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DEVELOPMENTAL OUTCOMES OF SENSORY STIMULATION AND PLAY THERAPY IN CHILDREN WITH SEVERE ACUTE MALNUTRITION

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ABSTRACT

Introduction- Malnutrition, particularly in the first 1000 days of life, is known to be associated with serious outcomes including increased vulnerability to infection and disease, compromised development, as well as mortality.[1] Severely malnourished children have poor levels of mental development and they continue to have low intelligence levels, behavior problems and poor school achievement in later childhood.[2] Achievements of milestones are faster in children who receive sensory stimulation than those who unfortunately are unable to do so.

Aims and objective- The primary objective of this systematic review was to synthesize evidence related to the question, in children with Severe Acute Malnutrition (SAM), does psychosocial stimulation improve child developmental outcomes? This study was conducted to evaluate comprehensive structured intervention package for children aged 6 to 59 months hospitalized with SAM. It was a pragmatic trial aimed at replicating how this type of intervention could be delivered in Malnutrition Treatment Center (MTC) and at home finding its effectiveness.

Material and method- We recruited 218 SAM children admitted to Balchikitsalaya, RNT Medical College Udaipur (Rajasthan) of complicated Severe Acute Malnutrition (SAM) with developmental delay. Their primary caregivers were recruited after being screened for eligibility. Developmental assessments done on admission, on discharge and at 3 months follow up. Sensory stimulation and play therapy activities were planned individually as per assessment. Statistical analysis for significance was done.

Results- Out of total 218 cases 95 (43.5%) were 6 months to 1 year, 85(39%) were 1 year to 2 years, 24(11%) were 2 years to 3 years, 10(4.6%) were 3 years to 4 years and 4(1.8%) were 4 years to 5 years of age group. Age group 6 months to 1 year showed maximum improvement in cognitive domain (94.74%), (100%), fine motor (86.32%), (98.95%) and gross motor (32.63%), (67.37%) at discharge and after 3 months respectively(P-value<0.05). Age group 1 year to 2 year showed maximum improvement in cognitive domain (48.24%), (76.47%) and fine motor (40.00%), (75.29%) at discharge and after 3 months respectively which is statistically significant (P-value<0.05). Age group of 2 year to 3 years show some improvement in fine motor (20.83%; 29.17%) and cognitive (29.17%; 45.83%) but these are not statistically significant (P-value>0.05). Rest of the domains does not show improvement in these children. Age group 3 year to 5 year children showed a little or no improvement even after 3 months follow up and play therapy.

Summary- Majority of cases are from the lower age groups. All cases belong to poor socioeconomic status. Significant improvement is seen only in lower age groups of <2 years. As the age advances chances of improvement are less. Here we found that as a result of play therapy maximum improvement was seen in cognitive, gross and fine motor domain while least improvement occur in self-help and emotional development. Henceforth early identification and management of SAM child in terms of nutrition and stimulation therapy does significant impact over developmental status of a child.

Conclusion- Our findings call attention to the importance of early evaluation of children's development status. Delays in child development trigger a complex and damaging cycle for the development of the child with such deficits. Complete developmental assessment enables early identification of children's preserved and affected abilities. As a consequence, it is possible to delineate effective early play therapy and likely help children reach better outcomes.

KEYWORDS : Malnutrition, Development, stimulation and play therapy, Cognition, SAM, MTC

INTRODUCTION

Optimal nutrition in infancy and early childhood is essential to meet the demands of rapid growth and development. The children, particularly in rural areas of India are vulnerable to malnutrition because of insufficient dietary intakes, recurrent infections, lack of proper care, and uneven distribution of food within the family. The National Family Health Survey (NFHS-4) reveal that in India out of all the children under the age of 5 years 38.4% are stunted (Height for age), 35.7% are under weight (Weight for age), 21% are wasted (Weight for Height) and 7.5% are severely wasted (Weight for Height).[3] Severe acute malnutrition (SAM) is one type of malnutrition that manifests in two forms: Marasmus, identified by severe wasting; and Kwashiorkor, characterized by the presence of bilateral pitting oedema.[4] Malnutrition not only enhances morbidity and mortality amongst children, it also leads to reduced work capacity and poor productivity. When these children grow up as adults, hamper the development of a country. Severely malnourished children have poor levels of mental development and they continue to have low intelligence levels, behavior problems and poor school achievement in later childhood.[2]

