CASE REPORT: ODYSSEAN MALARIA AT A RESIDENTIAL ESTATE, CITY OF TSHWANE, 14 JANUARY 2020

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Summary

In November 2019, the National Institute for Communicable Diseases (NICD) was notified of a malaria case at a residential estate, City of Tshwane, Gauteng Province. The case was investigated on 14 January 2020. An interview was conducted with the case-patient to gather information on demographics, clinical and exposure history, and an environmental assessment of the residence and immediate surroundings was conducted. The patient was a 48-year-old male. He and family members had no travel history to a malaria-endemic area. Following an initial misdiagnosis, the patient was hospitalized for 9 days and recovered following antimalarial treatment. The patient's residence is in close proximity (approximately 50-60 meters) to the N4 national highway on which vehicles from malaria-endemic areas may travel through. There was no evidence of local free-standing water that could enable mosquito breeding. The outbreak was most likely caused by the accidental introduction of an infected mosquito by a vehicle returning from a malaria transmission area, an event known as Odyssean malaria.

Background

Malaria is endemic to only three of South Africa's nine provinces including the northeastern areas of KwaZulu-Natal (KZN), Mpumalanga and Limpopo provinces.[1] Malaria in South Africa is seasonal, and peaks during the warmer, wetter summer months from September to May.[2] The malaria season overlaps with the festive period during which there is increased traffic flow between Gauteng Province and malaria endemic areas within South Africa and neighboring countries, especially Mozambique and Zimbabwe. This increases the incidence of a category known as Odyssean malaria. Odyssean malaria is acquired locally through a bite of an infective

Anopheles mosquito that has been inadvertently imported from a malaria endemic area via ground or air transport.[3]

Malaria is transmitted by certain *Anopheles* mosquito species that are endemic to South Africa's low altitude northeastern regions. This is the southernmost extent of their distribution in sub-Saharan Africa in which these species are common. Malaria generally presents as a 'flu-like febrile illness that can be fatal if not diagnosed and treated soon after the onset of symptoms.[2]

In South Africa, malaria is a class I notifiable medical condition (NMC). This means that notification should be made immediately upon the identification of a case that meets either the suspected, probable or confirmed case definition as given in the NMC guidelines.[4] Following notification of a case for which there is no travel history (i.e. a case of locally acquired malaria), an entomological assessment of the index house and the surrounding geographical location should be conducted by environmental health officials.[4] This is to identify potential *Anopheles* mosquito breeding sites that may indicate a need for insecticide-based control measures in the immediate area.

On 11 November 2015, the Outbreak Response Unit, Division of Public Health Surveillance and Response of the National Institute of Communicable Diseases (NICD), received a notification of a confirmed malaria case by the Gauteng Province Department of Health. The case-patient was a 49-year-old male who was admitted to a private hospital on 11 December 2019. The patient reported symptoms including fever, headache, nausea, vomiting and flu-like illness. As the patient had no travel history (within the past 3 months) to a malaria-endemic area, an investigation was subsequently conducted by the provincial/district Department of Health environmental health officers, district communicable disease coordinator and NICD to identify contacts and determine the possible cause of transmission. The objectives of the follow-up investigation were: 1) to describe the characteristics of the laboratory-confirmed malaria case; 2) to visit the index house and establish if there were breeding sites for mosquitoes, collect mosquito larvae and, if possible, to collect and identify mosquito vectors of malaria and 3) to conduct a site investigation in the immediate vicinity of the index house to identify possible routes of mosquito importation.

Methods

A descriptive study was conducted using the following case definitions as per NMC guidelines[4]:

- A suspected case in a non-endemic malaria area was defined as an individual presenting with fever, headache and/or 'flu-like illness (acute febrile 'flu-like illness) with no other cause for illness and non-specific laboratory findings.
- A probable case was defined as a clinically suspected case in an endemic area.
- A confirmed case demographics as an individual with a positive laboratory malaria test (malaria rapid antigen test, blood smear, or PCR) for *P. falciparum*, *P. vivax*, *P. ovale*, *P. malariae* or *P. knowlesi*.

