE) for Management of Severe Acute Malnutrition.[13] Age-appropriate sensory stimulation and structured play therapy were routinely provided according to the NCoE play therapy module. Children participated in two supervised sessions of approximately 15 minutes each day during hospitalization. Activities were individualized according to the child's developmental level. Mothers or primary caregivers were trained and encouraged to continue sensory stimulation and structured play activities at home following discharge as part of routine counselling.

Children were reassessed at discharge and subsequently at 1 month, 3 months, and 6 months after discharge. At each follow-up visit, anthropometric measurements, including body weight, length/height, and MUAC, were recorded. Developmental assessment was repeated using the NCoE Developmental Milestone Checklist to evaluate age-appropriate milestones across the gross motor, fine motor, language, cognitive, and

personal-social domains. Children identified with developmental red flag signs during follow-up were referred to the District Early Intervention Centre for further evaluation and management.

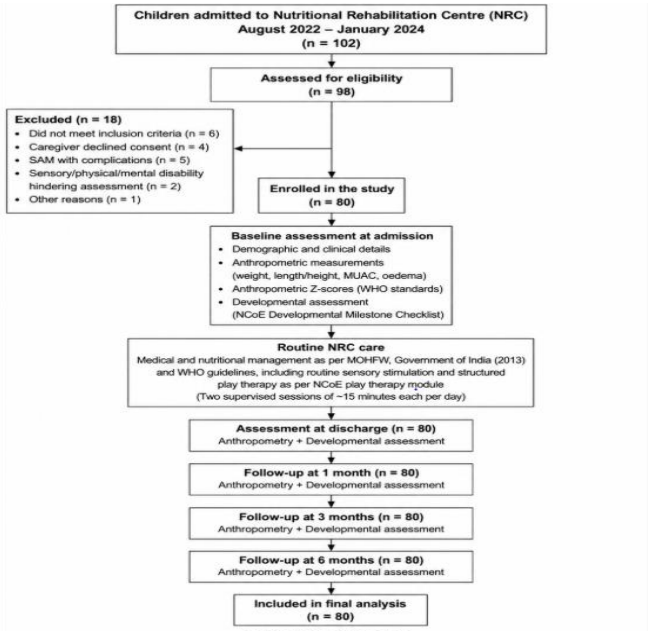

Fig. 1: Study Flow Diagram

MUAC: Mid-upper arm circumference; NCoE: National Centre of Excellence for Management of Severe Acute Malnutrition; MOHFW: Ministry of Health and Family Welfare.

The primary outcome measures were changes in anthropometric indicators of growth and developmental status during follow-up. Growth outcomes were assessed using serial anthropometric measurements, whereas developmental outcomes were assessed by achievement of age-appropriate developmental milestones. The prevalence of delayed developmental milestones among children with MAM and SAM was also determined.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Mc Nemers test was used to fins the changes in the qualitative variables at subsequent time intervals. Changes in anthropometric and developmental parameters across the follow-up visits (admission, discharge, 1 month, 3 months, and 6 months) were analyzed using paired t test, where the assumptions for parametric analysis were not satisfied, the Wilcoxon sign test was used. A two-sided P value <0.05 was considered statistically significant.

The study flow diagram depicting participant enrolment, follow-up, and outcome assessment is presented in [Figure 1].

Results

A total of 80 children with moderate acute malnutrition (MAM) and severe acute malnutrition (SAM) admitted to the Nutritional Rehabilitation Centre (NRC) were included in the study. The mean age of the participants was 21.22 ± 14.22 months (range: 2–60 months). The majority of children were younger than 24 months, with 29 (36.3%) aged 2–12 months and 27 (33.8%) aged 13–24 months. Male children constituted 65.0% (n = 52) of the study population, while females accounted for 35.0% (n = 28). Nearly half of the participants belonged to the lower-middle socioeconomic class (48.8%), followed by the upper-middle (25.0%), upper-lower (20.0%), and lower socioeconomic classes (6.3%), according to the Modified Kuppuswamy classification. Clinical examination revealed that anaemia (61.3%) and skin changes (63.7%) were the most common clinical manifestations, whereas hair changes were observed in 36.3% of children. Bilateral pedal edema was present in 12.5% of the participants, while the majority (87.5%) did not have edema.

