# Study of Tuberculosis and other Co- Morbidities with Severe Acute Malnutrion in Bihar

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**Abstract:**

**Background and Objectives:** The term malnutrition refers to both undernutrition as well as overnutrition. Undernutrition is a condition in which there is inadequate consumption, poor absorption or excessive loss of nutrients. Overnutrition is caused by overindulgence or excessive intake of specific nutrients. By using WHO guideline, to identify the children with SAM from the patients admitted in department of Pediatrics, BMIMS Pawapuri.

**Method:** This observational study will be carried out on admitted patients in upgraded department of Pediatrics, Pawapuri Nalanda.

**Conclusion:** Prevalence of Malnutrition is almost similar in both the sexes with slight male dominance. Most of the malnourished child are in the age group of 6 to 12 months, and mean age of presentation was 20 months.

**Keywords:** Immunization, malnutrition, TB, Pneumonia.

## Introduction

The term malnutrition refers to both undernutrition as well as overnutrition. Undernutrition is a condition in which there is inadequate consumption, poor absorption or excessive loss of nutrients. Overnutrition is caused by overindulgence or excessive intake of specific nutrients. However, sometimes the term malnutrition and protein energy malnutrition are used inter changeably with undernutrition. (GHAI) Malnutrition is a most widespread condition affecting health of children. Severe acute malnutrition among children (6-59 month of age) is defined by WHO & UNICEF as any of the following:

1. Weight for height below - <3 SD of the median WHO growth reference.and/or

2. Visible severe wasting and/or

3. Presence of bipedal pitting oedema. In a child below 6 months of age the mid upper arm circumference cannot be used.

SAM is a major public health problem, especially among under-five children in developing countries. Owing to reduced immunity[1], children with SAM are at a higher risk of acquiring infectious diseases including Tuberculosis, which is a major contributor to high mortality among these children. India accounts for one third of the global burden of malnourished children and approximately 46% of the under –five population in the country are moderate to severely underweight ,38% are moderately to severely wasted. TB is one of the most important infectious diseases in India with almost 40% of the population infected, approximately three million prevalent active tuberculosis cases (256/100000 population) and two million incident cases every year (185 /100,000 population). It is well known that malnutrition is one of the strong risk factors for progression from TB infection to disease and contributes to 26% of incident TB globally. The relationship between TB and nutrition is bidirectional, i.e having active TB leads to loss of weight and underweight is considered a risk factor for developing TB, whether through reactivation of latent TB or developing progressive primary disease upon infection. Undernutrition also leads to worse treatment outcomes once TB has developed. Hence the World Health Organization (WHO) recommends intensified case finding for TB amongst malnourished children. Recently, the Ministry of Health, Government of India, established several Nutritional Rehabilitation Centre (NRCs) across the country to comprehensively manage SAM children under its National Rural Health Misson initiative. SAM children identified at the villages are being routinely referred to these NRCs for comprehensive management. These specialised clinics are staffed by a paediatrician and equipped to effectively manage SAM children and diagnose

infectious disease, including TB. Malnutrition and infection often make vicious cycle. Prevention and appropriate treatment of TB, and other infections in infant and children are important to reduce malnutrition rates. Prevention and timely treatment of severe malnutrition significantly reduce the incidence of infectious disease in children. Infectious disease-like diarrhea, pneumonia, TB & other infection are more common in malnourished children than their well-nourished counterparts[2].

The mortality rate of children with complicated SAM that receive treatment in inpatient setup has remained unacceptably high. Such high mortality in inpatient units has been attributed to co-morbities such as infection. According to World Bank report, the prevalence of underweight children in India is among the highest in the world, and is nearly double that of Sub-Saharan Africa, the report says. It also observes that malnutrition in India is a concentrated phenomenon.

