



Case Report

Successful Management of a Child with Severe Acute Malnutrition and Ecthyma Gangrenosum

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ABSTRACT

Ecthyma gangrenosum (EG) is an uncommon but potentially life-threatening cutaneous infection characterized by rapidly progressive necrotic skin lesions. It is classically associated with *Pseudomonas aeruginosa* bacteraemia and severe immunocompromised states. Severe malnutrition can significantly impair host immunity and increase susceptibility to serious bacterial infections. Extensive EG in a young, severely malnourished child is an uncommon and clinically important presentation. We report the case of an 18-month-old child with severe malnutrition who presented with extensive cutaneous lesions consistent with ecthyma gangrenosum. This report aims to highlight the importance of considering serious invasive bacterial infection in malnourished children presenting with extensive necrotic skin lesions.

Keywords: Ecthyma gangrenosum, Child; Kano; Nigeria; Severe acute malnutrition

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INTRODUCTION

Ecthyma gangrenosum (EG) is an uncommon but potentially life-threatening cutaneous manifestation of invasive infection, classically associated with *Pseudomonas aeruginosa*. It is characterized by rapidly progressive necrotic skin lesions that may evolve from erythematous macules or pustules into haemorrhagic vesicles and subsequently into ulcers with a characteristic black eschar. Although EG is strongly associated with *P. aeruginosa* bacteraemia, other bacterial and fungal organisms have also been implicated, and the condition may occur in the absence of bacteremia (Vaiman *et al.*, 2015; Shah *et al.*, 2023).

The pathogenesis of EG involves invasion and destruction of cutaneous blood vessels. In the bacteremic form, circulating organisms reach the skin through the bloodstream and invade the walls of small vessels, producing perivascular inflammation, thrombosis, ischaemia, and ultimately tissue necrosis.

P. aeruginosa produces several virulence factors, including exotoxin A, elastase, and phospholipase C, which contribute to vascular and tissue destruction (Shah *et al.*, 2023).

EG is most frequently reported in individuals with impaired host immunity. Important predisposing conditions include neutropenia, hematological malignancies, diabetes mellitus, burns, and malnutrition (Shah *et al.*, 2023). Severe acute malnutrition is particularly important in young children because it is associated with profound impairment of cellular and humoral immune responses, increasing susceptibility to invasive bacterial infections. The combination of nutritional deficiency and infection may therefore produce a vicious cycle in which infection worsens nutritional status while malnutrition compromises the ability to control infection.

Although the anogenital and gluteal regions are commonly affected, EG may occur on virtually any

part of the body, including the extremities, trunk, and face (Vaiman *et al.*, 2015; Shah *et al.*, 2023). The occurrence of extensive lesions involving predominantly the trunk may therefore present a diagnostic challenge, particularly in a severely malnourished child in whom other causes of skin ulceration and necrosis may need to be considered.

The diagnosis of EG is primarily clinical, supported by microbiological investigations. Blood and lesion cultures are important for identifying the causative organism and guiding antimicrobial therapy. Because the lesions can progress rapidly and may be associated with sepsis, early recognition and prompt initiation of appropriate antimicrobial therapy are essential (Shah *et al.*, 2023). Previous reports have also demonstrated that EG can occur in malnourished children and may mimic other severe necrotizing conditions. For example, facial EG caused by *P. aeruginosa* has been reported in a severely malnourished child, highlighting the importance of considering EG in the differential diagnosis of necrotic skin lesions in this population (Isezuo *et al.*, 2018).

The prognosis of EG depends substantially on the underlying condition, the extent of infection, presence of bacteremia or sepsis, and the promptness of treatment. Mortality is particularly high when EG occurs in association with systemic infection and significant immunosuppression (Shah *et al.*, 2023). Consequently, management requires more than antimicrobial therapy alone and include correction of underlying nutritional deficiencies, appropriate wound care, and supportive management of systemic complications.

