Original Research Article

Clinical profile, management and outcome of under 5 children with severe acute malnutrition in NRC attached to a teaching hospital

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Abstract

Malnutrition is an important contributing factor for most deaths amongst children suffering from common childhood illness, such as diarrhea and pneumonia. Globally, malnutrition is responsible for almost one-half (45%) of the total under five deaths. Present study was undertaken to study the clinical profile and outcome of SAM children in MGM Hospital, Warangal, from december 2016 to september 2018 over 306 children above 6 months under 5 years of age.in this study majority were between the age of 12-24 months(47.4%). URTI (66.7%) was the most common associated comorbidity followed by anemia(50.3%) followed by Acute GE(41.2%). Severedehydration(28.1%)were the most common complication observed followed by Dyselectrolytemia. Every malnourished child can be weaned to healthy life if proper nutritional rehabilitation is provided. Malnutrition clinic in every pediatric set up can go a long way to reduce the childhood morbidity and mortality consequent to SAM.

Keywords: under 5 children, severe acute malnutrition, urti, Nutrition Rehabilitation Center.

Introduction

Moderate acute malnutrition was in about 60 million people and severe acute malnutrition documented in 13 million people worldwide[1]. According to NFHS-3 in India, prevalence of severe acute malnutrition (SAM) is 6.4% in children below 5 years with 100 focus districts having high prevalence of malnutrition being situated in 6 states: Bihar, Jharkhand, Madhya Pradesh, Rajasthan, Orissa and Uttar Pradesh[2]. Morality rate associated with moderate wasting is about 30 to 148 per 1000 children per year and severe wasting is about 73 to 187 per 1000children per year[3].

Children's nutritional status in Telangana according to NFHS-4, 28%of children under age five years are stunted, or too short for their age, which indicates that they have been under nourished for some time. 18% are wasted, or too thin for their height, which may result from inadequate recent food intake or a recent illness causing weight loss, and 5 % are severely wasted. 29% are underweight, which takes into account both chronic and acute under nutrition. 1% of children are overweight. Even during the first six months of life, when almost all babies are breastfed, 12 percent of children are stunted, 20 percent are underweight, and 40 percent are wasted[4]. Childhood under nutrition is an important public health issue and challenge in India[5]. At any point in time, an average eight million Indian children under age five years are severely wasted and are susceptible to acute complications, mortality and long term sequel[6]. There is an indirect as well as direct correlation of mortality in children with SAM. Emphasis is laid more on Management of SAM due to nine times higher risk of mortality than in well-nourished child[6]. Mortality can be prevented if timely action is taken with regard to nutritional rehabilitation and management of complications in children with SAM[7]. Besides increased mortality, malnutrition is associated with increased morbidity in terms of recurrent infections, growth retardation, and impaired long term psychosocial and cognitive Development[8]. SAM is the commonest reason for paediatric hospital admission[9].

The prevalence of malnutrition varies across states like Madhya Pradesh recording the highest rate (55%) and Kerala among the lowest (27%)[10]. This is believed to be due to a combination of socio-economic and societal factors including poverty, food insecurity, gender inequality, disease and poor access to health and developmental services[10]. Recovery rates in inpatient facilities to treat SAM children (NRCs)varied from state to state ranging from 37.1% to 65%[11]. There is paucity of data regarding outcomes of NRCs in Telangana state. Present study was undertaken to study the clinical profile of SAM children and outcome of NRC attached to MGM Hospital ,a tertiary careteaching hospital in north Telangana.

Aims and objectives

- To study the clinical presentation of SAM children at admission.
- To identify comorbidities among these children.
- To study the management and outcome.

Subjects and methods

This is a prospective Observational study conducted in the Nutritional Rehabilitation Center, Department of Pediatrics, Mahatma Gandhi Memorial Hospital, Kakatiya Medical College, Warangal.from December 2016 to September 2018 over 306 children above 6 months under 5 years of age. Institute ethical committee approval was taken before undertaking the study.

Inclusion Criteria

Under 5 children who fulfilled the WHO criteria of SAM

Exclusion criteria

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- Children with congenital mal formations.
- Chronic disorders like cardiac, renal, metabolic were excluded.

Results

Age

31children (10.1%) were Infants (≤12months) and 145 were aged between 12 to24 months (47.4%). 50(16.3%) children were in the age group of 25 to 36 months.44 (14.4%) children in the age group of 37 to 48 months. 36 (11.8%)children in the age group of 37 to 48 months. The mean age of the study population was 28.2 ± 6.4489 months. The age distribution from<12 months, 12-24 months, 25-36 months,37-48 months 49-60 months, is statistically significant (p-0.0001). Uncorrected chi square 42.29.

