*Research Article*

# EVALUATION OF THE MOST COMMON CO MORBID CONDITIONS ASSOCIATED WITH SEVERE ACUTE MALNUTRITION IN CHILDREN OF AGE GROUP 0-5 YEARS ADMITTED IN TERTIARY CARE TEACHING HOSPITAL

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## ABSTRACT

**Background:** This study was conducted to evaluate the most common comorbid conditions associated with severe acute malnutrition in children of age group 0-5 years admitted in tertiary care hospital.

**Methods:** A descriptive study was conducted in 120 mothers at nutrition rehabilitation centre (NRC). All children admitted in the NRC with SAM from the age of 1 month to 5 years were included in the study.

**Results:** Out of 120 patients, 49.16% were infants, 35% were toddlers and females are major portion 56%, than males 44%.Out of 120 mothers 48.3% were 18-22 years age group and the patients with commonly observed co morbidities are pneumonia 40.83%, global developmental delay 14.16%, septicemia 9.16% and anemia 8.33% etc. Major Comorbid conditions like Pneumonia 48.97% were observed in 13 to 36 months and Global Developmental Delay 70.58%, Septicemia 63.63% and Failure to thrive 36.36%, Anemia and Gastroenteritis, UTI, Microcephaly in 6 to 12 months children were observed. Minor comorbid conditions like Fever 75% Diarrhea 66.66% fallowed by Rickettsial Fever 100% were observed in 13 to 36 months children and Dehydration 50%, Dysentery 66.66% and cardiac beriberi 100% were observed in 37 to 60 months children.

**Conclusion:** In this study we found majority of comorbid conditions associated with severe acute malnutrition were infectious in origin. This study emphasizes the need to improve knowledge and confidence of mothers through appropriate counselling and support by the clinical pharmacist in association with other health care professionals with the ultimate goal of preventing malnutrition and associated comorbid conditions.

## INTRODUCTION

The term acute malnutrition is applied to describe the consequences of a sudden/sharp period of food shortage, and this is associated with loss of body fat and wasting of skeletal muscle[1]. A lack of dietary energy and one or more micronutrient deficiencies frequently occur concurrently within the same individual[5].

Under nutrition/malnutrition can be classified as mild, moderate or severe based on anthropometry (measurement of the size, weight and proportions of the human body), biochemistry and clinical assessment. The focus of this report is on severe acute malnutrition (SAM) in infants and children[5].

Forms of SAM include kwashiorkor [characteristics include edema which may be mild (bipedal) or severe (generalized), often associated with skin desquamation and hair changes][2, 3], marasmus (characteristics include emaciated appearance) and marasmic kwashiorkor (which has a combination of features). A range of physical and metabolic changes occur as the body tries to conserve energy and preserve essential functions for as long as possible in a process known as reductive adaptation[4].

The three indices - weight-for-age, height/length-for age, weight-for-height/length are used to identify three nutrition conditions: underweight, stunting and wasting, respectively[5, 6].

Strong evidence exists on synergism between under nutrition and child mortality due to common childhood illnesses including diarrhoea, acute respiratory infections, malaria and measles. Prevent deaths due to severe acute malnutrition (SAM), specialised treatment and prevention interventions are required. Besides increasing risk of mortality, under nutrition

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leads to growth retardation and impaired psychosocial and cognitive development.[5]

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.

### *Complications of severe acute malnutrition and their management* [6]

*Hypoglycemia –* 10% glucose/ 10%sucrose, administer antibiotics as hypoglycemia may be a feature of underlying infection.

*Hypothermia -* Re-warm, Put the child on the mother's bare chest (skin to skin contact i.e., kangaroo technique) and cover them, or cloth the child including the head, cover with a warm blanket and place a heater or lamp nearby.

*Dehydration* – Starter diet is given in alternate hours with reduced osmolarity ORS.

*Electrolyte imbalance* – Electrolyte supplements

*Infections* - If the child appears to have no complications give: Oral Amoxicillin 15mg/kg 8-hourly for 5 days. If child has complications (eg; septic shock, hypoglycemia, hypothermia, skin infections or dermatitis, respiratory or urinary tract infections, or lethargic/sickly appearance), use antibiotics.

## METHODOLOGY

This was a hospital based descriptive study conducted over a period of 6 months in 120 patients. This study will be carried out in the Nutrition Rehabilitation Centre.

### *Inclusion criteria*

Children of age group infants to pre-school child (0-5years), admitted with Severe Acute Malnutrition with co-morbidities in Nutritional Rehabilitation Centre, Mothers who gave consent to take part in the study.

### *Exclusion Criteria*

Children with mild to moderate acute malnutrition, mothers who are not willing to participate in the study and mothers who visited out patients, Mothers with children with other co-morbidities-HIV, cardiac, malignancies, chronic renal and hepatic disease and other chronic diseases.

