Acute Kidney Injury in Plasmodium Falciparum Malaria; Field Hospital Experience

Abu Sufyan, Hassan Jaffar*, Sijeel Ahmed**, Asad Sufyan***

Department of Surgery, Field Hospital-12 Darfur, Sudan, *Health Care Administrator, Field Hospital-12 Darfur, Sudan, **Department of Anesthesia, Field Hospital-12 Darfur, Sudan, ***Department of Medicine, Field Hospital-12 Darfur, Sudan,

ABSTRACT

Malaria is a significant health problem in tropical areas that can lead to fatal complications, including acute kidney injury. Plasmodium falciparum infection is a leading cause of complicated malaria and death. Although the pathogenesis of acute kidney injury is not fully understood, acute tubular necrosis is the most common histological finding. Acute kidney dysfunction due to malaria can cause irreversible damage if not appropriately managed. Therefore, early diagnosis and management with dialysis plays an essential role in saving life. In this case, a 34-year-old male Ethiopian National diagnosed case of malaria falciparum developed pulmonary oedema secondary to acute kidney injury, leading to death.

Keywords: Acute kidney injury, Falciparum malaria, Field hospital.


This is an Open Access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Malaria is a parasitic infection affecting millions of people in tropical areas. Plasmodium falciparum causes more severe disease owing to increasing drug resistance.\(^1\) It can lead to life-threatening conditions, including multiple organ failure, acute respiratory distress syndrome, acute renal failure, hepatic failure, pulmonary oedema and severe thrombocytopenia.\(^2\) Acute kidney injury occurs in approximately 40% of cases and can progress to end-stage renal disease, with 75% mortality.\(^3\) Here, we are sharing our experience of a Field Hospital where the Forward Surgical team (Surgeon and Anaesthetist only) was placed with limited diagnostic/laboratory facilities, primarily to deal with surgical emergencies.

CASE REPORT

A 34-year-old male, Ethiopian National, diagnosed case of malaria falciparum, evacuated to the field hospital at 1600 hours on 4th October 2020, with five days history of fever, two days history of nausea, vomiting and dizziness, treated by oral artemether and quinine for three days. There was no history of chest pain, headache, diarrhoea, constipation, dysuria, or jaundice. His past medical and surgical history was unremarkable. On examination, he was markedly palor, anxious-looking, and dehydrated with a pulse of 122 beats/minute, blood pressure of 160/90, Temperature of 36°C, respiratory rate of 22 breaths/minute, and SPO2 at room air was 88%. Systemic examination did not reveal any abnormality. Laboratory investigations revealed Hemoglobin 5gm/dl, platelet count 150000, and Blood sugar random 75mg/dl. Patient urgent evacuation to tertiary care setup was recommended to concerned authorities, and resuscitation started by passing intravenous lines, foley catheter and Oxygen inhalation. He was transfused with 100ml of 25% Dextrose, 500ml of Ringer lactate and two units of cross-matched blood in 5 hours, with 2gm of Injection ceftriaxone and 40mg of Injection Lasix. The patient's vital signs deteriorated, and he developed respiratory distress, gradually worsening, and chest auscultation revealed bilateral crept. Acute kidney injury leading to pulmonary oedema was suspected, and patient resus-citation continued; despite injecting 200mg of Lasix (divided in bolus), his urine output did not improve, hardly 50ml in six hours. At 1100 hours, the patient became irritable and could not maintain oxygen saturation. He was put on ventilatory support with standard sedation, developed ventricular tachycardia twice and revived after giving 200j shock. Despite the best possible resuscitative efforts, the patient went into cardiac arrest at 0405 hours on 5th October 2020, and death was declared. His postmortem report revealed a left polycystic kidney with multiple stones and a pale right kidney with an irregular surface, concluding that the renal failure led to pulmonary oedema and severe anaemia as a cause of death (Figure).

DISCUSSION

Malaria is the most prevalent endemic disease in Africa, Latin America, and Asia, causing frequent outbreaks due to different geographical factors.\(^4\) It infects around 300 million people around the globe.
with 200000 to 600000 deaths. Malaria infection has acute, fulminant, and chronic course. The malaria infection is transmitted by a mosquito bite resulting in hemolysis of red blood cells by merozoites with 12 days incubation period. The patient usually presents with fever and chills. However, with fulminant disease due to Plasmodium falciparum, it presents with anaemia, jaundice, acute kidney injury (AKI), fluid/electrolyte imbalance, respiratory failure, disseminated intravascular coagulation, shock and coma. Diagnosis is made with the help of a microscope by direct visualization of malaria parasites in thick and thin blood films.

The blockage of renal microcirculation due to the sequestration of red blood cells and immune-mediated glomerular injury with hypovolemia play a pivotal role in causing acute kidney dysfunction. The most commonly found histological finding is acute tubular necrosis. Cortical necrosis in malaria indicates more severe and irreversible kidney injury leading to end-stage kidney disease. Patients with acute kidney disease due to malaria usually present with oligoanuria, as in our case, severe metabolic acidosis and hyperkalemic state resulting in hyponatremia and hyperkalemia.

The treatment of malaria-associated kidney disease includes antimalarial drugs along with supportive measures. Early hemodialysis is recommended for AKI to decrease mortality and morbidity. Timely diagnosis and intensive care management with early dialysis can change the outcome of falciparum malaria-induced kidney injury.

Conflict of Interest: None.

Authors Contribution
Following authors have made substantial contributions to the manuscript as under:

AS & HJ: Conception, data acquisition, data analysis, drafting the manuscript, approval of the final version to be published.
SA: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.
AS: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES
7. Fairhurst RM, Wellems TE. Plasmodium species (Malaria) In: Mandell GL, Bennett JE, Dolin R, editors, editors. Mandell, Douglas, and Bennett’s Principles and practice of infectious diseases. 7th ed. Philadelphia: Churchill Livingstone; 2010. [Internet] available at: https://www.who.int/news-room/questions-and-answers/item/malaria?gclid=CwKCJAwxCOrmBnAFoQABB12kAQoY1o2JPBBLAFaSdA94LgBNAAYw7l6ZriS8QBa1DrWx5ToR5BrEoj7C57bMXTm_FczLxui sAZx0CCx8QAyVwBwE