Gender distribution

165 boys (53.9%) and 141 (46.1%) girls were enrolled in the study, boys andgirls were equally distributed.(P=0.21).

Geographical location

136(44.4%) were from Urban, 170 from rural (56.6%)

Gender distribution according to geographical area

Out of 306, 70 boys and 66 girls were from urban area,95 boys and 75 girlswere from rural area.

Socio economic status

2 children in the study population belongs to upper (class 1), 56 people belongs to upper middle (class 2),108 people fall in lower middle(class 3),102 lower(class 4) and 38 people belong to lower (class 5) according to modified Kuppuswamy classification. More than 2/3 of the SAM children were in class 3,& 4 which isstatistically significant(P=0.0001) and Z=5.8

Maternal education

More than half(66.1%)either illiterate or studied upto primary school, one fourths of mothers went to high school,22 mothers (7.2%) studied upto intermediate,2(0.7%) mothers studied upto degree and above in the study population.

Birth details

a) **Gestational age:** Out of 306 cases,upto two third cases were preterm, one third cases wereterm at birth.

b) **Birth weight:** 92.2% of SAM children had low birth weight(<2.5kg) and only 7.8% children had normal birth weight(≥2.5kg) .

Feeding details

102 mothers gave history of exclusive breast feed(EBF)till 6 months and weaning at 6 months, another 70 mothers continued Breast feed only, did not start any kind of complementary Feed beyond 6 months, in this 28 mothers were giving BF only at 10 months of age, another 8 beyond 14 months.50 mothers never Breast fed their babies, they were on top feeds only.

- **Details regarding Colostrum:** Only 31% mothers gave history of feeding colostrums. 69% children were not received colostrum.
- **Type of Top feeds among Top fed children:** Out of 134 top fed children, 98(73.1%) fed with animal milk(cow & buffalloe), rest were given formula feeds.(P-0.0003).14 mothers shifted from animal milk to formula and vise versa or mixture of both**.**
- **Top feeds dilution details**: Only 11% children received appropriately prepared formula feeds, rest 88% received over diluted feeds without added sugar in case of animal milk.
- **Type of Complementary feed:** Out of 306 children, 202(66%) received home made complementary feed and 104(34%) fed with commercial preparations.

Immunisation status

64(20.9%) only were fully immunized, rest of 242(79.1%) were partial andunimmunized.(P-0.00) & Z- 8.65%

Admission criteria

270 (88.2%) children were satisfying W/H < -3SD criteria, and 174 (56.9%) Children had MUAC < 115mm, 20(6.5%) had Bipedal edema, 36(11.8%) had wasting.

Medical conditions requiring triage at admission

Out of 306, majority 204(66.7%) had Urti, 154 (50.3%) had anemia, 126(41.2%) had acute watery diarrheoa at admission.60(19.6%) post meningitis cases after antibiotic and supportive care were shifted to NRC for rehabilitation,56(18.3%)were suffering from UTI,of these 26(18.5%) were culture positive, otitis media was found in almost one quarter 72(23.5%)of children.Half of children (50.3%) had anemia, mean hb was 8.8±1.69 grams.

Signs of specific nutrient deficiencies at admission

Out of 306 cases, loss of appetite as a presenting complaint was seen in 50.3%. signs of vitamin A,B,D deficiencies were observed in 19%,24.8%,20.9% respectively. skin changes(zinc deficiency) were seen in 14.4%, Hair changes(multi mineral deficiency) seen in 24.2%, Mental changesseen in 8.5%.

Life threatening complications at admission

Out of 306cases, 122(39.8%) children were admitted with life threateningcomplications, all could be triaged successfully.

Investigations

a) **Dyselectrolytemia:** Out of 306, 242(79.1%) had normal levels of s.electrolytes, 36(11.8%) had Hyponatremia, 24 (7.8%) had Hypokalemia,4(1.3%) hypocalcemia.

b) **Complete stool examination:** Stool examination was normal in 8.8% children17% children had occult blood in stool sample and reducing substances parasitic ova and cysts seen in 11.8%,0.7%,1.3% respectively.

c) **Other Investigations:** In 26(8.5%) children urine culture turned out to be positive, in 30(9.8%) children blood culture was positive, 36(11.8%)children had pneumonic changes in chest x ray.

Outcome

Out of 306 children, about one third 33.7%(103) recovered totally (wt gain >15% of admission weight),another one third 35%(107) partially recovered(wt gain was recorded but <15%),another one third cases 31.4%(107) were defaulted due to various socio economic reasons. Average weight gain at discharge- 9.82±9.07 Average length of stay-9.6±5.3days.