To establish the magnitude and possible source/s of the outbreak, the following activities were conducted during the site visit:

Epidemiological investigation: An in-depth key informant interview was conducted with the case-patient to gather information on demographics, clinical and malaria exposure history. Informed consent was granted.

Laboratory investigation: Blood smear microscopy and PCR analysis for the detection of malaria parasites was conducted by the hospital laboratory service at the time case-patient was admitted. No additional laboratory investigations were undertaken during the investigation for the confirmed case.

Environmental investigation: An environmental assessment of the case-patient's residence (index house) and immediate surroundings was conducted to identify possible mosquito breeding sites.

Public health intervention measures: Information pamphlets were distributed to the patient and health/promotion activities about malaria were conducted among community members and clinicians at nearby hospitals in the City of Tshwane by the provincial/district Department of Health.

Results

Epidemiological and clinical information: On 10 December 2019, a 48-year-old male developed symptoms of fever and fatigue and visited a nearby clinic. However, he was incorrectly diagnosed as having a stomach lining issue and was given treatment to alleviate the symptoms. As the day progressed his symptoms worsened and he reported a headache, nausea, vomiting, flu-like symptoms, sweating and was not able to sleep. On 11 December 2019, he went to a private hospital and was put on an IV drip. Blood tests were conducted and viral hepatitis was initially suspected. The patient was later admitted to ICU and was diagnosed with malaria following microscopy and PCR analysis of a blood sample. He was hospitalised for 9 days and recovered following antimalarial treatment. He was discharged on 20 December 2019.

The patient resides on a secure residential estate on the east side of Pretoria. He is a white-collar office worker and commutes to Johannesburg (Sandton) daily. He had no history of travel to a malaria-endemic area, and no recent needlesticks or blood transfusions were reported. He does not have a domestic worker and had no knowledge of other contacts (friends, family, neighbours and colleagues) who had travelled to an endemic area during the epidemiologically relevant period.

Environmental investigation: The patient's residence is immediately adjacent to the N4 national highway. As it is possible for mosquitoes to be transported long distances by road transport, there is an increased risk of imported malaria from vehicles that use highways as arterial routes between provinces.[3] An environmental investigation revealed no mosquitoes in the home and there was no evidence of free-standing water that could enable mosquito breeding. Therefore, no specific vector control measures were conducted at the residence.

Discussion & conclusion

This investigation shows a sporadic case of Odyssean malaria in a non-endemic area, with no evidence of an epidemiological link to any other case. The patient had no history of travel to any malaria-endemic areas, resulting in a delayed diagnosis. The high case fatality rates associated with Odyssean malaria are generally attributable to late presentation at health facilities and delayed or missed diagnoses.

Odyssean malaria can have a case fatality rate as high as 50% (current average is 17%) as compared to the national malaria case fatality rate of 0.7% in 2018.[5,6] The initial misdiagnosis in the case reported here highlights the importance of keeping malaria as a differential diagnosis for patients presenting with febrile illness, even in the absence of a travel history to a malaria endemic area.

Based on date of symptom onset and the typical incubation period for malaria, the patient in this case most likely acquired malaria from the bite of an infective *Anopheles* mosquito during the last week of November 2019. The mosquito in question could have alighted from a car, taxi, bus or truck that had stopped on the N4 highway in close proximity to the patient's residence.

Community outreach and recommendations

Upon completion of the investigation, malaria information pamphlets were provided to the patient. Additionally, health/promotion activities about malaria were conducted among community members and clinicians at nearby hospitals in the City of Tshwane by the provincial Department of Health. More specifically, healthcare workers were advised to consider malaria when a patient presents with 'flu-like illness, fever (>38°C) and headache, and progressively worsens over a short period of time, regardless whether there is a travel history to an endemic area or not. It was further advised that potential mosquito breeding sites should be drained or treated with an appropriate larvicide.

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