FOREWORD

In this issue:

Odyssean malaria is an unusual but recurrent occurrence in South Africa, especially in Gauteng Province. It refers to locally acquired malaria in one or more persons who have no recent travel history to an endemic area, implying that infective mosquitoes are occasionally transported to non-endemic areas – most likely by road transport – where they subsequently bite and infect one or more local residents. This issue describes two linked odyssean malaria cases that occurred in Kempton Park, Ekurhuleni District, in October 2021, once again reminding healthcare personnel to test for malaria in patients with unexplained febrile illness, even if they have not visited a malaria-affected area recently.

The World Health Organization urges all countries to prioritize antimicrobial resistance surveillance for selected organisms including carbapenem-resistant Enterobacterales (CRE). This issue contains the 2019-2020 CRE surveillance report from four sentinel sites in Gauteng Province, South Africa, during which an alarming 86% of the samples received tested positive for genes that facilitate resistance mechanisms in carbapenemase-producing Enterobacterales. This report also highlights sub-optimal functioning of the surveillance system at these sites and gives recommendations for their improvement.

Also in this issue is the acute flaccid paralysis (AFP) surveillance report for 2020. This surveillance system is used to monitor the possibility of circulating poliovirus. No wild-type nor vaccine-derived poliovirus were detected in South Africa during the surveillance period. Sabin poliovirus type 2 and circulating vaccine-derived poliovirus type 2 (cVDPV2) were however detected from 13 other African countries, highlighting the importance of ongoing surveillance and the need for logistical improvements to the surveillance system.

All contributors are thanked for their inputs, and we trust you will find these reports useful and interesting.

Basil Brooke, Editor

ODYSSEAN MALARIA IN KEMPTON PARK, GAUTENG PROVINCE – SEPTEMBER 2021

Inge Kleinhans[1], Basil Brooke[2,3], John Frean[2,3]

[1] Outbreak Response Unit, Division of Public Health Surveillance and Response, NICD

[2] Centre for Emerging Zoonotic & Parasitic Diseases, NICD

[3] Wits Research Institute for Malaria, School of Pathology, University of the Witwatersrand, Johannesburg

Summary

Locally-acquired malaria is generally limited to endemic areas but local cases can occur outside of these areas owing to the inadvertent transfer of infective mosquitoes by means of road or air transport, referred to as 'odyssean malaria'. Typically, delayed diagnosis and treatment leads to severe malaria illness and sometimes fatal outcomes. Two suspected odyssean malaria cases from the same residence in Kempton Park were investigated. Neither had a history of travel to a malaria endemic region. A site inspection by a multi-sectoral team led by NICD staff revealed no obvious malaria threat in the vicinity of the index house or at other relatives' houses that the patients frequently visited. Genotyping of the parasites in the patients' residual blood smears revealed the same strain of *Plasmodium falciparum*. Both patients required intensive care for severe malaria, but recovered on appropriate treatment. Health facilities in the vicinity were advised to maintain a high index of suspicion for malaria in febrile patients with unexplained illness, even in the absence of a travel history to a malaria-endemic area.

Introduction

Malaria (a category 1 notifiable disease) is a preventable and curable disease caused by *Plasmodium* species, which can be fatal if not timeously diagnosed and treated. The vectors are certain *Anopheles* mosquito species that prefer warm and humid climatic conditions. In southern Africa's endemic areas malaria is seasonal with the rates of transmission highest during the summer months (September to May).

Malaria transmission in South Africa is generally confined to areas of the lowveld, especially those bordering Mozambique, Botswana and Zimbabwe. The most affected districts occur in northern KwaZulu-Natal, Limpopo and Mpumalanga provinces, which are endemic for malaria. There is, however, an additional risk outside these endemic areas due to the capability of infected mosquitoes to travel by means of air, road, rail or sea transport.

These hitch-hiking mosquitos are capable of infecting more than one person on route or at their destination - referred to as 'odyssean malaria'.[1] Odyssean malaria is uncommon and so delayed diagnosis and treatment can lead to complications with severe, sometimes fatal outcomes.[1]

Gauteng Province is not endemic for malaria and therefore its disease burden largely derives from residents travelling to and from endemic areas/countries (imported malaria), and from occasional odyssean malaria incidents. Gauteng's importance as a transport hub, including OR Tambo International Airport, which is utilised by a great many travellers, raises the risk and incidence of imported and odyssean malaria.[1]

On Wednesday 29th October 2021, the Ekurhuleni District Health office notified the National Institute for Communicable Diseases (NICD) of two suspected odyssean malaria cases in Kempton Park. These cases did not have a recent travel history outside Gauteng Province or the country, and resided at the same address. There was therefore a high index of suspicion of odyssean malaria. An outbreak response team was activated, comprising four staff from NICD (a pathologist, an entomologist, two public health registrars) and five Ekurhuleni District Health office personnel, comprising environmental health practitioners and outbreak response team members.