Discussion

Present prospective observational study was carried out at NRC, Department of pediatrics MGMH to observe the clinical profile of under 5 children with SAM from December 2016 to September 2018, to determine outcome indicators of NRC.

Age wise distribution

The study revealed that majority are between the age of 12-24 months(47.4%),cumulatively less than 24 months of age group constitute major proportion of 57.5%.The mean age of the present study population was 28.2±6.44 months, in comparison to 17.21±13.94 months in sumandas et al[12]. In present study, age distribution from<12 months,12-24 months,25-36 months,37-48 months,49-60 months is statistically significant (p-0.0001) Similarly, in the studies by Choudhary[13] & Mamidi[14], majority of patients (96% and 71% respectively) were below 24 months. In the first 2 years of life, rapid growth occurs and requirement of substrates for energy and building of tissues also increases, thus deficiency of energy, protein andmicronutrients often result in malnutrition.

Gender distribution

Present study constitute 53.9% of males,46.1%females,this difference is not statistically significant and these findings are similar to study done by Dr nimisha pandya[15].A male preponderance was reported by various studies, choudhary Metal[13], Ashraf[16] described higher incidence of malnutrition in males (74.6%,53.7% respectively) in their hospital based studies.Higher number of female patients was also found by Joshi (78%)[17].

Geographical Area wise distribution

In present study majority children (56.6%) from rural areas, similar to nimisha pandya[15] 69.5%,suman das[12] 75% and 85 % in Syed Tariq[18]. NFHS-3&4 surveys also shows higher incidence of third of children in Rural households are malnourished[12].

Socioeconomic status (Modified kuppuswamy scale)

33% belongs to upper lower socio economic strata, similar to suman das et al[12] study, together 45.7% belongs to lower socio economic strata. 53.6% from middle socio economic strata. More than 2/3 of the SAM children were in class 3,&4 which is statistically

significant(P=0.0001) and Z=5.8 .Chowdhury[13], Tariq[18] ,Goyal [4] and Devi[19] reported 96%,83.6%,76%,89.8% patients belonging to lower socio-economic strata. This indicates that poor purchasing power, unavailability of food, improper distribution make the children vulnerable to malnutrition in deprived community.

Maternal literacy

37.3% mothers are illiterate, 28.8% studied up to primary school, 26.1% studied upto high school,only7.2%and 0.7% are studied up to intermediate and degree & above respectively. Present study shows high Maternal illiteracy, similar to chowdhary[13] and Goyal [4],Joshi[20] and Mittal[21] described education beyond high school level among 31% and 21.2% of mothers of SAM children, which was similar to our study.

Birth details

- **Gestational age**

out of 306 children,200(65.3%) were prematurely born and 106(34.6%) were term gestation, It was evident from data that a higher percentage of children with prematurity were malnourished compared to those children who born at term gestation, this data showing very strong correlation between prematurity and severe acute malnutrition later in infancy and early childhood.

- **Birth weight**

In present study, 92.2% of SAM children had low birth weight (<2.5kg) and only 7.8% children had normal birth weight(≥2.5kg). It is evident from datathat a higher percentage of children with LBW are malnourished compared to those with normal birth weights. Although several studies have been conducted to identify the important risk factors of malnutrition, none of them assess the role of LBW despite its high prevalence (36%),this study hasprovided evidence of a strong link between LBW and child malnutrition.In a study done by M shafiquer rahman[22] et al provided the evidence, among the children with LBW, 50.9% are stunted, 24.6% are wasted, and 52.1% are underweight compared to 38.6%, 13.9% and 32.6%, respectively inthe case of children with normal birth weights.

Immunisation

In our study 234(76.5%) children were partially immunized 8 (2.6%)children were un immunized. only 64(20.9%) children were fullyimmunized. this data is similar to suman das study, where 6.35% of children were unimmunized and 85.71% were partially immunized . The percentages were 42.7% versus 44% and 24% versus 62.3% in studies by Chowdhury[13] and Tariq[18]. Thus, failure of complete immunization is associated with SAM. However, Aprameya[23]. reported 84.6% and 42.3% SAM children were completely immunised in their studies. Appropriate catch-up Immunisation should be strictly followed whiledischarging the children from NRC.

Feeding details

- **Type of feed received during first 6 months**

In present study, EBF upto 6 months was done in 27.5% and 56.2% were mixed feed,16.3% were given only top feeds. The percentages were 32% for EBF, 35% for Mixed feeds, in the study done by Devi[19].In the study by Tariq[16], 41% were EBF, 32% were predominantly breastfed and 26.2% were mixed fed. Aprameya[23] reported EBF in 20.9%.

