

Study of Various Co-Morbid conditions in 6 months to 60 months in Age Group Children with Severe Acute Malnutrition

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ABSTRACT

Background: Severe acute malnutrition (SAM) among children below five years of age remains a major embarrassment and impediment to optimal human capital development in India. India is home to greatest population of severely malnourished children in the world and accounts for over 20% of underweight deaths and 2.1 million children do not survive up to 5 years of age.

Aim: To study the various co-morbid conditions in children in age group of 6 to 60 months with severe acute malnutrition.

Materials and Methods: A Hospital based descriptive study was carried out in Nutrition Rehabilitation Centre, Department of Pediatrics, SVRR Govt. General Hospital, Tirupati over a period of 1 year from September 2014 - August 2015. All children in the age group of 6 months to 60 months satisfying WHO criteria for defining SAM admitted in hospital were included in the study.

Results: Out of 176 patients, 54.81% were from rural areas and 45.19% were from urban areas. In this study most common co-morbid conditions identified were GIT infections (36.14%) followed by respiratory tract infections (28.3%), UTI (7.8%), Malaria (5.4%), Septicemia (4.8%) and Tuberculosis (3.01%). Most common minor co-morbid condition was anaemia contributing to 50.6%. Among vitamin deficiencies, vitamin B deficiency (15.06%) was the most common vitamin deficiency seen in children with SAM.

Conclusion: Apart from nutritional rehabilitation, timely identification and treatment of comorbid conditions like diarrhoea, acute respiratory tract infection, anaemia and micronutrient deficiencies is vital in malnourished children, so as to break under nutrition-disease cycle, and to decrease mortality and to improve outcome.

Keywords: Children, Severe acute malnutrition, WHO criteria, Co-morbidities, Gastrointestinal infections.

INTRODUCTION

Severe acute malnutrition (SAM) among children below five years of age remains a major embarrassment, and impediment to optimal human capital development in India. India is home to greatest population of severely malnourished children in the world and accounts for over 20% of underweight deaths and 2.1 million children do not survive up to 5 years of age.

Malnutrition is one of the leading causes of morbidity and mortality in children throughout the world. [1] In India, 6.4% of children under the age of 5 years are

suffering from SAM.^[3, 4] Median case fatality rate in children under 5 years is approximately 23.5% in SAM which may reach 50% in edematous malnutrition. This fatality rate can be brought down to 7-10% by standard case management protocol.^[3]

In India According to the National Survey (NFHS-3, 2005-06) 43% children under age of five years are underweight (low weight for age). 48% children under five are stunted (low height for age). 20% children under five years of age are wasted (low weight for height); Over 6% of these children are severely wasted (< 3SD) since, wasting denotes acute malnutrition, these children are said to have

Severe Acute Malnutrition.^[2,4] The levels of child under nutrition is unacceptably high in almost all states, even though some states like Goa, Kerala, Manipur, Mizoram, Punjab and Sikkim have lower levels.^[2]

Besides increasing risk of mortality, under nutrition leads to growth retardation and impaired psychosocial and cognitive development. A child with SAM can present with various co-morbid conditions which may be organic or non-organic causes. Children with malnutrition are highly susceptible to various infections when associated with various risk factors and co-morbid conditions.

A child with SAM also presents with various micronutrient deficiencies which should be identified early and managed appropriately. Nearly 70% (6-59 months) have anemia. Of these 26% have mild anemia, 40% have moderate anemia and 3% have severe anemia, 22% newborns have low birth weight (below 2.5Kgs).^[2,4]

Strong evidence exists on synergism between under-nutrition and child mortality due to common childhood illnesses including diarrhea, acute respiratory infections, malaria and measles. Prevention of deaths due to severe acute malnutrition (SAM), specialized treatment and prevention interventions are required.

In India, usually a SAM child presents to health care facility with one of the infections or clinical profile of various underlying disorders rather than isolated growth failure. Early identification of various co-morbid conditions, infections and proper management of complications play a vital role in deciding outcome during nutritional rehabilitation in a SAM child.

Hence the present study was undertaken to evaluate incidence of co-morbid conditions in children admitted with severe acute malnutrition and assessment of relative contribution of various variables.

