

Clinical Profile, Comorbidities and Anthropometric Characteristics of Children With Severe Acute Malnutrition: A Hospital-Based Study

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Abstract

Background: Children admitted with severe acute malnutrition (SAM) are frequently affected by superimposed infections, anemia, and other complications that may complicate nutritional rehabilitation. **Objective:** To describe the demographic profile, major comorbidities and available anthropometric characteristics of hospitalized children with SAM. **Methods:** This hospital-based study utilizes the data of a prospective observational study conducted on 204 children aged 6-30 months admitted to the department of paediatrics, SSG Hospital and Medical College, Vadodara, during 2023-2024. The study children met the study criteria for SAM, which included MUAC <115 mm, weight-for-height <-3 SD, bilateral pitting edema, or visible severe wasting, with clinical complications requiring inpatient management. **Results:** Out of the total 204 study children, 118 (57.84%) were male and 112 (54.9%) were aged 12-24 months. A total of 138 children (67.64%) resided in rural areas. Pneumonia was the most common comorbidity in 75 children (36.76%), followed by anemia in 61 (29.9%) and sepsis in 25 (12.25%). Diarrhea occurred in 18 (8.82%), tuberculosis in 15 (7.35%), congestive heart failure in 8 (3.9%), and HIV infection in 2 (0.98%) of the study children. MUAC <11.5 cm was found in 136 children (66.7%), and 68 (33.3%) had MUAC >11.5 cm but met the criteria for other anthropometric indicators of SAM. Microcephaly was found in 46 children (22.5%) and 158 (77.5%) were normocephalic. **Conclusion:** Hospitalized children with SAM mostly belonged to the 12-24 months age group and came from rural areas. The leading comorbidities were pneumonia, anemia, and sepsis, and about two-thirds of the study children had MUAC <11.5 cm and nearly a quarter had microcephaly. Early recognition and combined management of the inpatients with infection, anemia, nutritional deficiency, and other complications are essential elements of the inpatient care of children with SAM.

Keywords: severe acute malnutrition; clinical profile; comorbidity; pneumonia; anemia; sepsis; MUAC; anthropometry; hospitalized children.

1. Introduction

Severe acute malnutrition is an important clinical syndrome in young children that comprises severe wasting and/or nutritional edema. Children with SAM have diminished physiological reserves and altered immune function, resulting in an increased susceptibility to infection. Diarrhea, pneumonia, sepsis, tuberculosis, anemia, and other complications commonly complicate the illness and significantly contribute to the complexity of inpatient care [1-5].

Anthropometric evaluation is paramount in identifying SAM. World Health Organization (WHO) criteria include weight-for-height measurements of less than -3 SD, MUAC of less than 115 mm among children aged 6-59 months, and bilateral pitting edema [6, 7]. MUAC is a simple and rapid assessment tool that can be used to identify children with severe wasting conditions [8]. The evaluation of the head circumference is not considered as a primary diagnostic criterion for SAM, but it provides essential information about the child's growth pattern and possible developmental risks.

The clinical presentation and anthropometric features of hospitalized children with SAM can help identify complications, plan the further investigation, and manage concomitant infections and nutritional disorders. This study aimed to describe the demographic profile, major comorbidities, MUAC categories, and head circumference

categories reported in a prospective hospital cohort from Rajkot, India.

2. Objectives

1. To describe the demographic profile of children hospitalized with SAM in terms of age, sex, and residence.
2. To determine the prevalence of major comorbidities among hospitalized children with SAM.
3. To summarize the currently existing anthropometric characteristics of the children, specifically those pertaining to the MUAC and Head Circumference categories.

3. Materials and Methods

Study design and setting: This was a prospective observational study carried out in the department of paediatrics, SSG Hospital and Medical College, Vadodara, India during 2023-2024. A total of 204 children suffering from severe acute malnutrition were recruited in the study after taking informed consent from their parents or guardians.

Eligibility and admission criteria: The study comprised children aged between 6 and 30 months who met the inclusion criteria. The criteria for severe acute malnutrition (SAM) were mid-upper-arm circumference (MUAC) <115 mm, weight-for-height <-3 SD, bilateral pitting edema, or visible severe wasting. In addition, the children met the clinical complications for inpatient admission. The children with organic causes of malnutrition, including congenital heart disease, cerebral palsy, malabsorption syndromes, and genetic syndromes, were excluded from the initial cohort.

Clinical assessment: Detailed history and physical examination were performed. Age, sex, residence, immunization status, breastfeeding, and complementary feeding were recorded. The major comorbidities reported in the results were diarrhea, tuberculosis, HIV infection, pneumonia, anemia, congestive heart failure, and sepsis. All children received standard management for SAM according to WHO-based guidance.

Anthropometric variables: The thesis reported MUAC categories in relation to developmental assessment and provided the number of children with MUAC <11.5 cm and >11.5 cm. Head circumference was categorized as microcephaly or normocephaly. Individual weight, length or height, and weight-for-height distributions were not summarized in the available results tables; therefore, no unreported anthropometric means were added to this manuscript.

Analysis: Frequencies and percentages were calculated from the totals reported in the thesis. No new patient-level analysis was performed.