### *Data collection*

Specially designed Proforma was prepared to collect data which includes children/Patient Demographics, Mother Demographics, children and mother history along with general, systemic examinations and anthropometric details of children etc.

### *Study procedure*

Screening of children was done in inpatient department daily during the study period. Each participant's demographic data was collected along with the interview data. Each interview will take 15-20 minutes with in a period of 6 months. Anthropometric indices considered in children were height, weight, mid upper arm circumference (MUAC), age. The mothers of children who were found to be malnourished (visible wasting, bilateral edema, MUAC less than 12.5cm, WHZ less than 2sd) were enrolled into the study.

## RESULTS

A descriptive study was conducted for a period of six months at NRC, department of pediatrics of a tertiary care teaching hospital. A total number of 120 cases were collected.

### *Age wise distribution of patients*

Out of 120 patients, 59 (49.16%) were infants, 42 (35%) were toddlers, followed by 19 (15.8%) were children below 5yrs of age.

**Table 1** Age Wise Distribution of SAM Patients in NRC

| Age | Number | Percentage |
|---|---|---|
| Infants (1 – 12months) | 59 | 49.16% |
| Toddlers (12 – 36 months) | 42 | 35% |
| Child (3 – 12 years) | 19 | 15.8% |

### *Gender wise distribution of patients*

Out of 120 patients females are major portion i.e., 67 (56%), than males 53 (44%).

**Table 2** Gender wise distribution of SAM patients in NRC

| Gender | No. of patients | Percentage |
|---|---|---|
| Male | 53 | 44% |
| Female | 67 | 56% |

### *Mothers age wise distribution*

In our study majority of participated mothers aged between 18 – 22 years (48.3%) followed by 23 – 27 years (32.5%), 28 -32 years (15.8%), >32 years (3.33%).

**Table 3** Mother's age wise distribution of patients

| Mother age | Total | Percentage |
|---|---|---|
| 18 – 22 | 58 | 48.3% |
| 23 – 27 | 39 | 32.5% |
| 28 – 32 | 19 | 15.8% |
| >32 | 4 | 3.33% |

### *Co-morbidities associated with SAM*

In this study out of 120 children only two children were suffering with SAM without any co morbid conditions. Remaining 118 children were presented with one or more co morbid diseases along with. The most common diseases associated with SAM are pneumonia (40.83%), followed by global development delay (14.16%), septicemia, failure to thrive (9.16%), anemia, gastroenteritis (8.33%), UTI (6.66%) etc.

**Table 4** Co-morbidities

| Diagnosis | Number | Percentage |
|---|---|---|
| Microcephaly | 7 | 5.83% |
| Pneumonia | 49 | 40.83% |
| Malaria | 4 | 3.33% |
| URTI | 6 | 5% |
| Septicemia | 11 | 9.16% |
| Enteric fever | 2 | 1.66% |
| Anemia | 10 | 8.33% |
| Failure to thrive | 11 | 9.16% |
| Global developmental delay | 17 | 14.16% |
| Diarrhea | 3 | 2.5% |
| Urinary tract infections | 8 | 6.66% |
| Fever | 4 | 3.3% |
| Rickettsial fever | 2 | 1.66% |
| Gastro enteritis | 10 | 8.33% |
| LRTI | 2 | 1.66% |
| Meningitis | 4 | 3.33% |
| Tuberculosis | 2 | 1.66% |
| Dehydration | 4 | 3.33% |
| Cardiac beriberi | 1 | 0.83% |
| Cerebral palsy | 1 | 0.83% |

| | | |
|---|---|---|
| Jaundice | 1 | 0.83% |
| Rectal prolapsed | 1 | 0.83% |
| Phimosis | 1 | 0.83% |
| Herpes labialis | 1 | 0.83% |
| Left emphysema | 1 | 0.83% |
| Dysentery | 3 | 2.5% |
| VSD | 2 | 1.66% |
| HIV | 1 | 0.83% |
| ACHD | 2 | 1.66% |
| Febrile seizures | 1 | 0.83% |
| Measles | 1 | 0.83% |
| Only severe acute malnutrition | 2 | 1.66% |

### *Age wise distribution of major co-morbid conditions in the children*

In the present study, most common co morbid condition associated was Pneumonia 48.97% were observed in 13 to 36 months and 36.73% were in 37 to 60 months. Followed by Global Developmental Delay 70.58%, Septicemia 63.63% and Failure to thrive 36.36%, Anemia and Gastroenteritis, UTI, Microcephaly in 6 to 12 months children were observed.