MATERIALS AND METHODS

A hospital based descriptive study was carried out in Nutrition Rehabilitation Centre, Department of Pediatrics, Sri Venkateswara Ramnarain Ruia Government General Hospital (SVRRGGH), Tirupati, over a period of 1 year from September 2014 to August 2015.

All children in the age group of 6 months to 60 months satisfying WHO criteria for defining Severe Acute Malnutrition (SAM) admitted in Nutrition Rehabilitation Centre, Department of Pediatrics, SVRRGG Hospital were included in the study. Children with Mild to Moderate acute malnutrition, mothers who are not willing to participate in the study and outpatients were excluded in this study.

Permission to conduct the study was obtained from

Institutional Ethics Committee (IEC), Sri Venkateswara Medical College, Tirupati. Study has been conducted after taking written informed consent from the caretaker.

Detailed history has been taken and thorough general and systemic examination was done and vital signs were taken. Clinical signs of micronutrient deficiency and frequency of various co-morbid conditions in the study population were assessed. Diagnosis of under-nutrition was based on weight/height or length and MUAC as explained below.

Weight measurement

Infants under two years of age were weighed using a 25 kg Salter hanging scale while those above two years of age were weighed while standing on the measuring board. The scales were adjusted to zero before each measurement. The child weight was recorded to the nearest 100 grams and was then measured daily during the morning before ward round. Weight for height is compared.

Length / Height measurement

In patients up to the age of 24 months, length was measured using a length board in the recumbent position by two examiners. For those above 24 months and who were able to walk, height was measured while standing using a height meter. Weight for height / length and Z score of less than -1 was indicated as mild, less than -2 was indicated as moderate and less than -3 was indicated as severe wasting.

Mid-upper arm circumference (MUAC)

Measurements were done mid-point between acromion and olecranon process by tape measure on the left arm. The reading was recorded to the nearest 0.1 cm. Children with MUAC of 12.5-13.5 cm were mild, 11.0 to 12.5 cm were moderate and less than 11 cm were considered severe malnourished.

Specimen collection and laboratory procedures

Several laboratory tests were done in order to diagnose or rule out common illness and other associated co-morbidity on the first day of admission.

- Thick blood smears for malaria parasite using Giemsa stain.
- Stool for microscopic examination was collected on the same day of enrollment using wide-mouth screw cap clean container. Specimens were sent to the laboratory for analysis on the same day and most of specimens were analyzed within 3 hours of collection.
- Complete blood picture: 2ml of venous blood was

collected in anti-coagulated vacutainer (purpletop) and mixed properly and immediately sent to the laboratory for examination. Blood samples were run in automated hematology analyzer.

- Blood was taken for culture and antibiotic sensitivity.
- Urine culture and antibiotic sensitivity: Children under study were given to the mother how to collect the mid-stream urine.
- Random blood glucose measured using glucometer machine.
- HIV testing was done using IgM ELISA in children above 18 months old.
- Chest x-ray was taken in antero-posterior view to every child who had pneumonia according to IMCI guidelines.
- Other necessary investigations like 2D-Echocardiography and neuroimaging was performed as and when required for underlying etiology.

Patient's management protocol

All children who met the criteria for admission in malnutrition ward were managed and followed till discharge of the child according to WHO guidelines for management of moderate and severe malnutrition

Discharge criteria: Children were discharged as per discharge criteria of WHO guidelines.

Data Analysis: Data was tabulated using Microsoft Excel 2007.

Ethical considerations

Child's parents / caregivers were explained about the condition and the study in their own language and consent was taken before the child is recruited into the study.

RESULTS

From a total of 182 children aged between 6 to 60 months were admitted, out of which 16 were excluded as per exclusion criteria. Remaining subjects were included and studied for various co-morbid conditions.

In the present study, most common co-morbid condition associated was gastrointestinal infections (36.14%) followed by respiratory tract infections (28.3%), UTI (7.8%), Malaria (5.4%), Septicemia (4.8%), Tuberculosis (3.01%).

And most common minor co-morbid condition associated was anaemia contributing to 50.6%. Among vitamin deficiencies, vitamin B deficiency (15.06%) was the most

commonly seen in children with SAM.

Among minor comorbid conditions seen in SAM, anemia is the most common and is predominantly seen in girl children 58.2% of total children with anemia in this study. Mean age of distribution in the present study was 20.4 ± 11 months with majority of cases seen in between 13 to 36 months of age.