4. Results

A total of 204 children with SAM were recruited into the study. Out of all the participants, 118 (57.84%) children were male while 86 (42.15%) children were female. The largest age group consisted of 12-24 months children, which was 112 children (54.9%). The next largest group was 6-12 months, which was 35 children (17.15%). The remaining 57 children (27.94%) were older than 24 months. The calculated mean age in the thesis discussion was 21.5 months. 138 children (67.64%) were from rural areas while 66 children (32.35%) were from urban areas.

Characteristic	Category	n	%
Sex	Male	118	57.84
Sex	Female	86	42.15
Age	6-12 months	35	17.15
Age	12-24 months	112	54.90
Age	>24 months	57	27.94
Residence	Rural	138	67.64
Residence	Urban	66	32.35

Pneumonia was the most common comorbidity that occurred among 75 children (36.76%), and 61 children (29.9%)

had anemia, followed by sepsis in 25 children (12.25%). Other comorbidities were diarrhea among 18 children (8.82%), tuberculosis among 15 children (7.35%), congestive heart failure among 8 children (3.9%), and HIV infection among 2 children (0.98%).

Comorbidity	n	%
Pneumonia	75	36.76
Anemia	61	29.90
Sepsis	25	12.25
Diarrhea	18	8.82
Tuberculosis	15	7.35
Congestive heart failure	8	3.90
HIV infection	2	0.98

MUAC<11.5 cm was found in 136 children constituting 66.67% of the study group, while 68 children or 33.33% had MUAC>11.5 cm. The latter does not rule out SAM as children could also score positive on weight-for-height, bilateral edema, or visible severe wasting. Head circumference was classified as microcephaly in 46 children or 22.55% and normocephaly in 158 children or 77.45%.

Anthropometric variable	Category	n	% of 204
MUAC	<11.5 cm	136	66.67
MUAC	>11.5 cm	68	33.33
Head circumference	Microcephaly	46	22.55
Head circumference	Normocephaly	158	77.45

5. Discussion

The present hospital-based cohort was largely comprised of children in their second year of life, more than half of whom were in the 12-24 month age group. This age group is particularly nutritionally vulnerable since growth is still rapid, but children are beginning to shift from milk feeding to complementary and family foods, and are more susceptible to environmental infections. Similar patterns of age distribution have been observed in SAM cohorts and nutrition rehabilitation centers [9,10].

Pneumonia was the leading comorbidity, followed by anemia and sepsis. Malnutrition and infection are closely interrelated since undernutrition can impair immune response and the integrity of epithelial barriers, and infection can cause poor appetite, increased energy needs, and reduced nutrient absorption. Pneumonia is therefore an important clinical issue in children with SAM, especially since respiratory infections are an important cause of hospitalization and death in malnourished children [3,11].

Anemia was found in nearly 1 out of every 3 patients studied. Anemia in children with SAM may be due to iron deficiency, micronutrient deficiencies, inflammation, infection, or a combination of these. Weakness and impaired function may ensue. In the developmental component of the same thesis cohort, developmental quotient scores were lower when the severity of anemia was greater. Management requires a detailed evaluation since iron therapy in complicated SAM is usually introduced according to the stabilization/rehabilitation phase and not on admission. Sepsis was found in 12.25% of the children. Identification of an infection in SAM may be challenging as a result of suppressed febrile and inflammatory responses. It is for this reason that the standard management of complicated SAM focuses on active recognition and prompt management of suspected infection [5,12].

Approximately two-thirds of the children had MUAC below 11.5 cm which is associated with severe wasting as per this anthropometric indicator. The rest of the children (one-third of the total number) had MUAC above 11.5 cm but met the criteria for SAM based on other indicators applied within the scope of the study protocol. This observation demonstrates the rationale behind a recommendation to use more than one criterion accepted by the international community to assess severe acute malnutrition.

Microcephaly was reported from almost one-quarter of the cohort. Head circumference is not a primary criterion for diagnosis of SAM, but reduced head circumference may reflect children who have greater overall growth impairment and who are potentially vulnerable to neurodevelopmental problems. This finding should be interpreted

as an additional growth characteristic of the cohort, not an independent diagnostic feature of SAM.

6. Limitations

This was a single-center hospital-based study that included children aged 6-30 months, which means that the results cannot be extrapolated to all children with SAM in the community or older preschool children. The study authors also did not report complete distributions of weight, length or height, weight-for-height z-scores, edema grades, biochemical measurements, or microbiological confirmation of infection. The comorbidities were reported only as frequencies and percentages without adjustment for confounding variables using multivariable methods. Thus, the study reports the clinical burden of the condition in this population of hospitalized children but does not establish independent predictors of specific outcomes or complications.

7. Conclusion

Hospitalized children with severe acute malnutrition in this study were predominantly aged between 12-24 months and came mostly from rural areas. Pneumonia, anemia, and sepsis were the most frequent associated conditions. A MUAC below 11.5 cm was found in nearly two-thirds of the children, and microcephaly was detected in almost a quarter of the cases. It is essential to provide adequate nutritional support and systematically assess and manage the complications, such as infection, anemia, and others when treating severe acute malnutrition (SAM) in inpatient settings. The full set of inclusion criteria for SAM should always be used when identifying a child with acute malnutrition based on anthropometric measurements since the MUAC above 11.5 cm does not eliminate the possibility of SAM.

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