**Malaria in Travelers Returning from Short Organized Tours to Holiday Resorts in Mombassa, Kenya**

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**Key words:** malaria, Kenya, Mombassa, travel, prophylaxis

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**Abstract**

**Background:** Short trips to holiday resorts in Mombassa, Kenya, have gained popularity among Israelis since the early 1990s. A cluster of cases of malaria among returned travelers raised concern that preventive measures were being neglected.

**Objectives:** To characterize the demographic and clinical features of malaria acquired in Kenya, and to assess the adequacy of preventive measures.

**Methods:** Data were collected from investigation forms at the Ministry of Health. All persons who acquired malaria in Kenya during the years 1999–2001 were contacted by phone and questioned about use of chemoprophylaxis, attitudes towards malaria prevention, and disease course. Further information was extracted from hospital records.

**Results:** Kenya accounted for 30 (18%) of 169 cases of malaria imported to Israel and was the leading source of malaria in the study period. Of 30 malaria cases imported from Kenya, 29 occurred after short (1–2 weeks) travel to holiday resorts in Mombassa. Average patient age was 43 ± 12 years, which is older than average for travelers to tropical countries. Only 10% of the patients were fully compliant with malaria chemoprophylaxis. The most common reason for non-compliance was the belief that a short trip to a holiday resort carries a negligible risk of malaria. Only 3 of 13 patients (23%) who consulted their primary physician about post-travel fever were correctly diagnosed with malaria. Twenty percent of cases were severe enough to warrant admission to an intensive care unit; one case was fatal.

**Conclusions:** Measures aimed at preventing malaria and its severe sequelae among travelers should concentrate on increasing awareness of risks and compliance with malaria chemoprophylaxis.

**Keywords**

- malaria
- Kenya
- Mombassa
- travel
- prophylaxis

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**Patients and Methods**

Malaria is a reportable disease in Israel; all newly diagnosed cases are investigated by the Ministry of Health’s Department of Epidemiology. Investigation includes an interview of the patient, completion of a standard questionnaire, and review of the medical chart. We reviewed the data collected by the Ministry of Health on malaria diagnosed in Israel between 1 January 1999 and 31 December 2001. A confirmed case of malaria was defined as the occurrence of symptoms consistent with malaria (principally fever) and the demonstration of plasmodia on a Giemsa-stained peripheral blood smear [3,4]. For the purposes of this study, all persons who acquired malaria in Kenya were contacted by phone and interviewed again with an emphasis on the following points: a) pre-travel health consultation, b) use of malaria chemoprophylaxis, c) nature and length of travel to Kenya, d) time from travel to onset of symptoms, e) awareness by healthcare providers in Israel of the possible diagnosis of malaria in the returned traveler, and f) hospital course and complications. Medical records of hospitalized patients were reviewed whenever applicable.

**Results**

**Study population**

The Ministry of Health received reports of 170 cases of newly diagnosed malaria during the study period (55 cases in 1999, 53 in 2000, and 62 in 2001). Of these, 169 cases (99.4%) were imported. One case was acquired in Israel by a man sharing a hospital room with a malaria patient and thus represents a rare case of hospital-acquired
malaria. An investigation of this case by the Ministry of Health did not elucidate the mode of transmission. Of the 169 imported cases, 140 (82.8%) were diagnosed in Israeli residents returning from travel abroad, and 29 occurred in visitors or immigrants to Israel from other countries. Of 140 returned travelers diagnosed with malaria, 107 (76.4%) had traveled to Africa, 22 (15.7%) traveled to East Asia, 8 (5.7%) traveled to South or Central America, and 3 to other destinations. The most frequent destinations for returned travelers who acquired malaria in Africa were: Kenya (30 cases), Ethiopia (20 cases), Ghana (8 cases) and Nigeria (7 cases). Of the 30 travelers to Kenya, 29 (96.7%) had returned from an organized tour to a Mombassa holiday resort, and are the subject of this report. The length of stay in these cases ranged from 7 to 14 days. The mean age (±SD) was 43 ± 12 years [Table 1].

Pre-travel health consultation and malaria chemoprophylaxis

Fourteen patients (48%) received pre-travel consultation, only 5 of them took medications recommended for malaria chemoprophylaxis during their trip, and only 3 travelers (10%) completed all recommended doses of the antimalarial drug. All 15 patients who did not receive pre-travel consultation did not take malaria chemoprophylaxis. Malaria occurring in the 22 cases who had not taken malaria chemoprophylaxis was caused by Plasmodium falciparum in 22 cases, Plasmodium vivax in 1 case and an unspecified Plasmodium in 1 case. Onset of symptoms of falciparum malaria occurred at a median of 14 days after return to Israel (range 7–30 days); the single case of vivax malaria had an incubation period of 90 days. In contrast, malaria in all 3 patients who had taken adequate chemoprophylaxis was caused by P. vivax, and symptoms occurred at a median of 240 days after return (range 150–240 days). Two patients who were partially compliant with chemoprophylaxis developed P. falciparum infection 14 and 30 days respectively after returning to Israel.

