



A local outbreak of autochthonous *Plasmodium vivax* malaria in Laconia, Greece—a re-emerging infection in the southern borders of Europe?

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SUMMARY

Objectives: Malaria is considered to have been eradicated in Greece and only sporadic cases in travelers are reported. However the migration of populations from endemic countries of Asia to Greece may have caused a re-emergence of the disease.

Methods: A cluster of nine human malaria cases due to *Plasmodium vivax* infection in the area of Laconia (southern Peloponnese) from 2009 to 2010 is presented. Patients were hospitalized in Sparta General Hospital.

Results: Eight patients were diagnosed in 2009 and one in 2010. Two were refugees from Pakistan and Afghanistan and five were Romas living in a local camp. Apart from the two immigrants, no other patient had any history of travel, blood transfusion, or organ transplantation. All patients had a febrile illness, hematological abnormalities, and irregular liver function tests. Parasites were identified in peripheral blood smears, and PCR confirmed the presence of *P. vivax*. Sensitivity testing showed chloroquine susceptibility. Combined treatment with chloroquine followed by primaquine was completed uneventfully. Entomological surveillance disclosed the presence of *Anopheles saccharovi* as the predominant mosquito species, however PCR testing failed to identify *P. vivax* in the mosquito population.

Conclusions: We have presented the first large outbreak of the local transmission of autochthonous malaria cases in Greece since the 1950s. Enhanced entomological surveillance and early detection of malaria cases are crucial in order to prevent the re-emergence of malaria, not only in Greece, but in Europe as well.

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1. Introduction

Malaria is the most prevalent vector-borne disease in the world.¹ In 2008, there were an estimated 243 million (5th–95th percentile, 190–311 million cases) cases of malaria worldwide. The vast majority of cases (85%) were reported from the African region, followed by the South-East Asia region (10%) and the Eastern Mediterranean region (4%).² The global incidence of malaria due to *Plasmodium vivax* is estimated at approximately 70–80 million cases annually, while *P. vivax* is considered the second most common of the *Plasmodium* species causing human disease.³ Approximately 10–20% of the world's cases of *P. vivax* infection occur in Sub-Saharan Africa. *P. vivax* is causally associated with approximately 10% of malaria cases in Eastern and Southern Africa, but less than 1% of cases in Western and Central Africa. Outside of

the African continent, *P. vivax* accounts for more than 50% of all malaria cases; 80–90% of such cases occur in the Middle East, Asia, and the Western Pacific, mainly in the tropical regions, and 10–15% in Central and South America.⁴

Malaria is considered by the World Health Organization (WHO) to have been eradicated in Europe. It was endemic in Greece until 1973, at which time the country was declared malaria-free.⁵ Malaria is a reportable disease in Greece and is included in the national mandatory notification system. An increase in non-autochthonous malaria cases has been recorded from 1998 onwards in Greece (less than 50 cases in total), which reflects cases imported through non-screened migrants.⁶ Sustained local transmission had not been identified prior to the detection of the cases reported herein.

We present a cluster of nine human infections with *P. vivax* malaria occurring in the southern Greek peninsula of Peloponnese and more specifically in the area of Laconia. Eight cases were hospitalized in the Sparta General Hospital, Laconia Greece in 2009 and one in 2010. This case-series represents the first large outbreak

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of local transmission of autochthonous malaria cases in Greece since the 1950s.

2. Materials and methods

Eight patients were admitted to the Internal Medicine Department of the Sparta General Hospital between August 5 and October 11, 2009 with non-specific symptoms of a febrile illness: fever, malaise, abdominal pain, and mild jaundice. The first patient was an immigrant from Afghanistan who lived in Sparta, and who reported prior treatment for malaria with chloroquine for 3 days while in Afghanistan a year ago. The second patient was an immigrant from Pakistan who had been living in a small village called Skoutari (approximately 50 kilometers south of Sparta) for the past 4 months, since his arrival from Pakistan. The third patient was a Roma living in a camp situated in the area of Skala, Laconia, 30 km southeast of Sparta. During the 6 weeks that followed the initial presentation of these three patients, five more patients were admitted with similar symptoms to the same hospital; two inhabitants of Skala and a village called Glykovrisi (situated 10 km from Skala) and three more Romas from the same camp where the third patient lived. All of these patients resided or worked during the summer in the fields of Skala near the Eurotas River, in an area called 'Elos', which in Greek means swamp.

