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Case Report

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RAPID WEIGHT GAIN FOLLOWING CEFTRIAXONE TREATMENT IN A SEVERELY MALNOURISHED INFANT WITH INFECTION

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Abstract

Severe acute malnutrition (SAM) is a leading cause of child mortality, particularly in low- and middle-income regions such as Nusa Tenggara Timur (NTT), Indonesia, where prevalence and poverty rates remain high. SAM weakens the immune system and increases vulnerability to infections such as pneumonia and sepsis, forming a vicious cycle between malnutrition and disease. Effective management requires early identification and integrated treatment strategies addressing both nutritional and infectious components. This case report presents a severely malnourished infant from a rural area of NTT who developed bronchopneumonia and sepsis but exhibited unexpected early weight gain following a five-day course of ceftriaxone. The rapid clinical improvement suggests a possible role of short-term antibiotic therapy not only in controlling infection but also in enhancing early nutritional recovery. Few cases in the literature have documented such substantial early weight gain in a severely malnourished infant following antibiotic treatment alone. This observation offers a novel clinical insight into the potential metabolic benefits of infection control during the acute phase of SAM and highlights the need for further research into the broader impact of antimicrobial therapy on nutritional outcomes.

Keywords: Malnutrition, ceftriaxone, child, rural health, case report.

Introduction

Severely wasted children face a 12-fold higher risk of death compared to their well-nourished peers. Early detection and appropriate management are essential to improve outcomes.[1] Given the high burden of infections among children with severe acute malnutrition (SAM), prompt treatment of bacterial infections with appropriate antibiotics not only enhances the nutritional response to feeding but also prevents septic complications and reduces mortality. The World Health Organisation (WHO) recommends a range of antibiotic options for complicated SAM, including ampicillin/amoxicillin, gentamicin, and third-generation cephalosporins.[2] This case report highlights the use of a five-day course of ceftriaxone, selected for its broad-spectrum coverage, consideration of local resistance patterns, and the severity of the infection. The observed rapid weight gain suggests a potential role of antibiotics in short-term nutritional recovery, beyond their function in infection control.

Case Report

A 14-month-old male child from Sukun Island, Sikka Regency, Indonesia, weighing 6 kg, presented with a one-week history of intermittent fever, cough, and rhinorrhea. Parents reported poor appetite, but denied dyspnoea, vomiting, or diarrhoea. His weight had plateaued since October 2024. He had a previous episode of cough and cold at 6 months of age, which resolved without complications, based on parental reports. No known household contacts were undergoing tuberculosis (TB) treatment, although the paternal grandmother had a chronic cough. Immunization history was complete up to 9 months only. He was born at term, with a birth weight of 2720 g, length of 51 cm, and head circumference of 34 cm. Nutritional intake currently consists of family foods, though in the past few days, the child has only been consuming porridge. On presentation, his length was 67 cm and weight 6.0 kg, placing him below the 1st percentile for both parameters. The weight-for-age Z-score was <-3 SD, consistent with severe underweight, while the weight-for-length Z-score was approximately -3.5 SD, classifying him as having severe acute malnutrition (SAM). The mid-upper arm circumference was 105 mm, also meeting WHO criteria for SAM.

On admission, he was afebrile, with a temperature of 37.9°C, heart rate of 76 bpm, respiratory rate of 26 breaths per minute, and an oxygen saturation of 95% on room air. Peripheral perfusion was adequate, with a capillary refill time of 2 seconds. The abdomen appeared distended (Figure 1). Pulmonary examination revealed bilateral coarse rhonchi. The data supported the diagnosis of SAM, also known as severe wasting.

Figure 1. Patient's clinical manifestation

Laboratory results showed severe anaemia (haemoglobin 2.7g/dL) and leucocytosis (white cell count 46,800/µL). Blood glucose was within normal limits. Peripheral blood smear confirmed microcytic hypochromic anaemia with leucocytosis. Chest x-ray was suggestive of bronchopneumonia. Serum albumin was not assessed due to limited laboratory availability.

The patient underwent three days of stabilization therapy, including F-75 followed by F-100, intravenous fluids, and third-generation cephalosporin antibiotics (ceftriaxone) from Day 1 to Day 5. A transfusion protocol was initiated (3×60ml packed red blood cell transfusion). During hospitalization, the patient's weight progressively increased from 6kg to 7kg by the sixth day and further to 7.5kg by Day 9, demonstrating a rapid improvement in nutritional status following therapy (Table 1 and Figure 2).

Table 1. Anthropometry pre-treatment and post-treatment

Parameter	Pre-therapy (day 0)	Post-therapy (day 9)	WHO classification
Weight (kg)	6.0	7.5	Weight-for-age Z-score <-3SD (Severely underweight)
Length (cm)	67	67	Within normal limits
Weight-for-length Z-score	<-3SD	Between -1 and 0 SD	<-3SD classified as severe acute malnutrition (SAM)
Abdominal circumference (cm)	39	39	(-)
Upper arm circumference (mm)	105	110	<155 mm classified as SAM