Reasons reported by returned travelers for failure to comply with recommended malaria chemoprophylaxis included, most commonly, a perceived low risk of infection owing to the relatively short stay in Africa and the high-standard accommodations, fear of side effects from antimalarial drugs, perceived low efficacy of chemoprophylaxis, and negative advice given by travel agents, tour guides and fellow travelers [Table 2].

Diagnosis of malaria

Diagnosis of malaria was made by hospital physicians (at the emergency department or during hospitalization) in 83% of the 23 patients for whom this information was available [Table 1]. Ten of 13 patients (77%) who presented to their primary care physician with complaints of fever following recent travel to Kenya were diagnosed as having a non-specific viral illness without a peripheral blood smear having been performed. In one of these cases, which was caused by P. vivax, symptoms occurred 6 months after the return from Kenya; in the other nine cases symptoms occurred within 1 month of returning to Israel. In three cases malaria was not suspected and a diagnostic test for malaria was not performed during an emergency room evaluation. Two of these patients were discharged and later readmitted for persisting symptoms, at which time a diagnosis of malaria was made. The third patient was hospitalized, and a blood smear performed on the third hospital day was positive for P. falciparum. 

Disease severity and mortality

Six patients (21%) had severe malaria requiring admission to an intensive care unit. All severe cases were caused by P. falciparum. One patient died (case 3 below).

The following unusual cases demonstrate the potential severity of malaria and the difficulties of disease management:

- **Case 1. High-grade parasitemia**
  A 28 year old man consulted his family physician because of fever up to 39.5°C, rigors, headache and malaise. Ten days earlier he had returned from a 1 week trip to Mombassa. He had not

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### Table 1. Characteristics of 29 patients with malaria following a short trip to holiday resorts in Mombassa

<table>
<thead>
<tr>
<th>Characteristic of traveler</th>
<th>N (%)</th>
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<tbody>
<tr>
<td>No. of cases</td>
<td>29</td>
</tr>
<tr>
<td>Female, N (%)</td>
<td>13 (45)</td>
</tr>
<tr>
<td>Age, mean ± SD (yrs)</td>
<td>43 ± 12</td>
</tr>
<tr>
<td>Pre-travel consultation, N (%)</td>
<td>14 (48)</td>
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<tr>
<td>Length of stay, mean ± SD (days)</td>
<td>7 ± 3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Plasmodium species, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. falciparum</td>
</tr>
<tr>
<td>P. vivax</td>
</tr>
<tr>
<td>Not specified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis of malaria, N (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>By primary care physician</td>
</tr>
<tr>
<td>By emergency room physician</td>
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<tr>
<td>During hospitalization</td>
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<tr>
<td>By travel physician</td>
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<tr>
<th>Course and outcome, N (%)</th>
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<tbody>
<tr>
<td>Admission to department of medicine, complete recovery</td>
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<tr>
<td>Admission to ICU, complete recovery</td>
</tr>
<tr>
<td>Admission to ICU, death</td>
</tr>
</tbody>
</table>

* Data available for 23 patients.

 ICU = intensive care unit

### Table 2. Reasons for non-compliance with malaria chemoprophylaxis cited by 24 returned travelers who acquired malaria after short travel to Kenya

<table>
<thead>
<tr>
<th>Reason for non-compliance</th>
<th>N (%)</th>
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<tbody>
<tr>
<td>Perceived low risk for malaria during travel</td>
<td>11 (46)</td>
</tr>
<tr>
<td>Fear of side effects</td>
<td>6 (25)</td>
</tr>
<tr>
<td>Advised not to take chemoprophylaxis*</td>
<td>6 (25)</td>
</tr>
<tr>
<td>Perceived low efficacy of chemoprophylaxis</td>
<td>3 (13)</td>
</tr>
<tr>
<td>No knowledge of recommendation for chemoprophylaxis</td>
<td>3 (13)</td>
</tr>
<tr>
<td>Other**</td>
<td>2 (8)</td>
</tr>
</tbody>
</table>

* Advice against taking chemoprophylaxis was given by friends or family (3 cases), a travel agent (2 cases) and a tour guide (1 case).