A relatively small number of states, districts, and villages account for a large share of the burden – 5 states and 50 percent of villages account for about 80 percent of the maln malnutrition cases. Bihar is included in these states. Tuberculosis remains a significant source of morbidity and mortality among children in resource – limited settings. Of the 9 million new Tuberculosis infections each year ,11% are in children. Malnutrition is also highly prevalent in children living in Tuberculosis endemic countries and contributes to 2.2 million deaths in children under 5 years of age globally. Poverty, overcrouding, food insecurity, HIV further set the stage for both malnutrition and poor infection control. In 2012, the National Tuberculosis Programme (NTP) in india, issued a new paediatric TB management guideline. This guideline included a new algorithm for suspecting and diagnosing TB in children.

As per this guideline, all malnourished children were eligible for TB evaluation. Undernutrition and tuberculosis are linked and have a bidirectional relationship. Undernutrition increases the risk of TB which in turn, can lead to malnutrition. Undernutrition not only is a risk factor for progression of latent TB infection to active disease, but also increases the risk of of drug toxicity, relapse and death once TB develops.

## Objectives

By using WHO guideline, to identify the children with SAM from the patients admitted in department of Pediatrics, BMIMS Pawapuri. Study of association of Tuberculosis with SAM in Bihar

## Materials and Methods

This observational study will be carried out on admitted patients in upgraded department of Pediatrics, at BMIMS Pawapuri Nalanda. Study duration of one years WHO criteria will be used to define severe acute malnutrition.

### Inclusion criteria

All children between 6 months to 5 years of age with severe acute malnutrition admitted in department of Pediatrics will be included.

### Exclusion criteria

Children having congenital malformations & suspected metabolic conditions and parents of children not given consent will not be included in this study

Detailed & complete history that also includes nutritional history will be taken from their mother or nearby relative. Detailed physical examination and relevant investigation [like CBC, MT, ESR, Chest X-ray, sputum for acid fast bacilli, Gene xpert test for early morning gastric aspirate, blood urea, serum creatinine, serum electrolytes, USG whole abdomen, CSF examination, ADA, HIV will] be done as required. The clinical sign of micronutrient deficiency will be assessed.

Measuring tape

- Infantometer
- Stadiometer
- MUAC tape
- Electronic Weighing Machine
- Weight and Height simplified WHO chart

### WHO CRITERIA FULFILLED BY CHILD

- Weight for height below - <3 SD of the median WHO growth reference
- Visible severe wasting.
- Presence of bipedal pitting edema.
- Mid upper arm circumference below 11.5 c.m

Breast feeding /artificial feeding/top feed/early introduction of complementary feeding/ delayed introduction of complementary feeding.

## Results

**Table 1:**

| Age Group | Total Number (Percentage) |
|---|---|
| 6-12 Months | 56 (44.8%) |
| 13-24 Months | 36 (28.8%) |
| > 24 Months | 33 (26.4%) |
| Total | 125 (100%) |

Out of 125 SAM children 56 (44.8%) children belongs to age groups 6-12 month while 36 (28.8%) belongs to age group 13-24 Month and rest 33 (26.4%) children of age group more than 24 month.

**Table 2: Mean age of presentation in different age group (Total No.125)**

| Age Group | Mean Age of Presentation (In Month) |
|---|---|
| 6-12 Month | 9.16 Month |
| 13-24 Month | 19.38 Month |
| > 24 Month | 38.21 Month |
| Average Mean Age of Presentation In Total Population | 20.00 Month |

The mean age of presentation in 6–12-month, 13-24 month and > 24 month was 9.16 month 19.38 month and 38.21 month respectively while the average mean age of presentation in study population was 20.00 month.

**Table 3: Sex wise distribution in sam children (Total No. 125)**

| Age Group | Total No. | Male (No. & %) | Female (No. & %) |
|---|---|---|---|
| 6-12 Month | 56 | 35 (62.5%) | 21 (37.5%) |
| 13-24 Month | 36 | 24 (66.67%) | 12 (33.34%) |
| > 24 Month | 33 | 23 (69.7%) | 10 (30.3%) |
| Total | 125 | 82 (65.6%) | 43 (34.4%) |

A total of 82 children (65.6%) were male while 43 children (34.4%) were female.

