

Research Article

Inpatient treatment of SAM in an infant aged <23 months: a case report

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Abstract

Severe malnutrition of an infant remains noticeable in Bangladesh, which poses a major public health concern. A <23-month-old female child presented to the hospital with a 12-week history of severe acute malnutrition (SAM), characterized by WHZ<-3, MUAC<115 mm, and evident severe wasting or nutritional oedema. Poor appetite and oedema primarily affecting her four limbs were seen and resulted in a body mass index of 9.7 kg/m². An autoimmune and infective screen was done after her admission to the pediatric intensive care unit (PICU), and the results were unremarkable. Dietetic consultation led to the diagnosis of severe acute malnutrition, consequent to a severely restricted, primarily nutritionally inadequate diet. Analysis of the patient's reported diet with nutritional software revealed grossly suboptimal caloric intake with risk of inadequacy for most micronutrients, vitamins, and minerals. On arrival, sugar water (10 gr/100 mL) was started immediately, and an F-75 diet (75 kcal or 315 kJ/100 mL) in the PICU & ready to use therapeutic food (RUTF) in the pediatric ward were administered orally for the next 14 days. Marked improvement was seen after 2 weeks, with a near-complete resolution of appetite loss. These findings supported a diagnosis of a SAM patient with complications.

Keywords: Severe acute malnutrition, Ready-to-use therapeutic food, F-75 diet, Pediatric intensive care unit

Introduction

Nutritional status is the best indicator of child well-being and indirectly the well-being of the community. In developing countries, feeding habits are frequently inadequate and inconsistent with World Health Organization (WHO) standards, yet they are the most important factors influencing a child's physical and mental development (WHO, 2001). Poor nutritional status in early childhood also affects health in adulthood (Victora *et al.*, 2008). An estimated 34.2 million children under the age of five (5) in low- and middle-income countries had SAM in 2022, accounting for around 45% of fatalities in children before their fifth birthday (Oti & Allen, 2021; UNICEF *et al.*, 2023).

Although known to be a major public health problem in low-income countries, malnutrition contributes significantly to mortality among children under 5 years of age. At least 3.1 million children die from malnutrition, which accounts for 45% of all fatalities in children under five (Tran, 2013). Although Bangladesh has made significant progress toward achieving the Millennium Development Goals (MDGs), including reducing U5M from 134 to 45 fatalities per 1,000 live births between 1993 and 2018 (UNICEF & UN IGME, 2018), the country still confronts several obstacles.

Infant malnutrition is influenced by multidimensional factors. According to Kikafunda *et al.* (1998), the factors that influence infant malnutrition in developing countries are divided into three groups: maternal factors, dietary and socioenvironmental factors, and economic factors. Several studies have shown that infant malnutrition is strongly entrenched in poverty (Thang & Popkin, 2003; Deolalikar, 2005; Pongou *et al.*, 2006; Islam *et al.*, 2013). However, there

is a complicated connection between infant malnutrition and poverty. Malnutrition affects poor households as well as nonpoor households (Marjan *et al.*, 1998; Chee *et al.*, 2002). High household incomes cannot guarantee a satisfactory nutritional outcome for children if households lack hygienic care, food quality, and access to health care (Gross *et al.*, 1996; Ruel *et al.*, 1999; Agee, 2010).

Developing countries in general, and Bangladesh in particular, face several challenges, such as a deficient technical platform, underqualification of rural health staff, poor distribution or inadequate health services, and difficulties in accessing reference structures. Thus, based on these concerns, the WHO has defined the characteristics of an ideal screening test for resource-limited countries as being an affordable, sensitive, specific, user-friendly, and rapid test without equipment and delivered to those who need it most. The purpose of this case report was to investigate the inpatient child's nutritional status and evaluate the effectiveness of medical nutrition therapy in a child who required nutritional support in accordance with the "National Guidelines for the Management of Severely Malnourished Children in Bangladesh".

Case summary

In the intervention, the child was classified as SAM with complications using a simple algorithm that classified children into two groups (Figure 1). Anthropometric parameters were analyzed and mostly found to be deficient according to age (Table 1). On arrival, sugar water (10 gr/100 mL) was started immediately and then referred to the pediatric intensive care unit (PICU) to receive one to five days of inpatient treatment with medication and an F-75 diet (75 kcal or 315 kJ/100 mL) for up to 7 days. All dietary

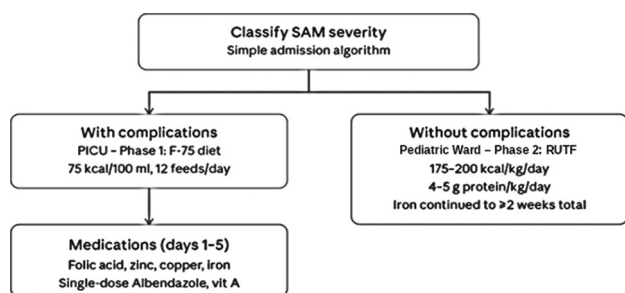


Figure 1: Classification and phase-wise management algorithm for severe acute malnutrition (SAM)

Table 1: Anthropometric parameters of the patient

Anthropometric parameter	Value	Baseline value
Weight	5.11 kg	≈11.5 kg
Height	72.6 cm	≈85.7 cm
Mid-upper arm circumference (MUAC)	11.5 cm	≈15.5 cm
Weight for age	< -3 SD	-
Height for age	< -3 SD	-
Weight for height	< -3 SD	-
Head circumference	Between -2 SD and -3 SD	-

SD - standard deviation

& medical treatment for her admission to the pediatric intensive care unit (PICU) was administered according to the “National Guidelines for the Management of Severely Malnourished Children in Bangladesh (IPHN, 2008).”

