



EPIDEMIOLOGICAL SURVEILLANCE REPORT

Malaria in Greece, 2015, up to 26/08/2015

Introduction

Malaria is a parasitic infection, transmitted through the bite of the infected female *Anopheles* mosquito. Five species of *Plasmodium* until now are a known cause of disease to humans: *Plasmodium falciparum*, *P. vivax*, *P. ovale*, *P. malariae* and *P. 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 -with ongoing transmission- in 97 countries around the world (WHO, World Malaria Report, 2014), mainly in sub-Saharan Africa and South East 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 & Prevention (HCDCP), the majority of which were travel related. At the same time until 200, sporadic malaria cases without reported travel history were reported from various places in the country in 1991, 1999 and 2000.

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

Malaria surveillance

Data are derived from the reports of laboratory-confirmed malaria cases to the HCDCP. The Department of Epidemiological Surveillance and Intervention undertakes a verification procedure through communication with the treating physicians, the hospital and the reference laboratory for malaria. Case, focus and environmental investigation are undertaken by the staff of the Department of Epidemiological Surveillance and Intervention, in collaboration with local public health authorities, for every locally acquired malaria case throughout Greece. In addition, case investigation and a limited focus and environmental investigation is carried out for imported malaria cases in high-risk, receptive areas (i.e. areas with confirmed or suspected circulation of the competent vector -*Anopheles*- including areas with a history of local transmission recorded in the previous years).

Malaria surveillance data, 2009 – 2014

The number of malaria cases reported to the HCDCP in 2009-2014 by year of symptom onset or infection and by epidemiological 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 epidemiological classification (imported/ locally-acquired), Greece, 2009 - 2014.

Year of symptom onset / infection	Case classification		Total
	Imported cases	Locally-acquired cases ²	
2009	44	7	51
2010	40	4	44
2011	54	42	96
2012	73	20	93
2013	22	3	25
2014	38	0	38

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 to previous transmission periods (two cases in 2012) are not included in the Table.

It should be noted that the aforementioned case classification is based on epidemiological criteria (e.g., the history of recent travel within the last 3 years to a malaria endemic country). However, recent *Plasmodium* genotyping results suggest that a number of cases previously classified as “imported” are actually locally acquired (e.g. immigrants from malaria endemic countries residing in the Municipalities of Evrotas, Lakonia and Sofades, Karditsa, in transmission periods 2011-2012).

Malaria surveillance data, 2015, up to 26/08/2015

In 2015, up to 26/08/2015, a total of 31 laboratory confirmed cases of malaria were reported to the HCDCP: 30 cases are classified as imported and one (1) case as locally acquired, with suspected place of infection the Municipality of Farkadona, Regional Unit of Trikala, Region of Thessaly.

Table 2 shows the reported malaria cases by epidemiological classification (imported/locally acquired), patient status (immigrants/returning traveller) and *Plasmodium* species.

Table 2. Malaria cases by epidemiological classification, status and Plasmodium species, Greece, 2015, up to 26/08/2015.

Epidemiological classification and status		<i>Plasmodium</i> species			
		<i>P. vivax</i>	<i>P. falciparum</i>	<i>P. ovale</i>	Not typed (non-falciparum)
Imported cases	Immigrants	19	3	0	1
	Travelers	0	6	1	0
Locally acquired cases		1	0	0	0
Total		20	9	1	1

The classification of all the malaria cases reported to the HCDCP by epidemiological classification (imported/locally acquired), patient status (immigrants/returning traveller) and place of residence/exposure and is presented in [Table 3](#).

Table 3. Classification of reported malaria cases by Regional Unit of residence, case classification and patient status, Greece, 2015, up to 26/08/2015 (n=31)

Regional Unit of residence/infection	Κατάταξη κρουσμάτων ελονοσίας			
	Imported cases			Locally acquired cases
	Immigrants from malaria endemic countries	Travelers to malaria endemic countries	Total	
East Attica	1	0	1	0
West Attica	1	0	1	0
Central Section of Athens	1	5	6	0
South Section of Athens	0	1	1	0
Viotia	4	0	4	0
Dodecanese	7	0	7	0
Thessaloniki	0	1	1	0
Cyclades	0	1	1	0
Lakonia	5	0	5	0
Rethymno	0	1	1	0
Samos	1	0	1	0
Trikala	0	0	0	1
Fthiotida	0	1	0	0
Total	20	10	30	1

HCDCP activities for the management of malaria, 2015

During spring 2012 the HCDCP developed an “Action Plan for the Management of Malaria, 2012-2015” and during summer 2015 the “Action Plan for the Management of Malaria” of the Ministry of Health was published, which included a risk assessment scheme for the re-emergence of malaria in the different areas of Greece. 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 (since 2009), the size and place of origin of migrant population in the area and ecological parameters in each area.