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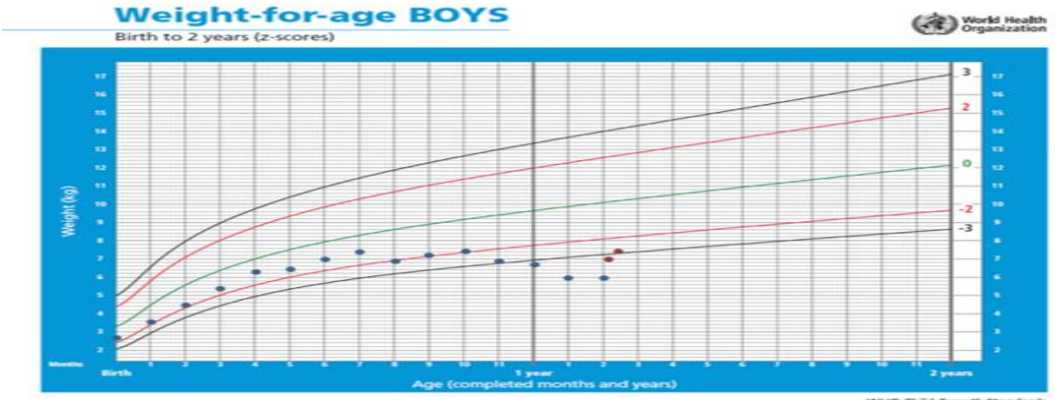

Figure 2. Nutritional status (weight/age)

Table 2. Laboratory findings pre-treatment and post-treatment

Parameter	Pre-therapy (day 0)	Post-therapy (day 9)	Normal Value
Haemoglobin	2.7 g/dL	15.3 g/dL	14-16 g/dL
Haematocrit (Hct)	8.5%	44.1%	45-47%
Leucocyte count	46,800/µL	10,000/µL	4,700-11,000/µL
Erythrocyte count	1.57 million/µL	5.69 million/µL	4.33-5.95 million/µL
Thrombocyte count	243,000/µL	631,000/µL	150,000-400,000/µL

Discussion

This patient came from Sukun Island, which lacks healthcare facilities. Wasting, or acute malnutrition, is a major predictor of child mortality, particularly in severe cases (weight-for-height Z-score <-3 SD or MUAC <115 mm). It reflects a critical loss of body reserves and immune function, increasing susceptibility to infections and reducing the body's ability to recover. These infections—such as bronchopneumonia—further suppressed appetite, increased metabolic demands, and led to nutrient loss, perpetuating a cycle of worsening malnutrition. This vicious cycle highlights the complex interplay between infection and malnutrition.[3]

A five-day course of ceftriaxone was selected for this patient due to the severity of infection and local resistance patterns. Ceftriaxone was chosen for its broad-spectrum activity, effectiveness in short treatment courses, and wide therapeutic index, which enhances both its safety and efficacy. Following ceftriaxone administration, the patient showed significant clinical improvement, including resolution of bronchopneumonia, reduced leucocytosis, and an increase in weight from 6.0 kg (<-3 SD) to 7.5 kg (between -2 and -3 SD) within nine days of treatment. This aligns with research highlighting the importance of antibiotic treatment, particularly amoxicillin, as a predictor of recovery in SAM. Yadeta SK, *et al* found that amoxicillin administration significantly improved recovery rates in eastern Ethiopia, while similar findings were reported by Mamo WN,

et al Fikrie A, *et al* reported a mean weight gain rate of 12.7 ± 8.9g/kg/day, with an overall recovery incidence density rate of 3.8 per 100 person-days and a median recovery time of 17 (IQR: 10–24) days.[4–6]

While WHO protocols for complicated SAM typically recommend a combination of ampicillin or amoxicillin with gentamicin, recent evidence suggests that third-generation cephalosporins may offer comparable outcomes. A meta-analysis summarized by Williams and Berkley (2016), which included 2,767 children with varying degrees of malnutrition from sub-Saharan Africa and Turkey, reported that ceftriaxone, gentamicin, and amoxicillin–gentamicin regimens had the highest bacterial susceptibility rates (>80%) based on blood, urine, and CSF cultures. In contrast, susceptibility was lower for amoxicillin–clavulanate (30.7%) and chloramphenicol (73.7%). An observational study in Niger examined 311 children with complicated SAM and stated that ceftriaxone has shown promising susceptibility data (median 84%, IQR 80–94%) and should be considered in future clinical trials for complicated SAM. [2,7,8]

Additionally, a 2012 randomized controlled trial by Zaidi AKM, *et al* in Pakistan evaluated ceftriaxone versus penicillin–gentamicin in young infants with signs of severe bacterial infection. The study found no significant difference in treatment failure rates between the two regimens, indicating that ceftriaxone may be a feasible alternative in community-based settings. In Indonesia, a 2018 study compared the effectiveness of ampicillin–gentamicin versus third-generation cephalosporins in 77 paediatric patients with community-acquired pneumonia and found no significant difference in rehospitalization rates across mild, moderate, and severe cases.[9,10] Williams PCM *et al*, referencing prior research including data from Sudan, conducted a comparative study on amoxicillin versus ceftriaxone in uncomplicated SAM and found similar outcomes; the ceftriaxone group showed slightly higher weight gain (55.7% vs. 53.5%, difference 2.2%) and recovery rate (74.6% vs. 70.0%, difference 4.6%) than the amoxicillin group, although these differences were not statistically significant.[2]

As this report involves a single patient, the findings are not generalizable. Treatment response may vary depending on local resistance patterns, infection severity, and nutritional status. Nevertheless, this case is noteworthy due to the rapid and substantial weight gain observed in a severely malnourished infant following a short course of ceftriaxone—a finding not commonly reported in similar contexts. This unexpected response raises questions about the broader metabolic or microbiome-related benefits of ceftriaxone in malnourished populations, particularly in remote areas with limited resources. Further research is needed to explore how different antibiotic regimens influence gut microbiota, nutrient absorption, and overall clinical outcomes in malnourished children.

Ethical Considerations: Informed consent has been obtained from the parents of the patient.

Conflict of Interest: The authors declare no conflict of interest.

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