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Case Report

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Severe Falciparum Malaria: A Case Report in an Infant

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ABSTRACT

Nigeria is one of the countries in the WHO African region with high malaria burden and mortality figures. *Plasmodium falciparum* is the deadliest malaria parasite and the most prevalent on the African continent. Some cases of *Plasmodium falciparum* malaria progress to severe form. We reported a severe case of falciparum malaria in an 8 months old male who developed several clinical manifestations such as severe prostration, vomiting, fever, and multiple episodes of tonic-clonic seizures following home treatment by "a nurse" with unknown antimalarials and antibiotics. At the time of presentation to the children's emergency room, his vital signs were consistent with clinical presentation. He had hepatomegaly on physical examination, a hallmark of malarial infection due to an immune response against the proliferation of the protozoa. Peripheral blood smear for malaria parasites was positive for *P. falciparum with a parasite density* of 66,808 parasites/UL. A diagnosis of Severe malaria to rule out meningitis was made. Prompt diagnosis and treatment, particularly if there is severe parasitemia and drug failure is essential in preventing mortality. The patient was started on intravenous (IV) saline, IV Artesunate, IV phenytoin, IV paracetamol, and broad-spectrum antibiotics. Following one week of treatment, his condition improved significantly and he was discharged.

Keywords: *Plasmodium* falciparum, Severe Malaria, 8 Months Old Male, Treatment Regimen.

INTRODUCTION

Malaria is a preventable and curable life-threatening disease caused by *Plasmodium* parasites and spread to humans via the bites of infected female *Anopheline* mosquitoes. Blood transfusion and contaminated needles may also transmit malaria. Globally in 2023, there were an estimated 263 million malaria cases and 597 000 malaria deaths in 83 countries [1]. Sub-Saharan Africa carries the heaviest malaria burden, accounting for an estimated 94% (246 million) of global cases and 95% (569 000) of malaria-related deaths in 2023 with Nigeria accounting for 25.9% and 30.9% of all malaria cases and deaths, respectively. 73.7% (~440,000) of all malaria deaths in 2023 were children under-5 years. A child dies nearly every minute from this preventable, treatable disease [1].

Plasmodium falciparum is the major cause of severe malaria, which manifests as multiple organ dysfunction with high parasitemia counts that is characterized by coma, severe prostration, seizures, and severe metabolic acidosis [2]. *Plasmodium falciparum-positive* malaria is one

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of the major causes of high childhood mortality in Nigeria. Poverty, self/home medication, and low-level education lead to delays in diagnosis and early management often leading to death. For early diagnosis, it is paramount to consider malaria in every febrile patient living in an area endemic to malaria [3]. The purpose of this case report is to emphasize the need for prompt clinical and laboratory diagnosis to reduce the severity and death toll due to the disease. We report a case of severe malaria manifested by a significant level of parasitemia despite home management with antimalarials and antibiotics by a nurse practitioner but susceptible to intravenous artesunate.

CASE REPORT

An 8-month-old male child presented to the Children's emergency department with the chief complaints of fever for 5 days, vomiting for 3 days followed by profound weakness for 1 day, and two episodes of seizures prior to presentation. The seizures as described by caregiver were tonic-clonic in nature lasting between 3-4 minutes. On examination, the child was febrile with severe prostration. The child had uneventful perinatal history and no developmental delay. The temperature was 38.90C, blood pressure 80/60 mmHg with oxygen saturation of 92%. Respiratory and heart rates were 37cycles/min and 114beats/min respectively. He was anicteric and moderately pale. On systemic examination, he had hepatomegaly with the liver being about 3cm palpable. All other systems were examined to be normal. A provisional diagnosis of Severe malaria to rule out meningitis was made.

A complete blood count showed Packed Cell Volume (PCV) was 22%. Other blood parameters: White blood cell (WBC) count of 6.0 x 109/l with neutrophilia and mild lymphopenia; Red blood cell (RBC) count 2.63 x1012/l; Platelet count 220 x 109/l; Mean Cell Volume 81fl; Mean Corpuscular Haemoglobin 26pg. A comprehensive metabolic panel comprising random blood glucose (68mg/dl), serum electrolytes, urea, creatinine, and the hepatic panel were normal. Urinalysis was negative for blood, nitrates and leucocyte esterase; red blood cell and pus cells were 0–3 and 2-3 per High Power Field (HPF) respectively. The cerebrospinal fluid (CSF) studies showed clear colourless CSF with protein of 28mg/dl; glucose 62mg/dl and <5WBCs/mm3. CSF culture was negative. He had a peripheral blood smear (Figure 1). Microbiology revealed multiple rings of *Plasmodium falciparum* with a parasite count of 4+ (> 10 *parasites per* HPF) and *parasite density* of 66,808 parasites/ul at 6:30 pm on Day 0. The final diagnosis of severe malaria was made. Treatment was initiated using intravenous (IV) artesunate followed by Artemisinin Combination Therapy (ACT) according to WHO guidelines. Other supportive treatments patient received included intravenous (IV) antibiotics (Ceftriaxone and Gentamicin) which were administered for 48hours, IV Normal saline, IV Phenobarbitone, and IV Paracetamol. Parenteral artesunate was given at a dose of 2.4mg/kg/dose at 0, 12, 24, and 48 hours.

