



EPIDEMIOLOGICAL SURVEILLANCE REPORT

Malaria in Greece, 2013

Introduction

Malaria is a parasitic infection, transmitted through the bite of the infected female *Anopheles* mosquito. Five types of plasmodia cause disease to humans: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae* and *Plasmodium knowlesi*. The most common symptoms of malaria (chills, high fever, sweating, malaise, headache and muscle aches) manifest usually 1-4 weeks after infection with the parasite, while relapses of the disease are usually observed in short intervals but up to five -and in extreme cases even up to eight- years after *P. vivax* infections. A number of effective anti-malarial drugs are available to treat the infection; starting the treatment promptly is essential in avoiding complications and interrupting the transmission of the disease in the community.

Malaria is currently endemic in 104 countries around the world (7 of which are in the prevention of reintroduction phase), mainly in sub-Saharan Africa and Asia. Greece was declared malaria-free in 1974, after an intense malaria eradication program (1946-1960). Until 2008, approximately 20-50 cases were reported annually to the Hellenic Center for Disease Control and Prevention (HCDCP), the majority of which were travel related. Until 2008, sporadic malaria cases without reported travel history were recorded in 1991, 1999 and 2000.

After 2009 we have seen the re-emergence of *P. vivax* malaria, both as sporadic introduced cases and as clusters, in persons without travel history to a malaria endemic country.

Epidemiological surveillance data

Data are derived from the reports of laboratory-confirmed malaria cases to the HCDCP. The Department of Epidemiologic Surveillance and Intervention undertakes a verification procedure through communication with the treating physicians, the hospital and the reference laboratory for malaria. Case and focus investigation is undertaken by the staff of the Department of Epidemiologic Surveillance and Intervention for malaria cases without reported travel history and for all malaria cases in areas with clusters of malaria cases (such as in Evrotas, Lakonia, where a cluster of malaria cases was detected in 2011).

Areas where sporadic malaria cases without travel history to a malaria endemic country are detected are immediately elevated to Risk Level 2 (according to the national risk assessment scheme) and are closely monitored for the following three years.

Malaria epidemiological surveillance data, 2009 – 2012

The number of malaria cases reported in the HCDCP in 2009-2013 by year of symptom onset or infection and by classification (imported/ locally-acquired) is presented in Table 1.

Table 1: Reported malaria cases by year of symptom onset¹ (for imported cases) or infection (for locally-acquired cases) and by classification (imported/ locally-acquired), Greece, 2009 - 2013².

Year of symptom onset / infection	Case classification		Total
	Imported cases	Locally-acquired cases	
2009	44	7	51
2010	40	4	44
2011	54	42 ³	96
2012	73	20 ⁴	93
2013	22	3	25

1. Cases with no information regarding the year of symptom onset were classified according to the year of hospitalization or notification.
2. Known recorded relapses and locally-acquired *P.malariae* cases attributed in previous transmission periods (two cases in 2012) are not included in the Table.
3. Two cases with symptom onset in 2012 attributed to the 2011 transmission period are included.
4. One case with symptom onset in 2013 attributed to the 2012 transmission period is included.

Malaria epidemiological surveillance data, 2013

In 2013, a total of 25 laboratory confirmed cases of malaria were reported to the HCDCP, 22 of which were classified as imported (13 cases in migrants from malaria endemic countries and 9 in returning travellers). Of the 22 imported cases, 12 cases were confirmed as *P.falciparum* infections (5 migrants from malaria endemic countries and 7 in returning travellers), 9 cases were confirmed as *P.vivax* infections (7 migrants from malaria endemic countries and 2 in returning traveller) and 1 case was confirmed as *P.ovale* infection (migrant from malaria endemic country).

The remaining three (3) *P.vivax* malaria cases referred to patients of Greek nationality with no travel history to a malaria endemic country and evidence of locally acquired infection (introduced cases); two cases were considered to be exposed in the Municipality of Alexandroupolis, Regional Unit of Evros and one case was considered to be exposed in the Municipality of Sofades, Regional Unit of Karditsa ([Figure 1](#)). Symptom onset was in weeks 39/2013 (23-29/09/2013), 43/2013 (21-27/10/2013) and 44/2013 (28/10-3/11/2013), respectively. No malaria cases were recorded in the Municipality of Evrotas, Lakonia in 2013.

The case classification by place of residence/exposure of all the malaria cases reported to the HCDCP in 2013 is presented in [Table 2](#).