Table 1: Comparison of weight, length/height, and mid-upper arm circumference (MUAC) during follow-up

Anthropometric parameter	Admission vs Discharge (Mean diff, p value)	Discharge vs 1 month (Mean diff, p value)	3 months vs 6 months (Mean diff, p value)
Weight (kg)	−0.327, 0.001*	−0.782, 0.001*	−1.587, 0.001*
Height/Length (cm)	−0.206, 0.035*	−0.302, 0.004*	−5.560, 0.001*
MUAC (cm)	−0.032, 0.024*	−0.391, 0.001*	−0.500, 0.001*

*significant

Significant improvements were observed in body weight, height/length, and MUAC between all assessed follow-up intervals [Table 1].

Table 2: Distribution of weight-for-height/length nutritional status at different follow-up time points

Weight-for-height/length (WHO Z-score)	Admission n (%)	Discharge n (%)	1 Month n (%)	3 Months n (%)	6 Months n (%)	Statistical comparison
< −3 SD	41 (51.3)	28 (35.0)	14 (17.5)	–	–	
−2 to −3 SD	39 (48.8)	44 (55.0)	46 (57.5)	15 (18.8)	3 (3.8)	
−1 to −2 SD	0 (0.0)	8 (10.0)	19 (23.8)	44 (55.0)	37 (46.3)	
0 to −1 SD	0 (0.0)	0 (0.0)	1 (1.3)	21 (26.3)	40 (50.0)	
Total	80 (100)	80 (100)	80 (100)	80 (100)	80 (100)	Admission vs Discharge: $\chi^2 = 10.75$, p = 0.004* Discharge vs 1 Month: $\chi^2 = 7.73$, p = 0.0513 Months vs 6 Months: $\chi^2 = 12.47$, p = 0.001*

Values are presented as frequency (%). χ^2 = Chi-square statistic; SD = Standard Deviation.
*Statistically significant at $p < 0.05$.

Table 3: Changes in developmental status across different developmental domains during follow-up

Developmental Domain	Interpretation	Admission n (%)	Discharge n (%)	1 Month n (%)	3 Months n (%)	6 Months n (%)	Admission vs Discharge χ^2 (p)	Discharge vs 1 Month χ^2 (p)	3 Months vs 6 Months χ^2 (p)
Gross Motor	Delayed	61 (76.3)	45 (56.3)	17 (21.3)	2 (2.5)	2 (2.5)	6.28 (0.012*)	20.64 (<0.001*)	0.26 (0.612)
	Not delayed	19 (23.8)	35 (43.8)	63 (78.8)	78 (97.5)	78 (97.5)			
Fine Motor	Delayed	69 (86.3)	62 (77.5)	41 (51.2)	8 (10.0)	3 (3.8)	1.51 (0.218)	12.01 (<0.001*)	1.56 (0.211)
	Not delayed	11 (13.8)	18 (22.5)	39 (48.8)	72 (90.0)	77 (96.3)			
Cognitive	Delayed	71 (88.8)	66 (82.5)	53 (66.3)	16 (20.0)	4 (5.0)	1.26 (0.250)	5.54 (0.018*)	6.91 (0.008*)
	Not delayed	9 (11.3)	14 (17.5)	27 (33.8)	64 (80.0)	76 (95.0)			
Receptive Language	Delayed	66 (82.5)	61 (76.3)	37 (46.3)	10 (12.5)	4 (5.0)	0.95 (0.328)	13.93 (<0.001*)	1.95 (0.160)
	Not delayed	14 (17.5)	19 (23.8)	43 (53.8)	70 (87.5)	76 (95.0)			
Expressive Language	Delayed	63 (78.8)	56 (70.0)	38 (47.5)	8 (10.0)	2 (2.5)	1.60 (0.204)	8.35 (0.003*)	2.66 (0.102)
	Not delayed	17 (21.3)	24 (30.0)	42 (52.5)	72 (90.0)	78 (97.5)			
Social-Emotional	Delayed	62 (77.5)	58 (72.5)	41 (51.2)	11 (13.8)	5 (6.3)	0.53 (0.465)	7.65 (0.005*)	1.74 (0.187)
	Not delayed	18 (22.5)	22 (27.5)	39 (48.8)	69 (86.3)	75 (93.8)			
Self-help	Delayed	59 (73.8)	57 (71.3)	46 (57.5)	13 (16.3)	5 (6.3)	0.13 (0.723)	3.28 (0.069)	3.06 (0.079)
	Not delayed	21 (26.3)	23 (28.7)	34 (42.5)	67 (83.8)	75 (93.8)			