After the diagnosis of *P. vivax* malaria was established for the first patient, the Hellenic Center for Disease Control and Prevention (HCDCP) was notified and an enhanced surveillance system was implemented in order to evaluate, control, and prevent the disease. Any patient living in the area and seeking medical care for a persistent febrile illness during the period of August to November 2009 was suspected of malaria infection. The identification of parasites in peripheral blood smears was considered diagnostic for malaria. Since malaria is a reportable disease in Greece, an HCDCP questionnaire was completed; when no history of travel, blood transfusion, or organ transplantation, or prior infection was mentioned, the case was considered autochthonous. Blood donation in the area was suspended and close contacts of the patients were examined. An entomological survey was conducted in the region to examine the presence of *Anopheles* mosquito species and to identify any pools of infection within that mosquito population. Water samples containing larvae were collected from the river irrigating the area, and traps were used to collect adult

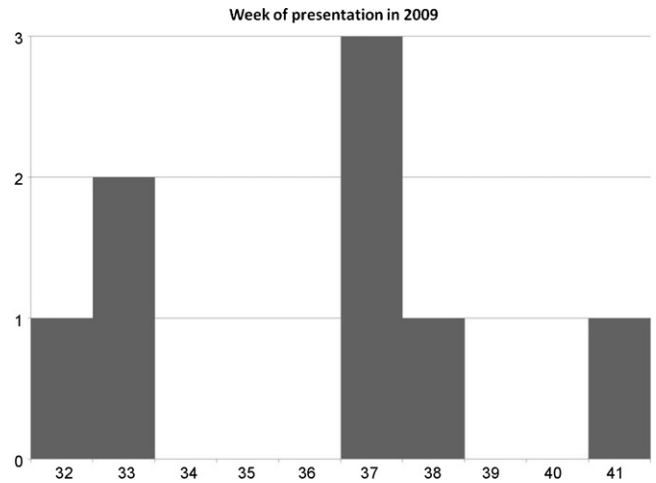


Figure 1. Time trend of the malaria cluster during the outbreak, August–October 2009.

mosquitoes. Blood samples for all patients were sent to the Athens School of Public Health for confirmation of the *Plasmodium* species by a previously described PCR-based method.⁷ Sensitivity tests were also performed to evaluate susceptibility of the *P. vivax* strain to the antimalarial agent chloroquine. A year later (July 2010) another Roma from the same camp presented with similar symptoms.

3. Results

3.1. Clinical and epidemiological data

Figure 1 illustrates the distribution of cases over time and the short time trend associated with this cluster in 2009. Figure 2 depicts a spot map of the cases. The median age of the patients from both 2009 and 2010 was 45.2 years.

Laboratory values on presentation for all patients are shown in Table 1. All presented with mild hemolytic anemia and neutropenia, and also thrombocytopenia, which is not a common finding in *P. vivax* malaria.³ All had an elevated erythrocyte sedimentation rate and C-reactive protein, mild jaundice, and abnormal liver

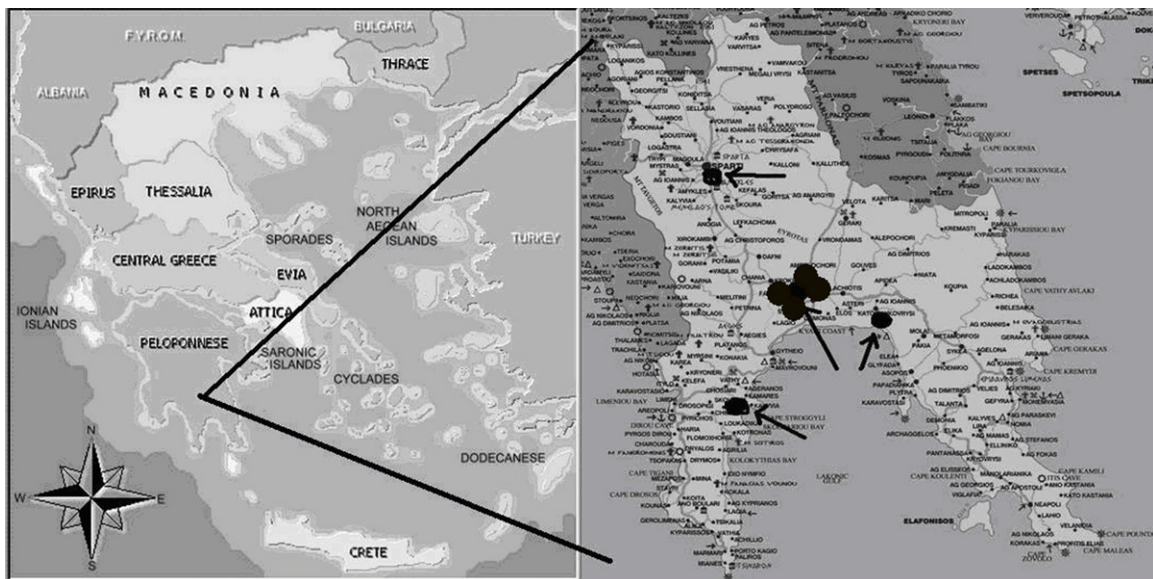


Figure 2. A spot map showing the area of residence of the cases in the region of the cluster of *Plasmodium vivax* infections.

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