Table 2. Classification of reported malaria cases by place of residence/exposure, Greece, 2013 (n=25)

Regional Unit of residence (for imported cases) or exposure (for locally acquired cases)	Classification of malaria cases			
	Imported			Locally acquired cases
	Immigrants from malaria endemic countries	Travelers to malaria endemic countries	Totalimp orted	
West Section of Athens	2	0	2	0
Central Section of Athens	4	2	6	0
Eat Attiki	0	2	2	0
Viotia	0	1	1	0
Karditsa	1	0	1	1
Larisa	0	1	1	0
Messinia	0	1	1	0
Piraeus	2	0	2	0
Lakonia	1	0	1	0
Evros	0	0	0	2
Thessaloniki	1	0	1	0
Samos	2	0	2	0
Ileia	0	1	1	0
Kavala	0	1	1	0
Total	13	9	22	3

Figure 1: Place of residence/exposure of the malaria cases without reported travel history to malaria-endemic areas, Greece, 2013 (n=3).



HCDCP activities for the management of malaria, 2013

During spring 2012 the HCDCP developed an Action Plan for the Management of Malaria 2012-2015, where a risk assessment scheme for re-emergence of malaria in the different areas of Greece was included. Based on this risk assessment, all areas (Regions, Municipalities) in Greece were assigned a Risk Level from 0-3, taking into consideration the malaria cases reported in the last three years, the size and place of origin of migrant population in the area and the ecological parameters in each area.

Activities to control malaria are implemented by HCDCP, in collaboration with a national project «*Integrated Surveillance and control programme for West Nile Virus and malaria in Greece*» (www.malwest.gr) coordinated by the University of Thessaly, which run until 2013.

Immediate response activities after the reporting of each locally-acquired malaria case to the HCDCP:

- **Communication to the hierarchy of the Ministry of Health.**
- **Communication to the relevant regional department of public health.**
- **Communication to the National Centre for Blood Donation**, responsible for the relevant blood safety measures.
- **Enhancement of early detection of cases and focus investigation:** HCDCP investigation teams are deployed after the detection of each locally acquired case to perform a “focus investigation”, in an area indicated by the epidemiological, entomological and environmental investigation. In this activity, all immigrants from malaria endemic countries in the focus are tested for malaria (RDT, microscopy and PCR), while individuals from non-endemic countries are screened for malaria compatible symptoms and/or tested for malaria accordingly. Fever screening is repeated on a weekly basis for a month after the initial investigation.

HCDCP staff in collaboration with public health professionals from the regional department of public health and entomologists carried out the focus investigation of the malaria cases in the Municipality of Alexandroupolis, Regional Unit of Evros, between 12-15/10/2013. This involved the malaria screening of immigrants in an immigrant detention centre in the area, with the assistance of the field team of Médecins Sans Frontières (MSF-Greece), who operated a project in the migrant detention centres. HCDCP staff also carried out the focus investigation of the malaria case in the Municipality of Sofades, Regional Unit of Karditsa, between 13-15/11/2013, in collaboration with public health professionals from the regional department of public health, the local authorities and the University of Thessaly.

In addition, the HCDCP has supported and/or developed a series of **support activities** to prevent the re-establishment of malaria in Greece:

I. Enhancement of malaria surveillance:

- **Active malaria case detection in the general and the migrant populations:** The HCDCP deployed a field team in the area of Evrotas, Lakonia from April to December 2013. This year (2013) the field staff was contracted via the national project «*Integrated Surveillance and control programme for West Nile Virus and malaria in Greece*» (www.malwest.gr).

A significant number of immigrants from malaria endemic countries (Pakistan and Afghanistan, etc) live and work in Evrotas. During the field visits, a registry of all residences and residents was created, health promotion information was provided for protection against mosquitoes and fever screening

and/or testing for malaria was performed regularly. In 2013 fever screening visits were performed on average every 7-10 days for the target population in the area (migrants and Roma populations).