Malnourished children do not play, cry, smile, complain or show normal emotions as normal children do. They may become lethargic and feeble. Mother/caregiver are often busy managing their other responsibilities, believes that child does not need any added attention. Therefore, the child with SAM is further neglected unintentionally. Malnutrition combined with psychosocial deprivation can have considerable implications on child development that last throughout life including reduced intellectual capacity, and at a larger scale this can result in reduced societal contribution.[5][6] Studies revealed that sensory stimulation and play activities along with nutritional therapy showed sustained benefits to mental development.[7] Malnourished children can make a remarkable improvement in development with adoption.[8] However, it is difficult to replicate this level of intervention. Research shows that stimulation through sensory play for all at risk children especially child with SAM facilitates development of skills in physical, social, emotional, cognitive/mental language, self-help areas, minimizing the effects of the damages caused by malnutrition. In spite of recommendations by the World Health Organization, stimulation has generally not been incorporated into the management of malnourished children.[9]

Achievements of milestones are faster in children who receive sensory stimulation than those who unfortunately are unable to do so. Sensory stimulation is an on-going process essential for learning; it is a continuous process not merely an activity. Sensory stimulation for the child starts in uterus. Different sensory stimulation from the environment and from within the body gives information to different

sense organs and their respective systems – Visual, Auditory, Tactile, Olfactory (smell), Gustatory (taste), Kinesthetic (movement) and the Vestibular (balance) system. All the senses have to work together so that the infants and toddlers can move, learn and behave in an age appropriate manner. These sensory stimulations enable the child to interact with the environment. Approximately 80% of the neuronal connections in the brain develop in the first three years of life; they may be pruned if not used. Sensory play encourages- Curiosity, Independent and Logical thinking, Problem solving, Social-emotional stability, Imagination and Creativity.

Psychosocial stimulation in children with SAM has not been evaluated in a rigorous manner in relation to child developmental and nutritional outcomes. Therefore, the primary objective of this systematic review was to synthesize evidence related to the question, In children with severe acute malnutrition, does psychosocial stimulation I

This study was conducted to evaluate comprehensive structured intervention package for children aged 6 to 59 months hospitalized with SAM. It was a pragmatic trial aimed at replicating how this type of intervention could be delivered in MTC setting and its effectiveness in this setting.

MATERIAL AND METHODS

This is a hospital based prospective study. This study was conducted at Malnutrition Treatment Center (MTC) in Balchikitsalaya, RNT Medical College, Udaipur (Rajasthan) during July 2019- December 2020. Total 218 children and their primary caregivers were recruited after being screened for eligibility within 24 hrs of admission to the MTC. Informed and written consent was taken from each subject.

Inclusion Criteria:

Children (6month to 5years) with SAM having development delay were included.

Exclusion Criteria:

1.Critically sick at admission 2.Known cause of developmental retardation like cerebral palsy, genetic disorders and metabolic syndrome.

Screening: Developmental screening assessment was done on admission considering history of child's development and what the child has achieved till now. The screening and outcome assessment was done using activity guide book of "National Center of Excellence for Sam Management, National Nutritional Rehabilitation Resource and Training Center".[10]

Sensory stimulation and play therapy: activities were planned individually as per assessment during screening:

1. Explain the mother/ caregiver the importance of the session.
2. Each individual child should have stimulation session for 15-30 minutes at least twice daily.
3. Mothers/ caregiver should be actively involved in these activities
4. Teach and help mother in each activity and in preparing toys to be used for stimulation
5. Start from the point what the child has achieved in each domain /and gradually aim to reach activities which normal child should be able to do for that age.
6. Household items can also be used for this, these should not be small in size which child can swallow, preferably non-breakable so that they do not cause any harm.
7. Toys used for all stimulation therapy can be prepared locally and Should be safe for the child , Should not have sharp edges, Materials and paint used should be washable, should be low cost.
8. Encourage mother to continue these activities after discharge.