**Table 5** Age wise distribution of major co-morbid conditions in SAM children

| Major co-morbid infections | 6 months to 12 months | 13 to 36 months | 37 to 60 months | Total |
|---|---|---|---|---|
| Pneumonia | 7 | 24 | 18 | 49(40.83%) |
| Global developmental delay | 12 | 3 | 2 | 17(14.16%) |
| Septicemia | 7 | 2 | 2 | 11(9.16%) |
| Failure to thrive | 4 | 4 | 3 | 11(9.16%) |
| Anemia | 6 | 3 | 1 | 10(8.33%) |
| Gastroenteritis | 8 | 1 | 1 | 10(8.33%) |
| Urinary tract infections | 3 | 2 | 3 | 8(6.66%) |
| Microcephaly | 2 | 3 | 2 | 7(5.83%) |

### *Gender wise distribution of major co morbid conditions in children*

In this study, female child are more suffered to major co morbid conditions like Pneumonia 77.55%, Global Developmental Delay 76.47%, Failure to thrive 72.72%, Gastroenteritis 50%, Urinary tract infections 62.5%.

**Table 6** Gender wise distribution of major co morbid conditions in children

| Major co-morbid infections | Male | Female | Total |
|---|---|---|---|
| Pneumonia | 11 | 38 | 49(40.83%) |
| Global developmental delay | 4 | 13 | 17(14.16%) |
| Septicemia | 7 | 4 | 11(9.16%) |
| Failure to thrive | 3 | 8 | 11(9.16%) |
| Anemia | 6 | 4 | 10(8.33%) |
| Gastroenteritis | 5 | 5 | 10(8.33%) |
| Urinary tract infections | 3 | 5 | 8(6.66%) |
| Microcephaly | 4 | 3 | 7(5.83%) |

### *Age wise distribution of minor co morbid conditions in children*

In the present study, most common co morbid condition associated was Fever 75% Diarrhea 66.66% fallowed by Rickettsial Fever 100% were observed in 13 to 36 months children and Dehydration 50%, Dysentery 66.66% and cardiac beriberi 100% were observed in 37 to 60 months children.

**Table 7** Age wise distribution of minor co-morbid conditions in SAM children

| Minor co-morbid conditions | 6 months to 12 months | 13 to 36 months | 37 to 60 months | Total |
|---|---|---|---|---|
| Diarrhea | 0 | 2 | 1 | 3(2.5%) |
| Fever | 1 | 3 | 0 | 4(3.33%) |
| Dehydration | 1 | 1 | 2 | 4(3.33%) |
| Rickettsial fever | 0 | 2 | 0 | 2(1.66%) |
| Cardiac beriberi | 0 | 0 | 1 | 1(0.83%) |
| Dysentery | 0 | 1 | 2 | 3(2.5%) |

### *Gender wise distribution of minor co morbid conditions in children*

In this study, male child are more suffered to minor co morbid conditions like Diarrhea 66.55% and Dehydration 50%, Dysentery 66.66% and Cardiac beriberi 100%.

**Table 8** Gender wise distribution of minor co morbid conditions in children

| Minor co-morbid conditions | Male | Female | Total |
|---|---|---|---|
| Diarrhea | 2 | 1 | 3(2.5%) |
| Fever | 1 | 3 | 4(3.33%) |
| Dehydration | 2 | 2 | 4(3.33%) |
| Rickettsial fever | 1 | 1 | 2(1.66%) |
| Cardiac beriberi | 1 | 0 | 1(0.83%) |
| Dysentery | 2 | 1 | 3(2.5%) |

## DISCUSSION

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[5, 6].

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[5, 6].

Our study included the children belonging to age group of 1month to 5 years. The mean age of study population was found to be 19.4 months (SD ±15) which is similar to the findings made by Sharma *et.al*,[8] in their study reported that prevalence of malnutrition is high in children less than 24 months. Similarly Mamidi *et.al*,[9] in their study reported that 71.1% of children were below 24 months. In our study prevalence of malnutrition was high in infants followed by toddlers and children. This is due to in initial 1-3 years of life rapid growth occurs and requirement of nutrients for building of tissue also increases. Thus, deficiency of protein, energy and other micronutrients in these years results in malnutrition. In our study, female patients were affected more when compared to males. This finding was in acceptance with the study performed by Joshi *et.al*,[10] who reported more prevalence of malnutrition among females (78%) than males (22%). This scenario was may be due to variation of parenteral attention towards one gender.[11]

The mental and social development of the child is dependent on the mother and if the mother dies, the child's growth and development are affected. The mother is also the first teacher of the child, and that is why the mother and child are treated as one unit.