Values are presented as n (%). χ^2 = Chi-square statistic. *$p < 0.05$ indicates statistical significance.

Developmental assessment demonstrated progressive improvement across all developmental domains during follow-up (Table 3). At admission, developmental delay was most prevalent in the cognitive domain (88.8%), followed by fine motor (86.3%), receptive language (82.5%), gross motor (76.3%), expressive language (78.8%), social-emotional (77.5%), and self-help (73.8%) domains. The proportion of children with developmental delay decreased steadily following routine nutritional rehabilitation, sensory stimulation, and structured play therapy. By the 6-month follow-up, developmental delay had reduced to 2.5% in the gross motor and expressive language domains, 3.8% in the fine motor domain, 5.0% in the cognitive and receptive language domains, and 6.3% in the social-emotional and self-help domains. Correspondingly, the proportion of children attaining age-appropriate developmental milestones increased across all domains, with more than 93% of children achieving normal developmental status by 6 months in every domain. These findings indicate substantial improvement in developmental outcomes over the follow-up period.

Discussion

The present prospective observational study evaluated the growth and developmental outcomes of children younger than five years with severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) receiving routine nutritional rehabilitation, including sensory stimulation and structured play therapy, at a Nutritional Rehabilitation Centre (NRC). The findings demonstrated progressive improvement in anthropometric parameters and developmental outcomes across all assessed domains during the 6-month follow-up. Developmental delay was common at admission but decreased substantially over time, with most children attaining age-appropriate developmental milestones by the end of follow-up.

The mean age of the study population was 21.2 months, and nearly 70% of the children were younger than two years of age, indicating that early childhood remains the period of greatest vulnerability to acute malnutrition. Male children constituted 65% of the study population, comparable to the findings reported by Hossain et al., who observed a predominance of male children among those with severe acute malnutrition.[14]

Anaemia was observed in more than half of the study participants (61.3%), highlighting the coexistence of multiple nutritional deficiencies among children with acute malnutrition. Similar findings were reported by Khandelwal et al., who identified anaemia in 53% of children with SAM and developmental delay.[15] Anaemia has been recognized as an important contributor to impaired neurodevelopment because reduced oxygen delivery to the developing brain adversely affects cognitive and psychomotor functions.[16,17]

At admission, developmental delay was observed across all assessed domains, with the highest prevalence in the cognitive (88.8%) and fine motor (86.3%) domains, followed by receptive language, expressive language, gross motor, social-emotional, and self-help domains. These findings are consistent with previous reports demonstrating that undernutrition adversely affects multiple aspects of child development.[9,16] Saleem et al. reported social development as the most frequently affected domain, followed by fine motor development,[16] whereas Khandelwal et al. observed delays predominantly in motor and language domains with associated cognitive impairment.[15] The variation in affected domains across studies may be attributed to differences in study populations, developmental assessment tools, severity of malnutrition, and age distribution.

The present study demonstrated progressive improvement in both growth and developmental outcomes during follow-up. Improvement was evident in anthropometric indicators, with a gradual shift of children from severe and moderate wasting towards normal weight-for-height categories over six months. Likewise, developmental delay decreased consistently across all domains, with gross motor and fine motor functions showing earlier improvement than cognitive, language, social-emotional, and self-help domains. This finding may be explained by earlier

recovery of gross motor functions following nutritional rehabilitation, whereas higher cognitive and language functions require sustained caregiver interaction, environmental stimulation, and continued neurological maturation.