Frequent assessments and counseling was done every week on OPD basis. **Outcome assessment** was done on discharge and 3 months follow up after discharge from MTC.

OBSERVATIONS

This study was conducted at Malnutrition Treatment Center (MTC) in Balchikitsalaya, RNT Medical College, Udaipur (Rajasthan). Out of total 218 cases 133(61%) were male and 85(39%) were female. Cases divided in 5 groups as 95 (43.5%) were 6 months to 1 year, 85(39%) were 1 year to 2 years, 24(11%) were 2 years to 3 years, 10(4.6%) were 3 years to 4 years and 4(1.8%) were 4 years to 5 years of age group. All patients belonged lower socioeconomic status of which 161(74%) lower, 12(5.5%) middle lower and 45(20.5%) belonged to upper lower status.

On clinical examination 161(74%) had fever, 61(28%) had cervical lymphadenopathy, 101(46%) had edema and 185(85%) had pallor. Associated co-morbidities were diarrhea 17(8%), sepsis 50(23%), anemia 85(39%), pneumonia 57(26%) and others 9(4%).

Table 1 Distribution Of 6 Months To 1 Year Age Group With Their Development At Discharge And At 3 Months Follow-up (n=95)

Developmental domain	at discharge		at 3 months follow up	
	Delayed	Improved	Delayed	Improved
Gross Motor	64(67.37%)	31(32.63%)	31(32.63%)	64(67.37%)
Fine Mortar	13(13.68%)	82(86.32%)	1(1.05%)	94(98.95%)
Cognitive	5(5.26%)	90(94.74%)	0	95(100%)
Receptive	58(61.05%)	37(38.95%)	52(54.74%)	43(45.26%)
Expressive	49(51.58%)	46(48.42%)	43(45.26%)	52(54.74%)
Social Emotional	54(56.84%)	41(43.16%)	51(53.68%)	44(46.32%)
Self Help	92(96.84%)	3(3.16%)	92(96.84%)	3(3.16%)

Table no.1 show that after giving play therapy during hospitalization and after discharge at home children of age group 6 months to 1 year showed maximum improvement in cognitive domain (94.74%), (100%), fine motor (86.32%), (98.95%) and gross motor (32.63%), (67.37%) at discharge and after 3 months respectively. More than 50% children achieved cognitive and fine motor milestone for that age (P-value<0.05). Delayed development was still present in some children but maximum was present in self help (96.84%), (96.84%). There was statistically no significant difference between age appropriate mile stones in these children at the time of discharge and at 3 months follow up in receptive, expressive, social emotional and self help domain (P-value>0.05).

Table 2 Distribution Of 1 Year To 2 Year Age Group With Their Development At Discharge And At 3 Months Follow-up (n=85)

Developmental domain	at discharge		at 3 months follow up	
	Delayed	Improved	Delayed	Improved
Gross Motor	57(67.06%)	28(32.94%)	48(56.47%)	37(43.53%)
Fine Mortar	51(60.00%)	34(40.00%)	21(24.71%)	64(75.29%)
Cognitive	44(51.76%)	41(48.24%)	20(23.53%)	65(76.47%)
Receptive	60(70.59%)	25(29.41%)	71(83.53%)	14(16.47%)
Expressive	57(67.06%)	28(32.94%)	54(63.53%)	31(36.47%)
Social Emotional	83(97.65%)	2(2.35%)	82(96.47%)	3(3.53%)
Self Help	75(88.24%)	10(11.76%)	73(85.88%)	12(14.12%)

Table no.2 show that age group 1 year to 2 year showed maximum improvement in cognitive (48.24%), (76.47%) and fine motor (40.00%), (75.29%) at discharge and after 3 months respectively which is statistically significant (P-value<0.05). Least improvement occurs in Social Emotional (2.35%; 3.53%) followed by Self Help (11.76%; 14.12%). Gross motor, expressive and receptive domains showed improvement in some children but were not statistically significant (P-value>0.05).