In the present study majority of children belonged to mothers whose age was between 18 – 22 years i.e. 58 (48.3%) followed by 23 – 27 years aged mothers 39 (32.5%), 28 – 32 years 19 (15.8%), >32 years 4 (3.3%) which was compared to the study conducted by Mital *et.al.*,[12] maximum number of mothers were in the age group of 21 – 25 years followed by 26 – 30 years.[10] It was observed that younger the age of the mother, more the incidence of SAM in their children showing inverse relation between mothers age and incidence of SAM. younger mothers are poorly nourished and less likely to gain adequate weight during pregnancy and also they are more prone to illness like anemia, preeclampsia which results in low birth weight of the child and also make the child prone to malnutrition.

In our study we observed that out of 120 children only two children were presented with Severe Acute Malnutrition without any co morbid conditions, remaining 118 children were associated with one or more co morbid conditions. The most common co morbid condition associated with SAM was pneumonia 40.83% followed by global developmental delay 14.16%, septicemia 9.16%, failure to thrive SAM9.16%, anemia 8.33%, gastroenteritis 8.33%, UTI 6.66%, microcephaly 5.83%, URTI 5%, diarrhea 2.5%, dysentery 2.5% and others.

Microcephaly (4.02%) is a birth defect where a baby's head is smaller than expected when compared to babies of the same sex and age. Babies with microcephaly often have smaller brains that might not have developed properly and Rectal prolapsed (0.83%) is a condition in which the rectum (the last part of the large intestine before it exits the anus) loses its normal attachments inside the body, allowing it to uncomfortable where as Phimosis (0.83%) is nothing but inability to retract the skin (foreskin or prepuce) covering the head (glands) of the penis and Herpes labialis (0.83%) is an infection of the mouth area that causes small, painful blisters to develop on the lips, gums or throat and Left emphysema (0.83%) is a condition in which the air sacs of the lungs are damaged and enlarged, causing breathlessness and Cardiac beriberi (0.83%) the cardiac insufficiency caused by thiamine deficiency is known as cardiac beriberi. Followed by Meningitis (3.33%), tuberculosis (1.66%) less commonly ventricular septal defect and acute coronary heart disease (1.66%), where as human immune deficiency virus, febrile seizures and measles (0.83%) are observed.

Choudary *et.al.*[7] observed that most common co morbid conditions associated with SAM was gastro intestinal, followed by respiratory infections, urinary tract infections, and otitis media. Other associated infections were tuberculosis, dysentery, measles, HIV, malaria. 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.

In this study mostly affected system are respiratory system where both upper and lower respiratory tract infections are present and most observed disease was pneumonia (40.83%). Generally children are more prone to respiratory tract infections due to their low immunity status.

Generally malnutrition is occurred by so many causes where infections are major. Malnutrition is a double edged sword disease. 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 innate host defense mechanisms i.e. macrophages and granulocytes are affected. Diminished Immune functions render malnourished patients more susceptible to infections.[6]

In the present study, (8.33%) patients were anaemic at the time of admission. Prevalence of anaemia was high in age group of 6 to 12 months (60%) Male children were mostly affected with anaemia contributing to 60% of total anaemic. Soni *et al*[13] in their study reported that incidence of anaemia was 60% in malnourished children.

Anaemia in PEM has been attributed to a number of factors including nutritional deficiencies, infections, blood loss, haemolysis and erythroid hyperplasia, ineffective erythropoesis due to vitamin B12 and folic acid deficiency and adaptation to lower oxygen requirements. [5, 6]

In this study the co morbidities are divided in to major and minor where female child were more prone to major co morbidities and male child were with minor co morbidities.

The different vitamins deficiency 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 them deficient in the required vitamins. Malnutrition occurs due to infections and other illness which results in decreased appetite as well as malnutrition in turn causes infections and other illness due to reduced immunity.[5, 6]

## CONCLUSION

Severe Acute Malnutrition is one of the leading causes of morbidity and mortality in children throughout the world. This high morbidity and mortality was attributed mainly to the co morbid conditions associated with severe acute malnutrition. The most common co morbid condition associated with severe acute malnutrition were pneumonia, followed by global developmental delay, septicemia, failure to thrive, anemia, gastroenteritis, UTI, microcephaly, URTI, diarrhea and dysentery. Anemia is predominantly seen in age group between 6 to 12 months of age and male children were more affected than female children. Pneumonia is predominantly seen in age group between 13 to 36 months of age and female children were more affected than male children. The high incidence of anemia in these children could be due to nutritional factors as well as incidental helminthes infections. Apart from nutritional rehabilitation, timely identification and treatment of co morbid conditions like pneumonia, global developmental delay, diarrhea, 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. This study emphasizes the need to improve knowledge and confidence of mothers through appropriate counselling and support by the clinical pharmacist in association with other health care professionals with the ultimate goal of preventing malnutrition and associated co morbid conditions.

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