The observed improvements are in agreement with findings from Ethiopia, where Abessa et al. reported significant gains in developmental performance following nutritional rehabilitation combined with play-based psychosocial stimulation.[17] Similarly, a randomized controlled trial from Ethiopia demonstrated improvements in gross motor skills during hospitalization and fine motor development during home-based follow-up among children receiving psychomotor and psychosocial stimulation in addition to standard nutritional rehabilitation.[18] Comparable observations have also been reported from Bangladesh,[19] supporting the role of integrating developmental stimulation into routine nutritional rehabilitation programmes.

An important observation in the present study was that two children continued to exhibit developmental delay across all domains despite nutritional recovery. Subsequent evaluation confirmed autism spectrum disorder, and both children were referred to the pediatric psychiatry team and the District Early Intervention Centre (DEIC) for comprehensive management. This finding highlights the importance of routine developmental screening in children with malnutrition, as persistent developmental delay may indicate underlying neurodevelopmental disorders requiring early multidisciplinary intervention.

Strengths and Limitations: The strengths of the present study include its prospective design, standardized assessment of anthropometric and developmental outcomes, and longitudinal follow-up of children from admission until six months after discharge. The study comprehensively evaluated multiple developmental domains, including gross motor, fine motor, cognitive, receptive and expressive language, social-emotional, and self-help skills, thereby providing valuable insights into the developmental recovery of children with moderate and severe acute malnutrition receiving routine care at a Nutritional Rehabilitation Centre.

However, certain limitations should be acknowledged. The study was conducted at a single tertiary care centre with a relatively small sample size, which may limit the generalizability of the findings. As this was an observational study without a comparison group, a causal relationship between sensory stimulation, structured play therapy, and the observed improvements in developmental outcomes cannot be established. Developmental assessment was performed using the National Centre of Excellence (NCoE) developmental milestone checklist rather than standardized psychometric assessment tools. In addition, subgroup analyses comparing children with severe acute malnutrition and moderate acute malnutrition were not performed because of the limited sample size.

Nevertheless, the findings of this study support the integration of developmental assessment, sensory stimulation, and age-appropriate structured play therapy into routine nutritional rehabilitation services at Nutritional Rehabilitation Centres. Training healthcare personnel in developmental assessment and caregiver-guided play therapy may facilitate early identification of developmental delays and improve the quality of rehabilitation services. Caregiver involvement should be encouraged to ensure the continuation of stimulation activities after discharge, and the incorporation of these interventions into community-based management programmes may help sustain developmental gains. Future multicentric studies with larger sample sizes, longer follow-up, and standardized developmental assessment tools are recommended to further strengthen the evidence.

Conclusion

Growth and developmental improvements were observed among children receiving routine nutritional rehabilitation that included sensory stimulation and structured play therapy. Gross motor recovery occurred earlier than cognitive, language, and social-emotional domains. These findings support incorporation of developmental assessment and caregiver-guided play therapy into routine nutritional rehabilitation services.

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Conflicts of interest

There are no conflicts of interest.

