Original Research Article

# An Epidemiological Study to Evaluate the Occurrence of Anaemia in Children with Severe Acute Malnutrition (SAM) and its Influence on the Results of Nutritional Rehabilitation.

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**Abstract**

**Aim:** To investigate the prevalence of anaemia among severely acute malnourished (SAM) children and its impact on the outcomes of nutritional rehabilitation in a tertiary care centre.

**Material and Methods:** This study was done in the department of Pediatrics, NMCH, Jamuhar, Sasaram, Bihar, India for 12 months.The detection of children with SAM was ensured in the villages by the community workers of the Integrated Child Development Services (ICDS) program either as part of monthly growth monitoring and promotion sessions at the ICDS centre (passive case finding) or in the context of community drives for the identification of children with SAM (active case finding). A physician conducted a clinical examination in children to detect the presence/absence of medical complications (altered alertness, respiratory tract infections, diarrhoea/severe dehydration, high fever/ malaria, tuberculosis, and/or severe Anaemia) using the criteria for the Integrated Management of Neonatal and Childhood Illnesses (IMNCI).

**Results:** A total of 162 children, aged 6-59 months were referred. Around forty 47% of children were in age group 6–12 months. Proportion of anaemic children is mostly same in each age group. Around 75% of SAM children were anaemic and this proportion is comparative high in female compare to male children. 75.3% children with SAM were found to be anaemic, 2.7% were severely anaemic and 72.6% were moderately anaemic. Anaemia is more prevalent and severe among female SAM children compare to male. There was no statistical difference in admission weight among anaemic and non-anaemic children. Anaemic children had statistically lower haemoglobin level compare to non-anaemic children so these children were comparable to see the effect of Anaemia. There is no statistical difference in weight gain and mean weight gain percentage difference in anaemic and non-anaemic children.

**Conclusion:** It was concluding that nearly all patients with severe acute malnutrition had anaemia as a common co-morbid condition. Most of them suffered from moderate to severe anaemia. This anaemia status don't affect the outcome of treatment.

**Keywords:** Anaemia, NRC, Sever Acute Malnutrition.

## Introduction

Anaemia is a widespread issue in public health, particularly in children who are experiencing severe acute malnutrition (SAM). SAM refers to a severe state when an individual has an extremely low weight in relation to their height. This condition is evident by apparent and severe wasting, or the occurrence of nutritional oedema. Children diagnosed with severe acute malnutrition (SAM) have a higher likelihood of experiencing illness and death. [1,2] anaemia, in addition, worsens their vulnerability by compromising their immune system, hindering their physical and cognitive growth, and making them more prone to infections. Gaining comprehension of and effectively dealing with anaemia in children with severe acute malnutrition (SAM) is essential for enhancing their overall health results, especially at nutritional rehabilitation centres (NRCs) where these children undergo rigorous therapy and get care. [3,4] The incidence of anaemia in children with severe acute malnutrition (SAM) is quite high, since studies have shown rates ranging from 50% to 80% in different environments. The cause of anaemia in these children is complex and involves several factors, including as shortages in nutrients

(iron, vitamin B12, folate), persistent infections (malaria, TB), and inflammatory diseases. Furthermore, children who are malnourished often have hindered intestinal absorption, which adds to the complexity of treating anemia. [5] Nutritional rehabilitation centres (NRCs) are crucial in the treatment of severe acute malnutrition (SAM) since they provide therapeutic feeding, medical intervention, and close monitoring. The efficacy of these institutions in addressing severe acute malnutrition (SAM) has been well demonstrated, however, the influence of anaemia on the recuperation and results of these youngsters is not as well-defined. [6,7] anaemia has the ability to extend the duration of hospital stays, hinder the process of recovery, and elevate the likelihood of problems during the rehabilitation phase. Recent research has emphasized the need of integrated management strategies that concurrently tackle both malnutrition and anaemia. For instance, the use of iron and vitamin supplementation, deworming, and blood transfusions in severe instances have shown encouraging benefits in enhancing haemoglobin levels and overall health outcomes in children with severe acute malnutrition (SAM). [8-10] Furthermore, it is essential to treat the root cause of infections and inflammation in order to effectively control anaemia in these children. The objective of this research is to analyse the frequency of anaemia in severely acute malnourished (SAM) children who are admitted to a nutritional rehabilitation unit at a tertiary care facility, and to examine the impact of anaemia on their overall health outcomes.

## Material and Methods

This study was done in the department of Pediatrics, NMCH, Jamuhar, Sasaram, Bihar, India for 12 months. The detection of children with SAM was ensured in the villages by the community workers of the Integrated Child Development Services (ICDS) program either as part of monthly growth monitoring and promotion sessions at the ICDS centre (passive case finding) or in the context of community drives for the identification of children with SAM (active case finding).

A physician conducted a clinical examination in children to detect the presence/absence of medical complications (altered alertness, respiratory tract infections, diarrhoea/severe dehydration, high fever/ malaria, tuberculosis, and/or severe Anaemia) using the criteria for the Integrated Management of Neonatal and Childhood Illnesses (IMNCI). Children with medical complications, and/or bilateral pitting oedema, and/or with poor appetite were fed a locally-prepared therapeutic formula meant as a substitute for F-75 (herewith referred to as F75-proxy) to provide 100 kcal/kg/day.