** Other reasons for non-compliance were the high cost of medications and forgetting to take chemoprophylaxis.
taken malaria chemoprophylaxis. The family physician diagnosed influenza and prescribed antibiotic treatment. Symptoms did not resolve over the next week, and the patient was hospitalized. On admission he appeared jaundiced but in good clinical condition. Temperature was 38°C, pulse 120 per minute and blood pressure 120/70 mmHg. Examination was notable for a distended abdomen, with an enlarged, tender liver. The spleen was not palpable. Laboratory studies revealed: hematocrit 30%, leukocyte count 4.68 x 10^3/µl, platelets 3 x 10^5/µl, bilirubin 7.8 mg/dl, conjugated bilirubin 5.0 mg/dl, aspartate transaminase 177 U/L (normal 10–40 U/L), alanine transaminase 200 U/L (normal 10–55 U/L), alkaline phosphatase 98 U/L (normal 45–115 U/L), lactic dehydrogenase 1,856 U/L (normal 110–210 U/L), prothrombin time 13.8 seconds, partial thromboplastin time 32.9 sec, fibrinogen 80 mg/dl (normal 175–400 mg/dl), fibrinogen split products >8 µg/ml. Microscopic examination of a peripheral thin blood smear revealed P. falciparum trophozoites (ring forms) in 50% of erythrocytes, and a rapid OptiMal test (Flow Inc., Portland, USA) was positive for P. falciparum. The patient was transferred to the intensive care unit where he received intravenous quinidine gluconate and oral doxycycline, 4 units of fresh frozen plasma, 10 units of cryoprecipitate and 10 units of platelets over the next 24 hours. On the third hospital day intravenous ceftriaxone was initiated for hospital-acquired pneumonia. Repeat blood smears revealed a marked reduction in the parasite load, and treatment was switched to oral quinine sulfate and doxycycline for a total of 7 days. Liver function tests, thrombocytopenia and evidence of intravascular coagulation resolved gradually. After 11 days in hospital, the patient was discharged in good condition.

**Case 2. Intolerance to antimalarial agents**

A 55 year old woman developed fever up to 40°C and rigors 1 week after returning from Kenya. She had not taken any malaria chemoprophylaxis during her 2 week trip. A thick blood smear performed in the emergency department was positive for P. falciparum. Laboratory tests on admission showed hemoglobin 9.8 g/dl, leukocytes 8.8 x 10^3/µl, platelets 50 x 10^5/µl, ALT 91 U/L, AST 44 U/L, albumin 2.8 g/dl, bilirubin 0.8 mg/dl; other values were within normal range. The patient was admitted to hospital and treatment with oral quinine sulfate and doxycycline was initiated. During hospitalization the patient developed shortness of breath, hypoxemia, and also tinnitus suggestive of cinchonism related to quinine use. A chest radiograph was consistent with acute respiratory distress syndrome. The patient was transferred to the intensive care unit. Due to severe tinnitus which the patient described as unbearable, antimalarial treatment was changed to artesunate given intramuscularly and intravenous doxycycline. Oxygen, positive airway pressure and diuretics were administered to control pulmonary congestion and hypoxemia. Blood and sputum cultures were sterile. After 2 days the patient's condition improved and she was transferred to a general medicine ward. The remainder of her hospital stay was uneventful.

**Case 3. Fatal malaria**

A 63 year old man presented to the emergency room because of fever and rigors for 3 days. Two weeks before the onset of his illness he returned from a 1 week trip to Kenya. He had not taken any malaria chemoprophylaxis. Known medical problems included ischemic heart disease and hypertension. On admission he appeared ill and fatigued, but alert and oriented and without respiratory distress. Temperature was 40°C, blood pressure 140/85 mmHg, pulse 95/minute. End-expiratory wheezes were heard over both lungs. Heart sounds were regular with a 2/6 apical systolic murmur. Pertinent laboratory results were: platelets 70 x 10^5/µl, hematocrit 49%, sodium 130 mmol/L, creatinine 1.7 mg/dl, urea nitrogen 20 mg/dl, AST 60 U/L, ALT 70 U/L. An electrocardiogram showed normal sinus rhythm with no evidence of ischemia. Chest X-ray was normal. A blood smear was positive for P. falciparum. Treatment with oral doxycycline and quinine sulfate was initiated. On the third hospital day, the patient was noted to be disoriented, dyspneic and still febrile. Oxygen saturation was 79% on room air and 91% with continuous positive airway pressure. A chest X-ray showed diffuse bilateral alveolar opacities consistent with pulmonary edema. The trachea was intubated, positive pressure ventilation was initiated and the patient was transferred to an intensive care unit. A pulmonary artery catheter was inserted. Doxycycline was discontinued, minocycline was given intravenously, quinine sulfate was given through a nasogastric tube, and ceftriaxone was added. The patient became hypotensive and required treatment with vasopressors. Acute renal failure and lactic acidosis developed. Complete atrioventricular block was treated with insertion of a transvenous pacemaker. Blood smears remained positive for plasmodia. The patient succumbed to shock and multi-organ failure on the 11th hospital day.