References

1. Elizabeth KE. Nutrition and Child Development. 4th ed. Hyderabad/New Delhi: Paras Medical Publisher; 2010.
2. World Health Organization, UNICEF, World Bank. Levels and Trends in Child Malnutrition: Joint Child Malnutrition Estimates 2021 Edition. Geneva: World Health Organization; 2021.
3. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-4), 2015–16: India. Mumbai: IIPS; 2017.
4. Das JK, Salam RA, Saeed M, Kazmi FA, Bhutta ZA. Effectiveness of interventions for managing acute malnutrition in children under five years of age in low-income and middle-income countries: a systematic review and meta-analysis. Nutrients. 2020;12:116. doi: 10.3390/nu12010116. PMID: 31906272; PMCID: PMC7019612.
5. Georgieff MK. Nutrition and the developing brain: nutrient priorities and measurement. Am J Clin Nutr. 2007;85(2):614S-620S. doi: 10.1093/ajcn/85.2.614S
6. Ashworth A, Khanum S, Jackson A, Schofield EC. Guidelines for the Inpatient Treatment of Severely Malnourished Children. Geneva: World Health Organization; 2003.
7. World Health Organization. Guideline: Updates on the Management of Severe Acute Malnutrition in Infants and Children. Geneva: WHO; 2013.
8. Daniel AI, Bandsma RHJ, Lytvyn L, Voskuijl WP, Potani I, van den Heuvel M. Psychosocial stimulation interventions for children with severe acute malnutrition: a systematic review. J Glob Health. 2017;7:010405. doi: 10.7189/jogh.07.010405. PMID: 28567278; PMCID: PMC5441448.
9. Elizabeth KE, Sathy N. The role of developmental stimulation in nutritional rehabilitation. Indian Pediatr. 1997;34:681-695.
10. Dalwai S, Choudhury P, Bavdekar SB, Dalal R, Kapil U, Dubey AP, et al. Consensus statement of the Indian Academy of Pediatrics on integrated management of severe acute malnutrition. Indian Pediatr. 2013;50:399-404. doi: 10.1007/s13312-013-0111-3.
11. World Health Organization. WHO Child Growth Standards and the

Identification of Severe Acute Malnutrition in Infants and Children. Geneva: WHO; 2009.
12. National Rural Health Mission, Ministry of Health and Family Welfare, Government of India. Facilitator Guide for Facility-Based Care of Severe Acute Malnutrition. New Delhi: Government of India; 2013.
13. Government of India. Sensory Stimulation and Structured Play Therapy Activities: Activity Guide. National Centre of Excellence (NCoE) for Management of Severe Acute Malnutrition. New Delhi: Ministry of Health and Family Welfare; 2019.
14. Hossain MI, Huq S, Islam MM, Ahmed T. Acceptability and efficacy of ready-to-use therapeutic food using soy protein isolate in under-5 children suffering from severe acute malnutrition in Bangladesh: a double-blind randomized non-inferiority trial. Eur J Nutr. 2020;59:1149-1161. doi:10.1007/s00394-019-01975-w.
15. Khandelwal N, Mandliya J, Nigam K, Patil V, Mathur A, Pathak A. Determinants of motor, language, cognitive and global developmental delay in children with complicated severe acute malnutrition at the time of discharge: an observational study from Central India. PLoS One. 2020;15:e0232726. doi:10.1371/journal.pone.0232726.
16. Saleem J, Zakar R, Mushtaq F, Bukhari GMJ, Fischer F. Comparative analysis of developmental profile between normal and severe acute malnourished under-five children in Pakistan: a multicentre cross-sectional study. BMJ Open. 2021;11:e048644. doi:10.1136/bmjopen-2020-048644.
17. Abessa TG, Worku BN, Wondafrash M, Girma T, Valy J, Lemmens J, et al. Effect of play-based family-centered psychomotor/psychosocial stimulation on the development of severely acutely malnourished children under six years of age: a randomized controlled trial. BMC Pediatr. 2019;19:336. doi:10.1186/s12887-019-1696-z.
18. Tessema TT, Alamdo AG, Yirtaw TG, Deble FA, Mekonen EB, Abessa TG, et al. The effects of psychosocial stimulation on the development, growth, and treatment outcome of children with severe acute malnutrition aged 6-59 months in southern Ethiopia: a cluster randomized controlled trial. BMC Public Health. 2019;19:1125. doi:10.1186/s12889-019-7916-5.
19. Nahar B, Hamadani JD, Ahmed T, Tofail F, Rahman A, Huda SN, et al. Effects of psychosocial stimulation on growth and development of severely malnourished children in a nutrition unit in Bangladesh. Eur J Clin Nutr. 2008;63:725-731. doi: 10.1038/ejcn.2008.44.