- **Screening of immigrants for malaria:** In 2013, HCDCP recommended the screening of immigrants from malaria endemic countries in local Health Centres on North Aegean and Dodecanese islands, where undocumented immigrants were entering the country through the sea borders.
 - **A geographical information system (GIS)** tool was created for risk assessment (mapping of vectors, their breeding sites and malaria cases) in the framework of the above project.
- II. Administration of antimalarial drugs to immigrants from malaria endemic countries:** In 2013, following the decision of the HCDCP Working Group on Vector-borne Diseases and the approval of the Committee for the Control of Tropical Diseases of the Ministry of Health, the field team in Lakonia delivered one course of antimalarials for *P.vivax* infection (Chloroquine + Primaquine) to all immigrants from malaria endemic countries who lived in the Municipality Evrotas, mainly in the villages Skala, Leimonas, AgioiTaxiarches, Elos (the epicenter of the 2011 outbreak). This therapeutic intervention was provided using Directly Observed Treatment (DOT) protocols with the informed consent of the participating immigrants and following testing of G6PD levels. The antimalarial course targeted *P.vivax* hypnozoites in order to reduce the reservoir and interrupt transmission of the disease. In 2013, DOT antimalarial therapy was administered to 862 persons.
- III. Enhancing laboratory diagnosis of malaria:** In 2013, HCDCP distributed Rapid Diagnostic Tests (RDTs) to hospitals and Health Centres in areas with recent recorded local malaria transmission and areas with large populations of immigrants from endemic countries (large urban centers, areas with immigration detention centres) aiming at prompt diagnosis and treatment of malaria cases. RDTs have contributed significantly to the early detection of malaria cases in our experience and have been proven a valuable field tool.
- IV. Standardization of the malaria treatment in Greece,** according to treatment guidelines developed by the HCDCP with the input of experts in infectious diseases. In order to follow up the effectiveness of treatment, a specific protocol is also recommended to monitor patients during and after treatment completion.
- V. Increase awareness amongst health professionals** for the diagnosis and management of malaria. In 2013, HCDCP staff delivered presentations and organized seminars for health professionals in 16 Health Centres/Hospitals in areas where locally acquired cases had occurred.
- VI. Communication to the public** on malaria and personal protection measures against mosquitoes: through participation in public meetings and educational material developed by the HCDCP and available through the Centre's website: www.keelpno.gr. A video advertisement with information on protection measures against mosquito bites was disseminated during the summer months.
- VII. Vector control activities - Entomologic surveillance:** Detailed technical guidance was communicated by the HCDCP to the Regional Administrations all over the country, in order to assist them to implement on time the calls for tenders for integrated vector control programs. In addition, individualized reports were developed by the HCDCP including all entomological and epidemiological data for each region, 2009-2013.

In the framework of the project "[Integrated Surveillance and control programme for West Nile Virus and malaria in Greece](#)", a number of entomological activities were also carried out:

- identification of mosquitoes collected through entomological surveillance (NSPH, University of Thessaly, BenakiPhytopathological Institute)
- genetic identification of mosquitoes
- insecticide resistance studies for *Anopheles spp.* mosquitoes at the BenakiPhytopathological Institute and at the Laboratory of Molecular Entomology at the Biology Department, University of Crete,
- testing of *Anopheles spp.* collected in Evrotas using molecular techniques for *Plasmodium* presence in the University of Crete,
- mosquito overwintering study (in-vitro and in-vivo),
- study on the comparison of effectiveness of various mosquito traps (BenakiPhytopathological Institute).

In addition, according to WHO and ECDC guidance, HCDCP implemented in the Municipality of Evrotas:

- the distribution of 550 LLINs (Long Lasting Insecticide-treated Nets) to immigrants, after obtaining a special license by the Ministry of Agriculture,
- the 1st round of Indoor Residual Spraying (IRS) performed in June 2013, and covering 91% of migrant residences. Residual activity was followed up on a monthly basis (BenakiPhytopathological Institute and Univ of Crete). The 2nd round of IRS was undertaken by the Regional Authority of Peloponnese in early October 2013.

VIII. Communication with international public health stakeholders: The HCDCP communicates frequently for exchange of knowhow and information on malaria cases and activities with the ECDC and WHO, as well as with a number of European and international agencies and networks.

Conclusions

Greece has been malaria-free since 1974, but a number of significant factors pose a threat for the re-establishment of the disease in specific areas, mainly:

- i. the large number of immigrants from malaria-endemic countries, who work mostly in the farming sector, combined with
- ii. the circulation of *Anopheles* mosquitoes, the competent vector of the disease, in many areas of Greece (receptive areas).

Fewer locally-acquired malaria cases were recorded in 2012, compared with 2011 and minimal in 2013. Overall 52% decrease in locally acquired cases was noted in 2012 compared to 2011 and 72% decrease in locally-acquired cases in Evrotas, Lakonia. Furthermore, active case detection in Evrotas improved significantly the timeliness of diagnosis of malaria in the area.

Locally acquired cases were minimal in 2013, partly due to the public health interventions that were implemented in Lakonia, as well as the overall decreased number of immigrants.

Early detection, appropriate investigation and treatment of malaria cases combined with **effective vector control** (larviciding and IRS) represent the main components of the public health strategy to fight the re-introduction of *P. vivax* in Greece and prevent its re-establishment in vulnerable areas of the country.

Advice for travelers to areas in Greece with reported locally-acquired malaria cases:

The HCDCP, based on the surveillance data available until now and the implemented control measures in the areas where locally-acquired *P. vivax* malaria cases have been reported, maintains that **the risk to travelers for malaria infection in Greece is very low**. For this reason, **chemoprophylaxis for malaria is not recommended** for visitors to areas where locally acquired malaria cases have occurred until today. However, personal protective measures against mosquitoes are strongly encouraged.