Table 3 Distribution Of 2 Year To 3 Year Age Group With Their Development At Discharge And At 3 Months Follow-up (n=24)

Developmental domain	at discharge		at 3 months follow up	
	Delayed	Improved	Delayed	Improved
Gross Motor	22(91.67%)	2(8.33%)	19(79.17%)	5(20.83%)
Fine Mortar	19(79.17%)	5(20.83%)	17(70.83%)	7(29.17%)
Cognitive	17(70.83%)	7(29.17%)	13(54.17%)	11(45.83%)
Receptive	23(95.83%)	1(4.17%)	23(95.83%)	1(4.17%)
Expressive	24(100%)	0(0.00%)	24(100%)	0(0.00%)
Social Emotional	24(100%)	0(0.00%)	24(100%)	0(0.00%)
Self Help	23(95.83%)	1(4.17%)	23(95.83%)	1(4.17%)

Table no. 3 shows that in age group 2 year to 3 year there is some improvement in fine motor (20.83%; 29.17%) and cognitive (29.17%; 45.83%) but these are not statistically significant (P-value>0.05). There was gross motor improvement (8.33%, 20.83%) in some children. Rest of the domains does not show improvement in this age group of 2 year to 3 years children.

Table 4 Distribution Of 3 Year To 5 Year Age Group With Their Development At Discharge And At 3 Months Follow-up (n=14)

Developmental domain	at discharge		at 3 months follow up	
	Delayed	Improved	Delayed	Improved
Gross Motor	14(100%)	0(0.00%)	13(92.86%)	1(7.14%)

Fine Mortar	13(92.86%)	1(7.14%)	12(85.71%)	2(14.28%)
Cognitive	13(92.86%)	1(7.14%)	12(85.71%)	2(14.28%)
Receptive	13(92.86%)	1(7.14%)	13(92.86%)	1(7.14%)
Expressive	14(100%)	0(0.00%)	14(100%)	0(0.00%)
Social Emotional	14(100%)	0(0.00%)	14(100%)	0(0.00%)
Self Help	14(100%)	0(0.00%)	14(100%)	0(0.00%)

In table no. 4 there are 14 children in age group 3 year to 5 year. Few children showed a little or no improvement even after 3 months follow up and play therapy which is statistically not significant. Some domains like expressive, social emotional and self help did not show improvement in any children.

DISCUSSION

In present study, more numbers of male children were affected with illnesses as their female counterparts which might be because of higher susceptibility to infections in them. This may also be explained by the higher rates of seeking medical attention by parents in male infants due to prevailing gender bias in society. All families of the SAM children belong to low socio-economic groups and live in poor home environments, all of which could compromise the care and attention that the SAM child's needs. A depriving home environment and poor nutrition remain detrimental to the outcomes of the intervention. This is the case with the present study. Piccolo et al point out that the whole sample is essentially from low socioeconomic status families.[11] Previous publications with such longitudinal data reported that socioeconomic conditions and maternal mental health were associated with language [12], memory and executive function, poor performance, and stress [13].

This study reveals that lower age groups were having more number of cases of developmental delay as 95 (43.5%) were 6 months to 1 year, 85(39%) were 1 year to 2 years, 24(11%) were 2 years to 3 years, 10(4.6%) were 3 years to 4 years and 4(1.8%) were 4 years to 5 years of age group. Similarly Zhang et al found that Overall, 35.7% of the surveyed children under 3 years of age had suspected developmental delay. Across all age groups, the prevalence of suspected developmental delay was inversely associated with the child's age, with the highest rate (48.0%) among children aged 6–11 months and the lowest (22.8%) among children aged 30–35 months. Across all domains, the prevalence of delay in communication skills was the lowest (8.9%) and that of delay in fine motor skills was the highest (20.6%); the prevalence of the other domains ranged from 15.1% to 16.7%.[14]