Classification of anaemia based on haemoglobin levels Mild anaemia: 10-10.9 g/dL, Moderate anaemia: 7-9.9 g/dL and Severe anaemia: <7 g/dL5 Primary outcome variables were mean rate of weight gain (gm/kg/day), proportion of children achieving target weight and recovery from SAM status. The mean rate of weight gain (g/kg/day) was calculated as weight gain over a defined time period divided by the number of days in anaemic and non-anaemic children.

## Results

A total of 162 children, aged 6 - 59 months were referred. Around forty seven percentage of children were in age group 6 – 12 months. Proportion of anaemic children is mostly same in each age group (Table I). Around 75% of SAM children were anaemic and this proportion is comparative high in female compare to male children. Table 2 depicts that in present study, 75.3% children with SAM were found to be anaemic, 2.7% were severely anaemic and 72.6% were moderately anaemic. Anaemia is more prevalent and severe among female SAM children compare to male. There was no statistical difference in admission weight among anaemic and non-anaemic children. Anaemic children had statistically lower haemoglobin level compare to non anaemic children so these children were comparable to see the effect of Anaemia. (Table 3) There is no statistical difference in weight gain and mean weight gain percentage difference in anaemic and non anaemic children (Table 4)

### Table 1: Age wise distribution of SAM children

| Particular | Anemia status | |
|---|---|---|
| | Anemic children, (%), n = 110 | Non-Anaemic children, (%), n =36 |
| < 12 Month | 49 (44.5) | 17 (47.2) |
| 12 – 24 Month | 39 (35.4) | 15 (41.2) |
| 24 – 36 Month | 16 (14.5) | 4 (11.1) |
| 36 – 48 Month | 5 (4.6) | 0 (0.0) |
| 48 – 60 Month | 1 (0.9) | 0 (0.0) |

**Table 2: Anaemia status in SAM child**

| Severity of Anemia | Female, n = 79 (%) | Male, n = 67 (%) | Total, N =146 |
|---|---|---|---|
| No anemia | 18 (22.8) | 18 (26.9) | 36 (24.7) |
| Mild anemia | 58 (73.4) | 48 (71.6) | 106 (72.6) |
| Severe anemia | 3 (3.8) | 1 (1.5) | 4 (2.7) |

**Table 3: Basic parameter difference in anaemic and non-anaemic group**

| | Mean | SD | p- value |
|---|---|---|---|
| Hemoglobin level | | | |
| Anemic | 7.3 | 1.8 | < 0.005 |
| Non anemic | 11.1 | 1.6 | |
| Weight of Admission | | | |
| Anemic | 6.25 | 1.48 | 0.94 |
| Non anemic | 6.23 | 1.19 | |

**Table 4: Outcome difference in anaemic and non-anaemic group**

| | Mean | SD | p- value |
|---|---|---|---|
| Weight gain in grams | | | |
| Anemic | 412.8 | 0.3 | 0.98 |
| Non anemic | 411.1 | 0.3 | |
| Mean percentage of weight gain | | | |
| Anemic | 6.88 | 6.26 | 0.92 |
| Non anemic | 6.75 | 6.83 | |

## Discussion

Anaemia associated with severe malnutrition is the consequence of multiple factors and represents an interaction between adaptation to inadequate food intake and the impact of other stresses associated with infection or dietary imbalance. [6] Lower mean values were observed for haemoglobin and haematocrit in children with SAM as compared to controls, a finding similar to previous studies. [7-10] In present study, 75.3% children with SAM were found to be anaemic, out of which 3.7% were severely anaemic and 96.3% were mild anaemic. This finding was similar to a study done by Thakur et al., where they reported 81.1% severely malnourished. children to be anaemic, out of which 67.3% as severely anaemic and 13.8% as moderately anaemic. [10] In another study by R kumar et al. 88.5% children had Anaemia, 24% had severe Anaemia and 55.7% had moderate Anaemia. [11] These red cell changes may be attributed to adaptation to lower metabolic oxygen requirements and decrease in lean body mass seen in PEM. Micronutrient deficiencies such as iron, zinc and copper have also been implicated as a contributory factor. [12] There was no statistical difference in admission weight among anaemic and non-anaemic children. Anaemic children had statistically lower haemoglobin level compare to non anaemic children so these children were comparable to see the effect of Anaemia. On comparison of malnutrition outcome in anaemic and non-anaemic children show that Anaemia does not had effect on outcome. This may be due to iron therapy in malnourished children after first week of treatment.

Thought Anaemia doesn't have effect on weight gain, timely identification and treatment of co-morbidities like Anaemia, diarrhoea, acute respiratory tract infection and micronutrient deficiencies is vital in malnourished children, so as to break undernutrition-disease cycle, and to decrease mortality and to improve outcome.

## Conclusion

It was concluding that nearly all patients with severe acute malnutrition had anaemia as a common co-morbid condition. Most of them suffered from moderate to severe anaemia. This anaemia status don't affect the outcome of treatment.

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