The aim of the outbreak response team was to confirm the diagnoses of odyssean malaria, collect patient samples for parasite genotyping and investigate the cases' residence and other places of interest for the presence of mosquito vectors, and to identify any situational risk factors that could be linked to malaria. The team therefore visited the residence of the cases (Figure 1, mapped as B), a residence of their family where they frequently overnight (mapped as C) and that of another family that they frequently visit (mapped as A).

Case & environmental investigation report

Kempton Park is a suburb within the Ekurhuleni Municipality with a total population of 171 575 and a population density of 1151 persons/km^2.[2] The municipality includes OR Tambo International Airport, many industry headquarters and logistics companies and major industrial sites, a power station and entertainment facilities. The odyssean cases reported from there are described below and in Table 1.

Table 1. Summary of odyssean malaria cases reported by Arwyp Medical Centre, Kempton Park, Ekurhuleni District, Gauteng Province, South Africa.

Patient (sex, age)	Date of onset of symptoms	Symptoms	Date diagnosed (notified)	Treatment	Status	Comment
Female, 24y	24/09/2021	Myalgia, headache, fatigue, chills	29/09/2021 (29/09/2021)	Artesunate, Coartem	Recovered and discharged	Severe disease with ICU admission and mechanical ventilation.
Male, 25y	27/09/2021	Diarrhoea, vomiting, myalgia, headache	30/09/2021 (30/09/2021)	Artesunate, Coartem	Prolonged hospitalisation, but discharged for home recovery	Severe disease with ICU admission and mechanical ventilation, complicated by acute respiratory distress syndrome and superimposed bacterial infection. Required renal dialysis for acute kidney Injury.

Case A: Case-patient A (24 y/o) symptom onset was Friday 24 September 2021. Her symptom profile included myalgia, headaches, fatigue and chills. Over the course of the weekend her symptoms did not improve and she initially visited a medical practice on Monday 27 September. COVID-19 was part of the differential diagnosis and with no relevant travel history, she was discharged with a negative COVID-19 PCR and home-based treatment. On 29 September, her condition worsened and she was rushed to the nearest medical facility. Here she was admitted to ICU, with her initial blood work showing thrombocytopenia and thereafter *Plasmodium falciparum* parasites were confirmed. Due to the absence of a travel history, odyssean malaria was suspected. She completed a full course of antimalarial treatment with intravenous artesunate, followed by oral artemether-lumefantrine (Coartem). During her admission she also developed bloodstream infections with *Staphylococcus capitis* and *Candida parapsilosis.* These resolved and her condition stabilised and improved. She was successfully discharged from hospital and recovered at home.

Case B: Case-patient B (25 y/o), husband of case-patient A, developed symptoms on 27 September. He experienced diarrhoea, vomiting, myalgia and headaches. At this stage, he visited a medical practice, where

he received symptomatic treatment. He also did not have any relevant travel history and had a negative COVID-19 PCR. His symptoms worsened, with dehydration, and he was rushed to the same medical facility on 30th September for emergency admission to ICU. Shortly thereafter he was intubated and ventilated. Due to the confirmation of the malaria diagnosis on his wife, his primary blood work-up included a formal malaria smear. He had a thrombocytopenia as well as acute kidney injury. His malaria smear was positive for *P. falciparum*. He required regular dialysis as well as mechanical ventilation. At one point in time he had to be reintubated due to complications of acute respiratory distress syndrome. After an additional period of mechanical ventilation and tailored treatment, he recovered and was successfully extubated. He completed the full antimalarial course of artesunate IV followed by artemether-lumefantrine (Coartem) orally. He was discharged to recover at home, where he required additional nutritional support, renal care and blood transfusion.

Because both infections occurred almost simultaneously in a married couple, the incubation period and time of onset of disease indicated several potential sites where they could have been infected (Figure 1), and these were investigated.