In this study out of 218 children 95 were in age group of 6 month to 1 year after giving play therapy during hospitalization at time of discharge maximum improvement seen in cognitive(94.74%) followed by fine motor(86.32%) and least improvement seen in self help(3.16%). After 3 months of follow up all children 100% improved in cognitive sphere, 98.95% in fine motor and 67.37% in gross motor. Even after 3 month of follow up none of the child achieve normal development for age. There was statistically significant difference seen between, cognitive, fine motor and gross motor mile stones in these children at the time of discharge and at 3 months follow up (P-value<0.05). (Table no.1) The present study reveals that the motor skills in general and the gross motor in particular, are more seriously affected and easily regained than the language and the personal social skills of SAM children. In fact, more severe effects on motor skills (gross) is expected since severe acute malnutrition reduces muscle mass. Muscle atrophy could reduce a child's physical activity and determine further explorations and interactions with environment.

There are 85 children in age group of 1 year to 2 year. At discharge maximum improvement seen in cognitive (48.24%) followed by fine motor (40.00%). Least improvement seen in social emotional (2.35%) followed by self help (11.76%). After 3 months of follow up maximum improvement is seen in cognitive (76.47%) and fine motor (75.29%) which is statistically significant. y might have been too short to generate a significant effect.

Abessa et al[15] find that the intervention group improved significantly on gross motor during hospital follow-up by 0.88 points ($p < 0.001$, effect size = 0.26 SD), and on fine motor functions during the home follow-up by 1.09 points ($p = 0.001$, effect size = 0.22 SD). Both young and older children benefited similarly from the treatment. The intervention did not contribute significantly to linear growth and nutritional outcomes.

Above data show that significant improvement is seen only in lower age groups of <2 years. As the age advances chances of improvement are less. Henceforth early identification and management of SAM child in terms of nutrition and stimulation therapy does significant impact over developmental status of a child. The first two years of life are critical periods in which brain and physical growth are most active. Nutritional and psychosocial deficits during this time period can result in lifelong impairment and disability. The combination of malnutrition and a lack of psychosocial stimulation are particularly harmful. Improving both nutritional status and stimulation has an added impact on a child's development and recovery. Therefore nutritional and psychosocial interventions should be integrated Though non-significant, the positive trend of improvement observed in the other areas of development could be related to a gradual recovery process. The duration of the intervention in the present study might have been too short to generate a significant effect.

Age related effects of SAM on child development have been documented in some retrospective studies. For instance, there was a lack of significant difference on psychomotor performance between a group of children aged from 6 to 12, who suffered from kwashiorkor during infancy and control groups having no infantile malnutrition.[16] Similarly, a study compared children admitted to hospital with under nutrition during the first year of life. Three to four years later, the mean developmental quotient of children treated in the first 4 months of life, and the control ones was similar. However, there was a difference in the developmental quotient of the control and those treated for under nutrition after 4 months of age.[17] Another study compared subjects of 2 to 21 years of age, who had been severely malnourished and hospitalized during the first 6 months with control siblings on intellectual performance, sensory motor abilities and social adaptation. No significant difference was found for the older subjects. It was argued that the significant effect of infantile malnutrition prevails only in children aged between 2 to 5 years following their episode of malnutrition, and that there is no significant difference after the age of 5 years.

CONCLUSION

Present work state A crucial relationship between neuropsychomotor development at early age with play therapy. Our findings call attention to the importance of early evaluation of children's development. Delays in child development trigger a complex and damaging cycle for the development of the child with such deficits. Here we found that as a result of play therapy maximum improvement was seen in cognitive, gross and fine motor and least improvement occur in self-help and emotional development. Complete neuropsychological assessment enables early identification of children's preserved and affected abilities. As a consequence, it is possible to delineate effective early pay therapy and likely help children reach better outcomes.

Recommendation

1. Development status should be assessed in all children with SAM at the time of admission.
2. After admission all children with SAM should be given age appropriate play therapy so that not only physical recovery but also there will be recovery in developmental skills of the child.
3. Play therapy should be started early as the age of child advances effectiveness of play therapy decrease.

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