**Table 4: Frequency of breastfeeding practice in sam population (Total No. 125)**

| Breast Feeding Practice | Total No. | Percentage |
|---|---|---|
| Exclusive Breast Feeding up to 6 month | 33 | 26.4% |
| Partial Breast Feeding | 92 | 73.6% |

Only 26.4 % of patient (33 cases) had received exclusive breast feeding upto to 6 month of age while 92 cases (73.6%) had received partial breast feeding. In the partial breast feeding group almost all (92) children received feeding by bottle. Almost all of bottle feeding baby received diluted cow milk.

**Table 5: Socio-economic status of the sam population (Total No. 125)**

| Socio-Economic Status | Total No. | Percentage |
|---|---|---|
| Below Poverty Line (BPL) | 103 | 82.4% |
| Above Poverty Line (APL) | 22 | 17.6% |

The families of around 82.4% SAM children belongs to lower socio-economic status (below poverty line) while 17.6% cases belongs to above poverty line. Diarrhoea was found to be most common complication associated with severe acute malnutrition. 38.71% (48 cases) SAM children had Diarrhoea. Pneumonia was found second most common complication. 37.1% (46 Cases) had Pneumonia. Meningitis was found in 12.1% (15 cases). In the nutritional deficiency Anemia was found in 65.33% population. A total of 81 cases had different degree of Anemia. After taking proper history (History of contact of T.B.) and investigations for the diagnosis T.B. (like CBC, Mantoux test (5 TU), ESR, CXR PA view, sputum for AFB, Gene Xpert test for T.B, USG –W/A, CSF examination {cell, sugar protein, culture and sensitivity for T.B, ZN staining for T.B., ADA level }) in patients of SAM of different diseases (Diarrhoea, meningitis, pneumonia, anemia). Total number of 38 cases (30.65%) of TB diagnosed in SAM. In those 17 cases (30.36%) were in the age group of 6-12 month,12 cases (33.34%) were in the age group of 13 -24 month and 9 cases (27.3%) were in the age group of greater then 24 month of age of children. So, TB is strongly associated with SAM, and most common in the age group of 6-12 month then 13 to 24 month and then after children of greater then 24 month of age.

**Table 6: Outcome of study (Total No. 125)**

| Parameter | No. & Percentage |
|---|---|
| Cured/Discharge | 111 (88.8%) |
| Death | 4 (3.2%) |
| Defaulter | 10 (8%) |

Out of Total 125 children 111 children (88.8%) discharged successfully, no. of defaulter case was 10 (8%) and total no. of death was 4 (3.2%) respectively.

## Discussion

Severe Acute Malnutrition affects nearly twenty million under five children, and contributes to one million child deaths yearly.[3] The mortality rate of

children with complicated SAM that receive treatment in inpatient setups has remained unacceptably high.[4] Such high mortality in inpatient units has been attributed to complication such as infections, fluid overload, dehydration micronutrient deficiencies and severe anaemia with oedema. Our study was done to know the Association of TB with severe Acute Malnutrition in Bihar, in hospitalized children between 6 months to 5 years. A total of 125 cases admitted in Paediatric department of Patna Medical College with Severe Acute Malnutrition over a period from January 2018 to November 2019 were studied.

**Prevalence of severe acute malnutrition in different age groups:** Age plays an important role in etiology of Severe acute malnutrition. Due to lack of exclusive breast feeding and improper complementary feeding, the nutrition deficiencies start at an early age. In our study we recorded highest prevalence of SAM in age group of 6 months to 12 months. 56 children out of 125 (44.8%) were in the age group of 6 to 12 months, while 36 patients

(28.8%) between 13 to 24 months and 33 patients (26.4%) between 24 months to 5 years. Highest number of children in age group of 6 to 12 month of age may be due to lack of exclusive breast feeding, use of diluted cow milk and lack of awareness about complementary feeding. This result correlates well with the findings of the study done by Kumar et al, where maximum 59.6% of SAM children were in the age group of 6 months to 12 months.[5] Also in a study done by Suman RL et al, majority of the patients (82%) were in the age group of 6 to 24 months.[6]