- **Details regarding Colostrum**

out of 306, 95(31%) received colostrums, similar to study done by suman das et al.69% of mothers could not give colostrums due to various reasons including false beliefs regarding colostrum, medical complications of pregnancy, lack of knowledge regarding nutritional benefits of colostrums. The data in the present study was showing significant correlation between SAM and children who were not given colosrum(P-0.00001).

Anthropometric data

majority (88.4%) were satisfying the W/H <-3SD criteria, in Manab narayana[24] 63.3%,in dhanalaxmi et al[25] all children were W/H <-3SD suggesting W/H is the most useful diagnostic criteria.

Comparison of MUAC

MUAC <11.5 cm was seen in 56.9%in present study, only 9.44% SAM children>6 months age had MUAC<11.5cm in suman das et al[12] Devi[19] reported sensitivity, specificity, positive predictive value (PPV) and negative predictive value of 44.9%, 94.74%, 84.62% and 72.73% of 11.5 cm MUAC as a diagnostic criteria for SAM. Dasgupta[26] also reported low sensitivity (17.5%) and PPV (30.5%) of MUAC cut-off value of 11.5cm. However, Finnish[27] and Bangladeshi[2 8] studies found MUAC<11.5cm to be a single useful criterionfor identifying malnutrition.

Comparison of percentages of bi pedal edema among variousstudies

Bipedal edema was seen in 11.8% incontrast to 1.11% in dhanalaxmi et al[25],5% in M.R.Prashanth et al[29]. 6.5% had visible severe wasting in present study.

Medical condition requiring triage at admission

URTI (66.7%) was the most common associated comorbidity followed by anemia(50.3%) followed by Acute GE(41.2%).Together acute respiratory tract infections (urti & lrti) are major comorbid condition in our study. Similar findings were noted in bharati et al. acute respiratory infections 33.45% was major co-morbid conditions followed by diarrhea 18.89% .In contrast LRTI was the most common associated infection followed by Acute GE in sumandas[12],Chowdhury[13], Tariq[18], Kumar[30]. As per NFHS-3, 70% in age group, 6-59 months are Anaemic in India[31]. 50.3% children are anemic in present study, whereas 88% children were anemic in Alka mathur et al[31]. mean Hb at admission In present study 8.8±1.69 grams. High number of cases with UTI noted in present study (N=56,18.3%), while 9% in nimish pandya[15],2.7% in syed tariq[18],2.3% in sumandev[12], 4% in chaudhary[13]. Incidence of TB(1.3%) is similar to that reported by sumandas[12] 0.63% and dhanalaxmi[25] 1.3%,is lower than syed tariq 6%[18]. Incidence of Otitis media 23.5% in our study, unlike in suman das[12] 0.79%,choudhary[13] 2.7%, sumandas 0.79%. Incidence of HIV 1.3% in our study while 0.1% in nimish pandya[15], 0.31% in sumandas[12]. Incidence of skin infections 15% in our study,in contrast to 7.94% insumandas[12].

Symptoms and signs of specific nutrient deficiencies at admission

Most common presenting symptom was Fever in 67.3% similar to Rinki shah[32] followed by cold and cough (urti) 66.7%,loss of appetite was seen in 50.3%. Most common vitamin deficiency was vitamin B — as also described by Chowdhury[13]Skin changes due to zinc deficiency seen in 14.4% in contrast to 30.16% in sumandas[12].Hair changes due to multi mineral deficiency seen in 24.2% in contrast to 34.92% in sumandas.

Life threatening complications

Severe dehydration(28.1%)were the most common complication observed followed by Dyselectrolytemia, seen in 20.9%,among Dyselectrolytemias, Hyponatremia (11.8%), Hypokalemia (7.8%), Hypocalcemia(1.3%)was frequent. These findings are in contrast to Nimisha pandya[15], RinkiH shah[32]. Hypoglycemia(6.5%) similar to Tariq[18] 6.8%,veryhigh in chaudhary[2] 21.3%,Hypothermia (5.2%) incontrast to sumandas[12] and devi[19], Tariq[18] was 20.31%,11.5%,11% respectively. This implies that all SAM children should be suspected to have infections on their arrival to health facility. Infection may not produce the classical signs of fever in SAM children. Instead severe infection may be associated with hypothermia. All SAM Children must be suspected and screened for above complications.