The whole treatment process included an initial phase (phase 1) of treatment in the PICU and a second phase (phase 2) of treatment in the pediatric ward (Figure 1). Locally prepared Formula 75 containing 75 kcal/100 mL was given to her over 12 feeds per day for 7 days. Medication in the initial phase (phase 1) included a single oral dose of folic acid (5 mg), zinc (2 mg/kg/d), copper (0.3 mg/kg/d), and, but only when she started gaining weight, elemental iron (3 mg/kg/d), given for at least 2 weeks. Additionally, vitamin A and albendazole were administered orally once (Figure 1), as there was no record of the child receiving these treatments during the twice-yearly Vitamin A+ campaigns that are common in the living area.

Once complications were under control on the fifth day, she was referred back to the pediatric ward to complete treatment. The child was shifted back to the pediatric ward, where treatment continued with an F-75 diet (75 kcal or 315 kJ/100 mL) for an additional two days, followed by ready-to-use therapeutic food (RUTF), which has been endorsed by the WHO, WFP, UNSCN, and UNICEF (WHO *et al.*, 2007), until the following conditions were satisfied: good appetite, oedema reducing, and autoimmune and infection tests were okay.

While she was treated by the pediatric ward staff, RUTF was provided as a weekly ration in proportion to a child’s weight. The pediatric ward staff used a simple chart to calculate the correct ration size, which provided 175-200 kcal kg⁻¹/day⁻¹ and 4- 5 g protein kg⁻¹/day⁻¹. Regular

follow-up was conducted to monitor the anthropometric and biochemical parameters. Despite the significant challenges, the child showed gradual improvement.

Discussion

According to Bangladesh’s first IPC Acute Malnutrition (AMN) report, between January and December 2025, an estimated 1.6 million children between the ages of 6 and 59 months are suffering or expected to suffer acute malnutrition, with 143,850 of those children experiencing Severe Acute Malnutrition (SAM) (IPC, 2025). Although Bangladesh has experienced rapid economic growth over the last decade, this has not translated into substantial improvements in nutritional outcomes. Data indicate that the pace of decline in childhood stunting has slowed, falling from about 60% in the mid-1990s to 31% in 2018, and further to 24% by 2022 (Richi & Alam, 2025). Field studies have consistently demonstrated a two-way association between malnutrition and infectious diseases (Brown, 1994, 2003). Episodes of acute diarrhea and pneumonia are especially common in the first two to three years of life, a period when immune defenses are compromised (Brown, 2003). Among children admitted with severe malnutrition, diarrhea was the most frequent presenting complication (68.4%), whereas sepsis was the leading complication during hospital stay (9%) (Rodríguez *et al.*, 2011). Pneumonia is prevalent among malnourished children and is often associated with fatal outcomes, particularly in children aged <24 months. Although acute respiratory infections (ARIs) may result from different bacterial pathogens, evidence consistently indicates that malnutrition greatly increases the risk of death, raising it by two to three times (Tupasi *et al.*, 1988). Consequently, malnutrition and pneumonia remain leading causes of fatalities in children (Rice *et al.*, 2000).

The clinical presentation of SAM varies among marasmus, kwashiorkor, and marasmic-kwashiorkor, the latter being seen in this child. Key diagnostic markers include weight-for-height <-3 SD, MUAC <115 mm, and nutritional oedema, all of which were present in this case (WHO, 2013). This case highlights the complex and multifactorial nature of severe malnutrition, which is made worse by delayed weaning, poor feeding practices, probable infections, and potential malabsorption. The child’s clinical features, including poor appetite, severe wasting, or nutritional oedema, were consistent with marasmic-kwashiorkor-like malnutrition. Management of SAM with complications requires phasewise care following the “National Guidelines for the Management of Severely Malnourished Children in Bangladesh,” which is based on WHO’s structured approach to care and involves two phases, including the initial phase (phase 1) and the second phase (phase 2) with RUTF, micronutrient supplementation, and infection control (Sadler *et al.*, 2011). Early recognition and intervention are critical, as untreated SAM carries a mortality risk of up to 20-30% in resource-limited settings (Manary & Sandige, 2008).

From a public health perspective, strengthening government-led child nutrition and welfare initiatives for the early identification and management of SAM is an obvious priority. Regular growth monitoring, caregiver education on timely weaning and complementary feeding, and community-based management of malnutrition (CMAM) are vital strategies for reducing the disease burden.

Conclusion

SAM often presents with visible clinical signs and a variety of symptoms. Suggestive symptoms in a suspected case should lead to a request for anthropometric measurements like MUAC and WHZ, even if there is comorbidity. In the absence of medication and specific treatment, early diagnosis will result in better management of patients and therefore limit the prevalence of the morbidity and mortality associated with SAM.

Ethical approval

No personal details or identifying information are included in this article. Consent was provided by the patient's parent for the case report to be written and published. Ethics approval was not obtained from the authors' Institutional Ethics Committee because it was not required for a case report.

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