CASE REPORT

An 18-months-old child presented to Dermatology Clinic of Aminu Kano Teaching Hospital, Kano with multiple necrotic ulcers on the chest and abdomen of 2 weeks which started as painless pustules, then became vesicular, and later ulcerated within 2 days. The child had measles few days prior to the appearance of the lesions. He was predominantly on

breast milk and the only child of both parents in a monogamous setting. Father is a peasant farmer and mother is a house wife. Child has not been immunized.

Examination revealed a chronically ill-looking male child, febrile (temperature 39.2°C), moderately pale, with bilateral pitting pedal oedema, weight was 6kg with weight for height being below -3 standard deviation of the mean weight according to the WHO standard growth charts. The mid-upper arm circumference was 11.0cm (low). Examination of the skin lesions showed gangrenous ulcers with central black eschar mainly on the chest and abdomen with few lesions on the upper and lower limbs. Other systems examination was not contributory. Diagnosis of ecthyma gangrenosum in a severely malnourished child was made based on the history and the examination findings.

Gram staining was done for the swab of the lesion which revealed gram-negative bacilli and culture yielded *Pseudomonas aeruginosa*. Full blood count showed a white blood cell count of $15.8 \times 10^9/L$ [neutrophil 6%, lymphocytes 67%, monocytes 26%, eosinophils 1%], haematocrit 29.5% and platelets counts of $385 \times 10^9/L$. Figure 1 showed the picture of the child at presentation. Tissue biopsy was taken for histological examination which showed necrotizing vasculitis with bacterial invasion of small and medium vessels, thrombosis, tissue necrosis and ischaemia which further strengthen the diagnosis of EG.

He was placed on intravenous ciprofloxacin (10mg/kg/dose 12hourly), nutritional rehabilitation with F75 and later F100. The ulcers were cleaned with eusol, and gentamicin cream applied daily. After 10 days of treatment the ulcers healed significantly and the child had a good weight gain (gained $>10g/kg/day$). There was no ongoing weight loss, the oedema resolved, the child had good appetite and can take therapeutic food. The child was discharged to outpatient nutrition care. Figure 2 showed the picture of the child after 2 weeks on treatment.



Figure 1: The picture of the child at presentation (with mouth ulcers, lesions on the chest and side of the face)



Figure 2: Picture of the child after 2 weeks on treatment (mouth ulcers healed with good weight gain and other ulcers healed)

DISCUSSION

Ecthyma gangrenosum (EG) is an uncommon but potentially life-threatening necrotizing cutaneous infection classically associated with *Pseudomonas aeruginosa*. It is characterized by rapid progression from an erythematous macule or papule to a vesicle or pustule and subsequently to a necrotic ulcer with a characteristic central black eschar. The lesions result largely from invasion of dermal and subcutaneous blood vessels by the infecting organism, producing

vascular thrombosis, tissue ischaemia and necrosis. Although EG is classically associated with *P. aeruginosa* bacteraemia in immunocompromised or neutropenic patients, it can occur in other immunocompromised states, including severe malnutrition (Isezuo *et al.*, 2018; Ribeiro *et al.*, 2022).

The present case is notable because the clinical evolution of the lesions was highly characteristic of EG. The lesions reportedly began as painless pustules,

became vesicular and subsequently ulcerated within approximately two days. At presentation, there were multiple gangrenous ulcers with central black eschar, predominantly involving the chest and abdomen, with a few lesions on the upper and lower limbs. This rapid evolution is consistent with classical evolution of EG described in literature. Although the lower limbs, gluteal and perineal regions are commonly involved, lesions may occur on the trunk and other anatomical sites (Yahya *et al.*, 2025; Isezuo *et al.*, 2018). A particularly important feature in this patient was the presence of severe acute malnutrition (SAM). The child had a weight of 6 kg, weight-for-height below -3 standard deviations, a Mid Upper Arm Circumference (MUAC) of 11cm and bilateral pitting pedal oedema. These findings indicate severe acute malnutrition with nutritional oedema. Severe acute malnutrition substantially increases susceptibility to serious infections because malnutrition is associated with impaired innate and adaptive immune responses, impaired epithelial barrier function, lymphoid tissue abnormalities, and alterations in complement and cellular immune function (Rytter *et al.*, 2014).