In present study, 77(46.38%) were males and 89(53.62%) were females with female predominance, 54.81% were from rural areas and 45.19% were from urban areas, most of the mothers belonged to age group between 21 to 25 years of age (51.8%).

Almost 92.7% of total mothers are under the age of 25 years, 42.77% of the mothers were illiterate, Majority of the children in the present study were breast fed for less than 3 months of age, most of the children was exclusively breast fed beyond 6 months of age, 42.7% children were partially immunized. 51.7% of children under study belonged to lower socio economic status (Class IV and V) according to Modified Kuppu swamy scale.

DISCUSSION

Severe acute malnutrition (SAM) among children below five years of age remains a major embarrassment, and impediment to optimal human capital development in India. Malnutrition is the one of the leading causes of morbidity and mortality in children throughout the world particularly developing countries.

Under nutrition is associated with high rates of mortality and morbidity and is an underlying factor in almost one-third to half of all children under five years who die each year of preventable causes. Strong evidence exists on synergism between under nutrition and child mortality due to common childhood illnesses including diarrhea, acute respiratory infections, malaria, and measles. Prevention of deaths due to severe acute malnutrition (SAM), specialized treatment and prevention interventions are required.

Severe Acute Malnutrition affects nearly twenty million under five children and contributes to one million child deaths yearly. The mortality rate of children with complicated SAM that receive treatment in inpatient set ups has remained unacceptably high. (Heikens) Such high mortality in inpatient units has been attributed to co-morbid conditions such as infections and micronutrient deficiencies.

In present study, all Children admitted in the age group of 6 months to 60 months of age satisfying WHO criteria¹³ for defining Severe Acute Malnutrition (SAM) admitted in Nutrition Rehabilitation centre, Department of

Pediatrics, SVRRGG Hospital were included in the study. Of these 16 were excluded as per the exclusion criteria and whose parents against medical advice. So total of 166 children were observed. Thorough general and systemic examination was done, and vital signs were taken.

In our study the most common co-morbid condition associated with severe acute malnutrition was gastrointestinal infections (36.14%) followed by respiratory tract infection (28.3%), Urinary tract infections (7.83%), Malaria (5.42%), Septicemia (4.8%). Which was consistent with study conducted by Choudary et al.^[7] Sharma et al.^[8]. Choudary et al.^[7] observed that most common co-morbidity associated with PEM was gastrointestinal (60%) followed by respiratory infection (52%), UTI (4%), and otitis media (2.7%).

Other associated infections were tuberculosis (9.3%), dysentery (6.7%), measles (4%), HIV (4%), Malaria (1.3%). Sharma et al.^[8] reported in his study that the incidence of malnutrition linked with infections was 4%, Diarrhoea and Dysentery constitute majority of infections about 50% and second most common was recurrent upper and lower respiratory infections. Bernalet al.^[11] reported that most common associated illness at admission was diarrhea (68.4%), among these, 31.5% were dehydrated and second most common being respiratory tract infections.

Kumar et al.^[6] found in their study that diarrhea (54%) was the most common comorbid disease associated with SAM followed by acute respiratory infections (27.9%). Malaria and Measles were diagnosed in 3.8% each and HIV infection was seen in 2.88%.

Malnutrition adversely affects the immune status of children and makes them more vulnerable to infections. In severely malnourished patients, both acquired immunity i.e., lymphocyte functions as well as in the most defense mechanisms i.e., macrophages and granulocytes are affected. Diminished immune functions are under nourished patients more susceptible to infections.

In the present study, 54.81% patients were anemic at the time of admission. Prevalence of anemia was high in age group of 13 to 36 months (50.5%). Girl children were mostly affected with anemia contributing to 58.24% of total children with anemia. Choudary et al.^[7] observed in their study that 85.3% patients were anemic at the time of admission and out of them 10.9% mild, 59.3% moderate and 29.7% had severe anemia. Soni et al.^[10] in their study reported that incidence of anemia was 60% in malnourished children. Kumar et al.^[6] observed that among the subjects 11.5% had normal hemoglobin level, 7.6% mild anemia, 55.7% moderate anemia, and 24% had severe anemia. Anemia in PEM has been attributed to a number of factors including nutritional deficiencies, infections, blood loss, hemolysis, and erythroid

hyperplasia, ineffective erythropoiesis due to vitamin-B12 and folic acid deficiency and adaptation to lower oxygen requirements.