Table 1 : Comparing the complications and comorbidities among variousstudies

Characteristic	Present study(%)	Chowdhury[13] (%)	Kumar[30] (%)	Tariq[18] (%)	Devi[19] (%)
Anemia	50.3	85.3	88.3		69.2
Vit B def.	24.8	40	14.4		
Vit A def.	19	28	5.8		
Vit C def.		1.3	1.9		

AGE	72.6	50	33.6	30.1	14
LRTI	17	52	27.9	26.3	63
TB	1.3	9.3	22.1	4	
HIV	1.3	4	2.9		2.6
Otitis media	23.5	2.7			
Measles	0.7	4	3.8	3.8	
UTI	18.3	4	1	2.7	1.3
Pedal edema	6.5	14.7	27		
Skin infection	15		18.2	16.3	
hypoglycemia	6.5	21.3		6.8	
hypothermia	20.31			11	11.5
hypokalemia	7.8			9.58	6.4

Investigations

Positive urine cultures obtained in 8.5% cases. The UTI has come outto be one of the major co-morbidity, with positive culture in 22%in Alka mathur et al[31];*E. coli* was causative agent in more than 90 % cases. Wide variation has been reported in the incidence of UTI in different studies. In a study on "Infections in Children Admitted with Complicated SAM in Niger" out of 300 children tested, a UTI was detected in 48 (16%). *E. coli* represented more than three quarters (n= 37/48) of the microorganisms isolated[32]. On the contrary, very low incidence has been reported by R. Kumar et al[30] in Rewa study only 1%.In Review article on SAM and infection by Kelsey D. J. Jones, James A. Berkley[33] in different studies UTI has been reported to range from 11% to 42 %. Most of the studies reviewed for this are conducted amongst sick SAM children treated in inpatient facilities at tertiary centres. Such a high incidence emphasizes that all SAM cases should be investigated for UTI irrespective of signs and symptoms.

Treatment details

Table-2: Children with different complication were treated accordingly and the details were given below

Treatment modality	Frequency	Percentage
IVF	156	50.9%
Antibiotics	262	85.6%
F75	258	84.3%
F100	306	100%

Mean duration of stay 9.6 ± 5.3days.Mean weight at admission 8 ± 2.09 grams. Total quantity of F75 offered during stabilization phase 2580 ml. Total quantity of F100 offered during transition and rehabilitation phase 7680ml.

Outcome

Recovery (weight gain >15% of admission weight) 33.7%is very much low when compared to national guidelines(>75%)and other studies Tariq (75.3%), dhanalaxmi(81%), and Nimisha pandya (93%), Partial recovery (weight gain <15% of admission weight) is 35%, in contrast to Tariq (29%). Defaulter rate (31.4%) is very much higher than national guidelines (<15%) and various other studies. Because we discharged many patients due to personal and social reasons. This led to high number of incomplete follow-ups and many of them lost follow up due lack of motivation by field level health workers. This may be the reason for less cure rate in our study. Discharged patients were not seen by peripheral health workers ASHA/ANW, which could have increased the follow up. This highlights the importance of community-based program for the management of SAM withoutmedical complication and for those who are to be followed up after NRC care should be in place to complement the services of NRCs. Death rate is 0% during the study period and within the range of national guidelines and lower than other studies.Average weight gain is 9.82 ± 9.07gr/kg/day is more than national guidelines and other studies. Mean length of stay is 9.6 ± 5.3 days is very less[34].

Conclusion

- This study highlighted the need of mothers to have accurate knowledge about infant and young child feeding practices.
- W/H Ratio is best among four criteria for identifying SAM
- There is a strong impact of IYCF practices on nutritional status and morbidity of children.
- It is practical and effective to manage complicated SAM as per GOI and WHO guidelines,in a hospital setting with NRC attached with pediatrics department.
- Hospital based management of SAM children in NRC is a significant step in reducing morbidity and mortality among undernourished children.
- NRCs provides life saving care for children with SAM as demonstrated by the high survival rates of the program.
- High defaulter rate and low recovery rate are of particularly concern.
- Short duration of stay in NRC is major handicap to outcome.
- Community based therapeutic care for children with Uncomplicated SAM needs to become a key component of the continuum of care for children with SAM. Hence strengthening of centrally sponsored community based ICDS program is essential in early detection and management of SAM.
- Every malnourished child can be weaned to healthy life if proper nutritional rehabilitation is provided. Malnutrition clinic in every pediatric set up can go a long way to reduce the childhood morbidity and mortality consequent toSAM.
- New approaches for the management of SAM, such as community-based therapeutic care, complement the existing WHO inpatient protocols. These programmes use ready-to-use therapeutic food to treat most children suffering from SAM as outpatients, reserving inpatient treatment for those with complications.

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