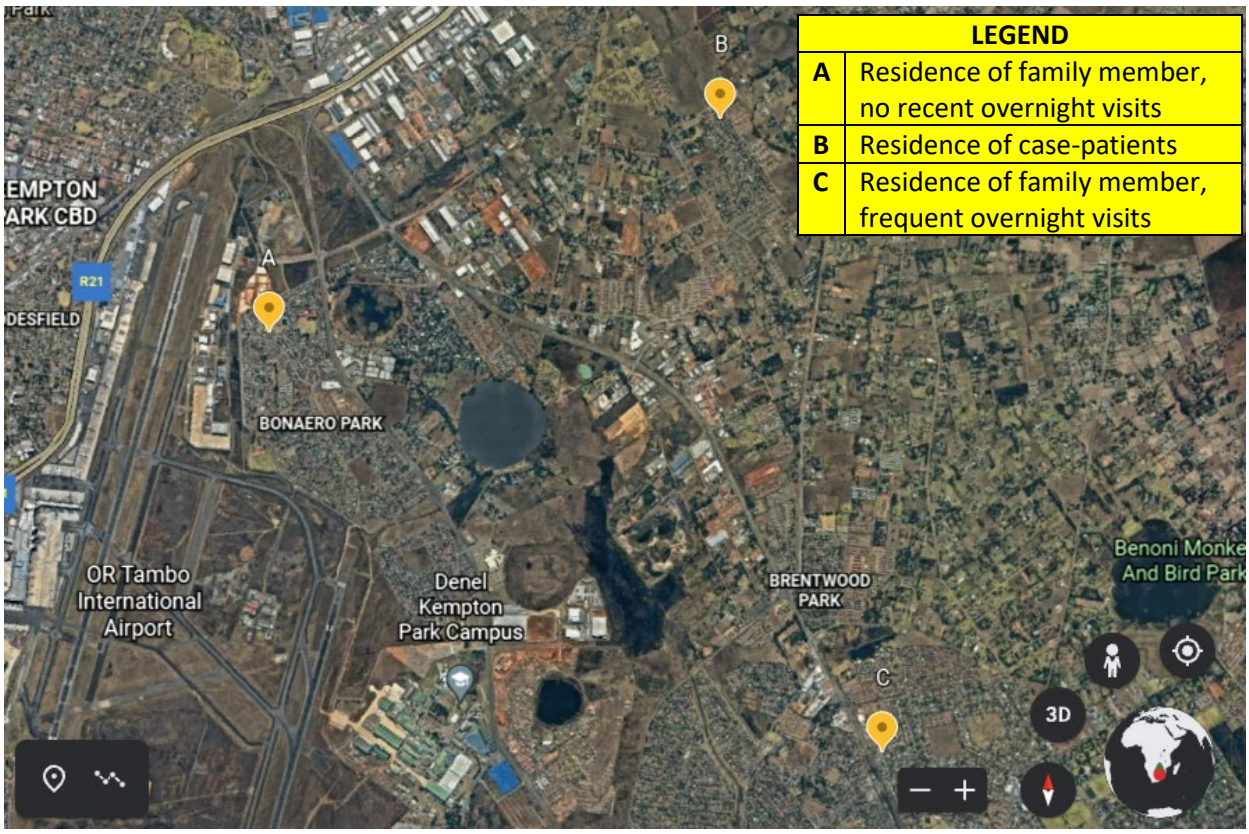

Figure 1. Satellite image showing locations of the residences investigated, Kempton Park, Ekurhuleni Municipality, Gauteng Province, South Africa.

Entomological investigations: No *Anopheles* mosquito adults or larvae were detected indoors or on the properties of A, B and C or their surrounds.

Parasite specimens: Residual laboratory blood specimens of both patients were acquired, and were PCR positive for *P. falciparum*. Genotyping at the NICD's Parasitology Reference Laboratory was conducted and it was concluded that the infections were caused by the same parasite strain, and therefore a single mosquito was responsible for transmission in both cases.

Discussion & conclusions

Based on the date of onset of symptoms in the case-patients, the most likely scenario is that they were bitten and infected during the night in the same house, which occurred either at residence B or C. Based on a parasite incubation and development period of 7 to 14 days, these infections would have occurred during early to mid-September 2021. As neither patient reported travel to a malaria-affected region during that period, both cases are classified as odyssean malaria.

Situational analyses revealed no major transport hubs in close proximity (within 1.5 km based on maximum mosquito dispersal distance) to any of the residences investigated. There were additionally no industries in close proximity to any of the residences, and no apparent travel by any close neighbours to a malaria affected area, as far as could be ascertained. No mosquito breeding sites could be identified and no adult mosquitoes were found in any of the dwellings.

It is therefore concluded that the patients were most likely infected by the same infective *Anopheles* mosquito during the same night or within a few days of each other, and that the culprit mosquito was inadvertently transported from a malarious area by road transport (car, taxi, bus etc). The mosquito would have exited the vehicle in close proximity to either residence B or C, thereafter seeking blood meals and transmitting malaria infections during that process.

Recommendations

As there were no follow-on cases, no vector control measures were required. It was, however, recommended that health facilities in the vicinity maintain a high index of suspicion for malaria in febrile patients with unexplained illness, even in the absence of a travel history to a malaria endemic area. It was also recommended that health promotion activities include malaria symptom awareness and the need to seek prompt medical assistance should these symptoms develop.