In the present study Vitamin deficiencies are seen in 22.2% of cases. The most common vitamin deficiency signs were angular stomatitis, cheilosis, and glossitis. Vitamin-B deficiency is the most common vitamin deficiency in the present study. Other vitamin deficiencies observed were Vitamin-A deficiency (6.6%) and vitamin-D deficiency (0.6%).

Among Vitamin deficiencies Choudary et al.^[7] found that vitamin-B deficiency (40%) was most common followed by Vitamin-A deficiency (28%), Vitamin-D deficiency (6.7%) and Vitamin-C deficiency (1.3%). Sharma et al.^[8] also reported Vitamin-A deficiency in 8.7% cases and Vitamin-B deficiency in 32.5% of malnourished children. Mathur et al.^[12] Singh et al.^[9] Choudary et al.^[7] and Chandna and Sehgal et al.^[13] also reported that angular stomatitis, xerosis of conjunctiva, cheilosis, and glossitis were most common vitamin deficiency signs. The different vitamin deficiencies seen in SAM patients is because of lack of adequate nutritious food intake and the food which is taken have very low amounts of vitamins and minerals making the deficient in the required vitamins.

In the present study apart from anaemia and vitamin deficiencies hypoglycemia was detected in 7.8% cases having blood sugar less than 54 mg/dl. Mild to moderate hypoglycemia is quite common in case of PEM which has no risk of mortality but symptomatic profound hypoglycemia is life threatening and requires urgent treatment. Choudary et al.^[7] in their study detected hypoglycemia in 21.3% cases having blood sugar less than 54 mg/dl. Limitation of the study is as this being a hospital based descriptive study this cannot be extrapolated to general population.

CONCLUSION

Severe acute malnutrition is one of leading cause of mortality and morbidity in our country. Prevalence of malnutrition is still high in hospital setting on the basis of this study. In the present study most common comorbid condition associated with severe acute malnutrition were gastrointestinal infections followed by respiratory tract infections, UTI, Malaria, septicemia and tuberculosis. Anemia was commonly associated minor co-morbidity and Girls were more affected than boys. The high incidence of anemia in these children could be due to nutritional factors as well as incidental helminthic infections. Vitamin-B deficiency is the most common vitamin deficiency seen in children with severe acute malnutrition.

Study of various Co-Morbid conditions in 6 months to 60 months in Age Group Children

Table 1 : Age wise distribution of major co-morbid conditions in the subjects under study

Major co-morbid infections	6 months to 12 months	13to 36 months	37to 60 months	Total
Gastrointestinal infections	20	39	01	60 (36.14%)
Respiratory tract infections	15	25	07	47 (28.3%)
Urinary tract infections	02	09	02	13 (7.8%)
Malaria	03	06	00	09 (5.42%)
Septicemia	06	01	01	08 (4.8%)
Tuberculosis	00	01	04	05 (3.01%)
HIV	00	01	00	01 (0.6%)

Table 2 : Age wise distribution of minor co-morbid conditions in subjects under study

Minor co-morbid conditions	6 to 12 months	13 to 36 months	37 to 60 months	Total
Anaemia	26	46	19	91 (54.81%)
Hypoglycemia	4	9	0	13 (7.8%)
Electrolyte imbalances	3	8	1	12 (7.2%)
Vitamin-A deficiency	0	7	4	11 (6.6%)
Vitamin-B deficiency	3	22	0	25 (15.06%)
Vitamin-D deficiency	0	1	0	1 (0.6%)

Education of mothers and anganwadi teachers regarding importance of introducing complementary feeding and supplementation of iron especially low birth weight and preterm babies till 1 year of age is very important to prevent anemia and SAM. Apart from nutritional rehabilitation, timely identification and treatment of comorbid conditions like diarrhoea, acute respiratory tract infection, anemia and micronutrient deficiencies is vital in malnourished children, so as to break under nutrition disease cycle, and to decrease mortality and to improve outcome.

CONFLICT OF INTEREST :

The authors declared no conflict of interest

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