The relationship between malnutrition and infection is bidirectional. Severe malnutrition compromises host defense, increasing susceptibility to infection, while infection increases metabolic requirements and nutrient losses, further worsening nutrition status. This vicious cycle is particularly important in children with SAM, in whom infection is a major contributor to morbidity and mortality (Jones *et al.*, 2014). The presence of severe malnutrition in this child therefore provides an important predisposing factor for development and rapid progression of an opportunistic infection such as EG.

The recent history of measles is also clinically significant. The child had measles several days before the appearance of the skin lesions and had not received immunization. Measles can produce transient immune dysfunction, thereby increasing susceptibility to secondary bacterial infections. In this patient, the combination of measles, severe malnutrition and inadequate immunization may have created a particularly vulnerable host environment for invasive bacterial infection. Malnutrition itself is associated with impaired immune function, and infection can be considerably more severe in severely malnourished children (Rytter *et al.*, 2014; Jones *et al.*, 2014).

The microbiological findings strongly support the diagnosis. Gram staining of the lesion demonstrated Gram-negative bacilli, while culture yielded

Pseudomonas aeruginosa. The isolation of *Pseudomonas* from a characteristic necrotic skin lesion is highly supportive of EG. *Pseudomonas aeruginosa* remains the organism most strongly associated with the condition, although other Gram-negative and Gram-positive bacteria, as well as fungi, have occasionally been reported to produce EG-like lesions (Isuzou *et al.*, 2018).

The full blood count showed a white-cell count of $15.8 \times 10^9/L$, with neutrophils accounting for 6%. This corresponds to an estimated absolute neutrophil count of approximately $0.9 \times 10^9/L$, indicating moderate neutropenia. The EG is classically associated with neutropenia, but neutropenia is not an absolute requirement for its development. Cases have been described in apparently healthy children and in children without established immunodeficiency. Wuyts *et al.* (2019), for example, reported EG in a toddler caused by *P. aeruginosa* and emphasized that EG should prompt consideration of underlying immunological abnormalities, particularly neutropenia, even when the child initially appears otherwise healthy.

The child was commenced on Ciprofloxacin which has antipseudomonal activity and is one of the agents that may be used when the isolate is susceptible. Prompt systemic antimicrobial therapy is important to prevent development of bacteraemia and sepsis which may be associated with EG (Galazka *et al.*, 2021). Because EG involves deeper dermal and vascular infection, topical therapy alone is inadequate, though the use of gentamicin cream and local wound care was reasonable as an adjunct to systemic treatment. In extensive necrotic lesions, surgical assessment and debridement may also be necessary depending on the depth and extent of tissue involvement (Galazka *et al.*, 2021).

Nutritional rehabilitation was a particularly important component of treatment. The child received F-75 followed by F-100, consistent with therapeutic nutritional management of complicated severe acute malnutrition. Nutritional rehabilitation helps restore immune function, promotes tissue repair and improves resistance to further infection. Current WHO guideline emphasizes early identification and appropriate inpatient management of children with severe wasting or nutritional oedema complicated by acute medical problems (WHO, 2023).

The reported weight gain of more than 10g/kg/day, significant healing of the ulcers, improved appetite, resolution of oedema, and absence of further weight loss indicate a favourable response. Current WHO guidelines indicates that appropriate anthropometric

and clinical criteria should be assessed before discharging SAM patients from in-patient to outpatient care (WHO, 2023).

CONCLUSION

This case is clinically important because it illustrates the potentially serious interaction between severe acute malnutrition and invasive bacterial skin infection. Ecthyma gangrenosum should be considered when a malnourished child develops rapidly progressive pustular or vesicular lesions followed by necrosis and black eschar, particularly when fever is present. Early recognition, wound culture, prompt systemic antipseudomonal treatment and simultaneous nutritional rehabilitation can substantially improve outcome.

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