**Discussion**

In the 1990s, Kenya became an increasingly popular travel destination for Israelis. Travel agencies offer short vacations at Mombassa holiday resorts, featuring comfortable accommodations and targeting the family market. During the study period, Mombassa was the leading source of malaria among returned Israeli travelers. Severe malaria was frequent in this cohort, with 20% of cases severe enough to require admission to an intensive care unit. This contrasts with the much lower rate of severe malaria (2.8%) reported recently by the GeoSentinel surveillance network [5]. Moreover, the three cases reported here – a patient with high-grade parasitemia, a patient who manifested intolerance to the most commonly used antimalarial drug, quinine, and a case of fatal malaria – underscore the complex challenges of malaria management.

Malaria in travelers is preventable by appropriate chemoprophylaxis. Half the patients in our survey received no pre-travel health consultation, only a third of those who received consultation opted to take malaria chemoprophylaxis, and only 10% of the study population adhered to the chemoprophylaxis recommendations. Responses to our survey indicate that travel to Mombassa is becoming increasingly popular, with a high proportion of travelers not taking malaria chemoprophylaxis. This highlights the need for targeted health education campaigns to raise awareness among travelers about the importance of malaria prevention.

ALT = alanine aminotransferase

AST = aspartate aminotransferase
not providing health advice to prospective travelers, or actively, by denying travel-associated health risks when prompted [6]. An effective intervention to reduce the incidence of malaria among travelers should compel travel agents to provide information on malaria risk to persons traveling to endemic areas, and to refer prospective travelers to health counseling [7]. These measures will also increase vaccination coverage among travelers to the tropics.

Our survey indicated that persons infected with malaria acquired in Kenya were not the prototypical young backpackers returning from a prolonged journey abroad [1,2]. Of 30 cases of malaria acquired in Kenya, all but one occurred among travelers returning from short stays of 1 to 2 weeks in a Mombassa holiday resort. The mean patient age of 43 years also suggests a significantly older population than the average visitor to the travel advisory clinics in Israel [2]. Of note, age ≥40 years has been shown to be associated with severe malaria [8] and may explain the unusually high proportion of severe malaria in this cohort.

Our survey also uncovered a worrisome lack of awareness among healthcare providers in Israel to the possible diagnosis of malaria in a febrile returned traveler. Ten of 13 malaria episodes were initially ascribed to a viral illness by the patient’s primary physician, without performing a blood smear to exclude malaria. In only one of these cases did symptoms occur late (6 months) after the return from Kenya. The need to rapidly perform a blood smear in every febrile person returning from a malaria-endemic region cannot be overemphasized [7].

The occurrence of malaria more than 45 days after return is consistent with relapsing infection, and may occur with the use of chemoprophylactic agents which are ineffective against the liver stages of \( P. vivax \) and \( P. ovale \) [9]. Three of four cases of relapsing infection with \( P. vivax \) occurred among patients who were compliant with chemoprophylaxis; there were no cases of \( P. falciparum \) malaria among patients who adhered to a recommended chemoprophylactic regimen. These findings are consistent with those recently presented by Schwartz et al. [9].

The treatment of severe malaria is challenging, as demonstrated by the three cases reported here. Potential problems include multi-organ failure (specifically non-cardiogenic pulmonary edema and cerebral malaria), resistance to antimalarial drugs, overhydration leading to pulmonary edema, side effects of drugs (e.g., hypoglycemia) and bacterial superinfection [10]. Physicians caring for patients with malaria need to be aware of new treatment options, such as artemisinin derivatives and atovaquone-proguanil. Potent antimalarial drugs should be stocked at all hospital pharmacies [1].

**Conclusion**

During the study period, Kenya was a leading travel destination accounting for malaria in Israeli travelers. Malaria occurring in short-term travelers to Kenya may be severe and even fatal, and can be ascribed to lack of compliance with chemoprophylaxis, owing mainly to a perceived low risk of infection. Preventive efforts should be directed at increasing the availability of authoritative health counseling to travelers. This may be done by mandating the provision of health information by travel agents as well as through public education. In addition, clinicians should be aware of the need to exclude malaria in any febrile person recently returned from Africa.

**References**


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**In politics, if you want anything said, ask a man. If you want anything done, ask a woman.**

Margaret Thatcher (1945–), British stateswoman and Conservative prime minister

**The reverse side also has a reverse side.**

Japanese proverb