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BRIEF REPORT

A 4-Day Incubation Period of *Plasmodium falciparum* Infection in a Nonimmune Patient in Ghana: A Case Report

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Plasmodium falciparum can cause severe infection and has the shortest incubation period compared with all the other *Plasmodium* species. Incubation periods of 9–14 days for the immune and 6–14 days for the nonimmune have been reported for *P. falciparum*. However, an incubation period of less than 5 days has not been reported, as of yet. This report presents a case of a 23-year-old nonimmune female who presented with signs and symptoms 4 days after being bitten by mosquitoes while visiting Ghana. The patient was successfully treated with a 1-day course of parenteral artesunate, followed by a 3-day course of oral artemisinin combination therapy.

Keywords. artesunate; Ghana; incubation period; Malaria; nonimmune; *Plasmodium falciparum*; West Africa.

Plasmodium falciparum is one of the prominent *Plasmodium* species, transmitted by malaria-causing vectors, in Ghana [1, 2]. This *Plasmodium* species is responsible for the majority of the uncomplicated and severe malaria cases that are reported in clinics and hospitals throughout Ghana [3]. Among the 5 species of *Plasmodium* that cause human infection, *P. falciparum* causes the most severe form of malaria [4]. Like the other species, *P. falciparum* is transmitted by the bite of an infected female Anopheles mosquito; however, it has a relatively shorter incubation period than the others [5]. The incubation period for *P. falciparum* is 9–14 days, whereas those of *P. vivax* and *P. malariae* are 12–17 days and 18–40 days, respectively [5]. Though a shorter incubation period of 6 days for *P. falciparum* has been reported, especially in the nonimmune [4], an incubation period of less than 5 days has not been reported in literature. Presented here is a case of a 4-day incubation period of *P. falciparum* infection in a nonimmune patient in Ghana.

CASE REPORT

A 23-year-old female medical student from the United Kingdom presented to a local hospital 5 days after arriving in Ghana, with a 24-hour history of fever, chills, bodily pains, vomiting, and diarrhea. She reported a recent incident of several mosquito bites while she was sitting outside the first night she arrived in the country. The patient had never visited Africa before this trip. She had been taking 250 mg of mefloquine once a week for malaria prophylaxis but admitted to not being compliant with her medication. The patient admitted to being a cigarette smoker and to smoking about 3 packs per week. Since the onset of her symptoms, she had vomited twice and passed loose, nonbloody stool 4 times. Upon examination, the patient exhibited several insect bite marks bilaterally on the legs and a temperature of 37.8°C; she was not dehydrated, pale, or in respiratory distress. She had a flat abdomen but reported mild epigastric tenderness. Breath sounds were clear bilaterally; in addition, heart sounds were clear, with no rubs, murmurs, or gallops. The patient was conscious and oriented to time, place, and person. Her full blood count investigation revealed a hemoglobin level (Hb) of 12.3 g/dL; white blood cell count (WBC) of 8.2×10^9 µL with differentials (neutrophils 50%, lymphocytes 30%, monocytes 20%, and basophils 0%) and platelets of 158×10^9 uL. A rapid diagnostic test (RDT) was positive for malaria parasites, and malaria parasites were also seen on blood film microscopy, with a parasitemia level of 2+. Urine pregnancy test was negative, and urinalysis showed no signs of infection. The patient was diagnosed with malaria and was immediately started on artesunate injection, 160 mg Q12H. The patient was also placed on 500 mL 5% dextrose normal saline infusion, alternating with 500 mL ringers lactate infusion, for 24 hours. The patient's fever, vomiting, and diarrhea subsided 24 hours after commencing treatment. The patient was subsequently placed on oral, adult-course artemether lumefantrine (80/480 mg, repeated every 8 hours for the first day, then twice daily for the next 2 days) and paracetamol (acetaminophen) 1 g every 8 hours for 3 days. The patient's condition improved, and she was discharged 3 days after. The patient was re-examined a week later and found to be recovering well, with resolution of her symptoms. Before leaving Ghana, 6 weeks post–hospital admission, there was no parasite observed in her blood film microscopy, and RDT was negative.

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DISCUSSION

Our patient had not visited Africa or any other malaria-endemic region of the world. Therefore, she had no form of immunity against malaria. She manifested febrile symptoms 4 days after the mosquito bites, which infected her with the malaria parasite, as evidenced by the positive *P. falciparum*–specific RDT.

The virulence of *P. falciparum* is seen in the severity of the disease [4, 6]. It has also been reported to have a short incubation period and life cycle [4, 6]. The life cycle begins with the bite from an infected female Anopheles mosquito. The sporozoites' journey through the liver to the red blood cells which is marked by 2 important periods in the life cycle: the prepatent period (from sporozoite entry to parasite detection in the blood) and the incubation period (sporozoites to the manifestation of symptoms) [4]. The duration of these periods, especially the incubation period, is usually influenced by the level of immunity of the infected patient, antimalarial prophylaxis, and previous malaria treatment [4, 7]. The nonimmune state of our patient would have been responsible for the unusually short incubation period noted in this case [4]. Though she was on mefloquine prophylaxis, which is specific to *P. falciparum* [8], she was not consistent in taking the course. Though the patient had a short incubation period, her symptoms were not severe, probably because she reported to the hospital as soon as the symptoms began. She presented with the typical malarial symptoms of fever, chills, vomiting, and diarrhea [9]. The physical findings were also not remarkable, which is not uncommon, even in nonimmune patients [4]. The laboratory results also reflect the unremarkable nature of this infection, as all blood cells (leukocytes, red cells, and platelets) were within normal reference range. Usually, more severe infections, especially in the nonimmune, present with thrombocytopenia, anemia, and neutrophilia with band formation [10]. RDT was used as a diagnostic tool to diagnose malaria in this patient, and the positive RDT was confirmed with microscopy, which is indeed the best practice in laboratory diagnosis of malaria [11–13]. Though the patient did not present with severe malaria and, as per the World Health Organization guidelines, being nonimmune is not a criterion for treatment with intravenous artesunate [14], the decision to start the patient on parenteral antimalarial was because of the vomiting, as she might not have been able to tolerate oral medication. Artesunate was the parenteral antimalarial drug of choice for this patient. It is a very efficacious drug, whose rapid parasite clearance, lack of or minimal clinical side effects, and an easy administration made it a better option than quinine [15, 16].

CONCLUSION

P. falciparum malaria typically manifests within 2 months of exposure to mosquito bites and generally presents clinically in travelers after their return from an endemic region [17]. Unlike the typical incubation period, this case highlights the successful management of *P. falciparum* infection occurring in a nonimmune patient 4 days after being bitten by mosquitoes. The patient was successfully treated with a 1-day course of parenteral artesunate, followed by a 3-day course of oral antimalarial artemisinin combination therapy.

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