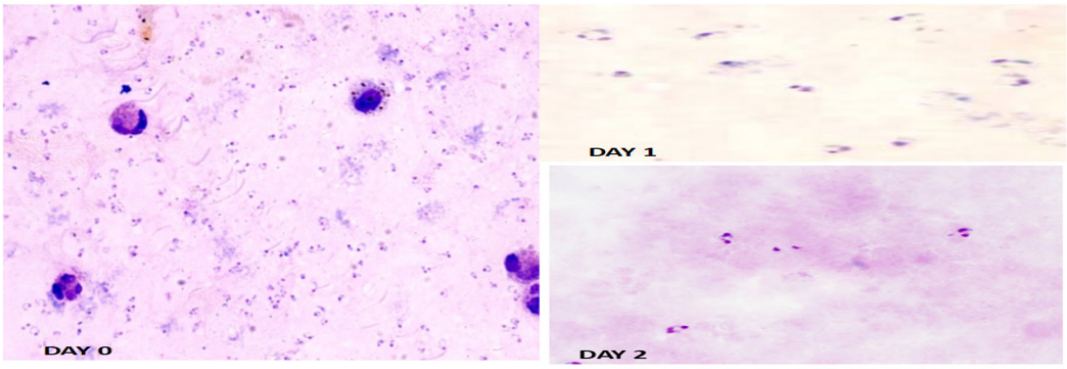

Figure 1. Serial Giemsa-stained thick films of the patient's blood sample.

With the commencement of therapy, parasitemia level decreased to 2000 parasites/ul at 3:25 pm on Day 1 after the second dose of IV Artesunate with occasional intermittent fever spikes. On follow-up, fever decreased, prostration improved and the patient had only one episode of a seizure lasting about 30 seconds post-admission. On day 2, *parasite density* was 12 parasites/ul at 10:15 am. On Day 3 at 10:35 am, the peripheral blood film report was negative (Table 1). The patient was placed on oral artemether-lumefantrine for 3 more days. A repeat peripheral blood film on days 4 and 5 was also negative. He was discharged after one week of treatment with scheduled repeat laboratory work-up weekly for 2 weeks as an outpatient.

Table 1. Daily Malaria Parasite Density Quantification

Peripheral blood film	Day 0	Day 1	Day 2	Day 3-5
Parasite density(parasites/ul)	66,808	2000	12	0
Parasite count/HPF	+4 (>10p/HPF)	+2 (11-100p/100HPF)	+1 (1-10parasites/100HPF)	0

HPF= High Power Field

DISCUSSION

Plasmodium falciparum malaria is a major cause of mortality in the pediatric age group [4]. Complications involve the nervous, respiratory, renal, and/or hematopoietic systems. According to WHO criteria, severe malaria is defined as P. falciparum asexual parasitemia and one or more of the following clinical features: impaired consciousness, prostration, respiratory distress, multiple seizures, jaundice, hemoglobinuria, abnormal bleeding, severe anemia, renal impairment, circulatory collapse, pulmonary edema, and shock are features of severe malaria [2]. The index case had severe prostration, multiple seizures with positive P. falciparum asexual parasitemia thus illustrating the need to recognize severe malaria early and initiate prompt treatment.

Treatment of severe malaria requires immediate antimalarial therapy with supportive care and management of complications because mortality is highest in the first 24 hours of presentation [5]. For severe malaria, the WHO recommends parenteral artesunate otherwise, treatment with quinine is recommended. Clinical evidence from two large-scale, multi-centre trials in South East Asia (SEAQUAMAT) [6] and Africa (AQUAMAT) [7] showed a reduction in the risk of death using injectable artesunate compared to quinine. It is estimated that injectable artesunate could save up to an additional 195,000 lives each year if used throughout Africa. This equates to saving one extra life for every 41 children treated. Artesunate's efficiency and life-saving benefit for severe malaria derives from its rapid parasiticidal ability across all the life stages of the plasmodium parasite unlike quinine which is slower and stage-specific, mainly affecting the mature blood stages. Treatment is generally parenteral initially. It is then completed with oral antimalarial if the patient is tolerating oral intake. Completion of oral antimalarial therapy is 3–7 days afterward depending on the regimen, which can include artemether-lumefantrine, dihydroartemisinin-piperaquine, artesunate-amodiaquine, doxycycline, clindamycin, quinidine, atovaquone-proguanil and mefloquine.

The patient presented in this case had severe malaria with other possible causes for his symptoms excluded. The level of *Plasmodium falciparum* parasitemia at clinical presentation has repeatedly been shown to correlate with the severity of the disease [8], which was the case with our patient. The *parasite density* was calculated from thick blood films using the formula: number of parasites/white blood cells counted (usually 200WBCs) × 8000 (average number of white blood cells). The *parasite density* was also estimated by counting *parasites per* high power field (HPF) on the thick film. Our patient initially had a parasitemia level of 66,808 parasites/ul despite taking a course of antimalaria medication prescribed by a nurse practitioner. Plausible reasons may have been treatment failure from possible poor oral absorption, sequestered malaria parasites in the gastrointestinal tract, inadequate dosing, and poor drug quality.

Following the commencement of parenteral artesunate, the parasitemia dropped within 24 hours, indicating rapid parasite clearance from the blood. This improved his symptoms and by day 3 peripheral blood film was negative for malaria parasite. Similar results were noted by Arcelia et al., 2018 in Indonesia [9]. Progression to severe malaria in this patient could have ideally been prevented if adequate care was sought at the outset. Educating patients and caregivers on mosquito bites preventive measures as well as the need to seek early adequate care will go a long way in protection from this disease and its debilitating effects [10].

CONCLUSION

Severe falciparum malaria can be life-threatening unless it is diagnosed early. Timely adequate medical intervention and education on mosquito bite preventive measures are key players in limiting the morbidity and mortality associated with severe falciparum malaria. Rapid parasite clearance, low toxicity, and ease of administration associated with parenteral Artesunate regimen makes it a veritable choice in the management of severe malaria.

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CONFLICTS OF INTEREST

Authors declare that there are no conflicts of interest.

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