The result of my study, Kumar et al, Suman RL et al shows more prevalence of SAM in 6 to 12 month of age group. The mean age of presentation was 20 months which also correlates with study of Suman RL et al, (16.54 months) and Kumar et al. (14.30 months) and Dr. Tarachand Saini (19.7 month).,[7] A study from Nepal by Thapa A et al, however reported the mean age of presentation at 23.20 months. This may be because, the above study included the SAM children above 1 year of age only.[8]

**Table 7:**

|  | **My study** | **Suman RL et al.[6]** | **Kumar R et al.[5]** | **Thapa A et al.[8]** | **Tarachand Saini[7]** |
|---|---|---|---|---|---|
| Highest prevalence age group | 6-12 Month (44.8%) | 6-24 month (82%) | 6-12 month (59.6%) | - | 1-3 year (51.75%) |
| Mean Age of Presentation | 20.00 month | 16.54 Month | 14.30 Month | 23.2 month | 19.7 month |

As a general consensus prevalence of Malnutrition is more in Female Children, due to relatively negligence of Female children. However, in our study, we found slightly male predominance. A total of 82 patients (65.6%) were Males while 43 patients (34.4%) were Females. Study by Kumar et al, and Thapa A

et al however reported a higher incidence in Females 51.9% & 51.7%[8] respectively. This may be due to a sense of relative negligence by the parents towards the female child in the society regarding breast feeding, Immunization and other feeding practices.

**Table 8:**

| Sex | My Study | Suman RL et al.[6] | Irena et al.[9] | Tarachand Saini[7] | Tendai Munthali[13] | Thapa[8] | Kumar et al.[5] |
|---|---|---|---|---|---|---|---|
| Male | 65.6% | 52% | 55.3% | 68.53 | 54% | 48.3% | 48.1% |
| Female | 34.4% | 48% | 44.71% | 31.47% | 46% | 51.7% | 51.9% |

Out of the parameters used, Weight for Height/ Length <-3SD was found in 88% cases. Visible severe wasting was present in 32% cases . Bilateral pedal oedema was present in 15.2% cases. Study by Kumar et al, which shows weight for height <-3SD in 75.8% cases, severe visible wasting in 24.03% cases and bilateral pitting oedema in 27% cases.[5] A study by Suman RL et al shows edema in 100% cases because his study was only on edematous children.[6] Overlapping nature of protein-energy malnutrition and micronutrient deficiencies were well understood and it is seen that lack of one micronutrient is typically associated with deficiency of others.[12] Anemia (65.33%) the common micronutrient deficiency associated with malnutrition in our study, and in another study done, by Kumar et al the

prevalence of anemia was 88.3%[5]. In another study by Suman RL et al the prevalence of Anaemia was 74%[6], study by Thapa shows prevalence of anaemia 60%[8] and study by Tarachand Saini shows prevalence of Anaemia 43.16%[7] The high incidence of anemia in these children could be due to nutritional factors as well as incidental helminthic infections. In our study out of 125 children 111 (88.8%) children discharged successfully, No. of defaulter case was 10 (8%) and total no. of death was 4 (3.2%). In a study at west Ethiopia[11] shows 66.8% cure rate 4.4% death, 16.6% defaulter and 12.2% children transferred out. The finding of my study, Dhanalakshmi K & P Nagar shows very similar percentage of children discharged from hospital.

## Conclusion

Prevalence of Malnutrition is almost similar in both the sexes with slight male dominance. Most of the malnourished child are in the age group of 6 to 12 months, and mean age of presentation was 20 month. Prevalence of malnutrition is more in children with poor socio-economic background. Proper breast-feeding and regular immunization has a great role in preventing malnutrition. Mother education persist as a strong predictor of child nutritional status. Diarrhea was the most common complication followed by Pneumonia & tuberculosis.

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