Activities to control malaria implemented by the HCDCP include:

I. Enhanced malaria surveillance activities

- **Case investigation:** HCDCP investigates all notified malaria cases in order to classify them as imported or locally acquired. For locally-acquired cases or imported cases in receptive areas, an in-depth interview with the patient is conducted, in order to identify the suspected place of exposure and the risk for further local transmission.
- **Communication with stakeholders and health professionals** at national and local level, after the reporting of each locally-acquired malaria case to the HCDCP:
 - i. Ministry of Health (MoH), minister and directorate for Public Health
 - ii. Regional public health authorities,
 - iii. Committee for the Prevention and Management of Tropical Diseases
 - iv. Working Group for the designation of areas affected from vector-borne diseases,
 - v. National Centre for Blood Donation, responsible for the relevant blood safety measures,
 - vi. Physicians practicing in the affected area, to raise their awareness for investigating suspect cases.
- **Focus investigation – reactive case detection:** HCDCP investigation teams are deployed after the notification of each locally acquired case (or imported case in high-risk, receptive areas) 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, PCR), while individual from non-endemic countries are screened for malaria compatible symptoms and tested for malaria accordingly. Fever screening is repeated on a regular basis for a month after the initial investigation.

In 2015 HCDCP staff in collaboration with staff from the University of Thessaly performed focus investigation for the recorded locally acquired case in Regional Unit of Trikala, in 17-18/08/2015, as well as raising awareness of the physicians working in the area and the local community. No further malaria case was detected from this focus, until now.

Furthermore, HCDCP staff -in collaboration with local public health authorities- coordinated and performed in 2015 (up to 26/08/2015) focus investigation for six imported cases in receptive (rural) areas, as well as raising awareness of the physicians working in these areas.

- **Environmental and vector investigation** is performed in the area after the detection of each locally acquired malaria case (or imported case in a receptive area), in order to identify *Anopheles* breeding sites and other risk factors for local transmission.
- **Proactive malaria case detection in Evrotas, Lakonia:** The HCDCP, in collaboration with the Dept for Hygiene and Epidemiology Univ of Thessaly, deployed since a field team in the area of Evrotas, Lakonia, for the active detection of malaria cases. Since July 2015, a field team with staff from the HCDCP and University of Thessaly, with the financial support of the Region of Peloponnese, continues

the active malaria case detection, as well as the focus investigation of all recorded malaria cases, in this area (i.e., of the 5 imported cases recorded up to 26/08/2015). A significant number of immigrants from malaria endemic countries (Pakistan and Afghanistan, etc) live and seasonally work in Evrotas. During the field visits, health promotion information is provided for protection against mosquitoes and fever screening and/or testing for malaria is performed regularly. Fever screening visits are performed every 10-15 days for the target population in the area (immigrant and Roma populations).

- **Enhancing laboratory diagnosis of malaria:** Since 2012, HCDCP distributed Rapid Diagnostic Tests (RDTs) for malaria to hospitals and Health Centers in areas with recently recorded local malaria transmission and areas with large populations of immigrants from endemic countries (large urban centers, areas with immigration detention centers, irregular points of entry for undocumented immigrants) 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. Furthermore, HCDCP recommends and facilitates the samples to be sent from any laboratory to the reference laboratory, for confirmation and/ or further genotyping.
- II. Administration of antimalarial drugs to immigrants from malaria endemic countries:** In 2013 and 2014, following the decision of the HCDCP Working Group on Vector-borne Diseases and the approval of the Committee for the Prevention and Management of Tropical Diseases of the Ministry of Health, the field team in Lakonia delivered -before and during the transmission periods- one course of antimalarials for *P. vivax* infection (Chloroquine + Primaquine) to all immigrants from malaria endemic countries who lived in the Municipality of Evrotas. 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. Overall, in 2013 DOT antimalarial therapy was administered to 862 persons and in 2014 to 232 persons, in the area of Evrotas.
- III. 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. HCDCP have secured supply of specific anti-malarial medicines for timely distribution to Health Units and treating of patients.
- IV. Increase awareness amongst health professionals** for the diagnosis and management of malaria. In 2015, HCDCP staff delivered presentations and organized seminars for health professionals in 14 Health Centers/Hospitals in areas where locally acquired cases had occurred and in vulnerable areas. Informative letters were also sent to all hospitals.
- V. Communication to the public** on malaria and personal protection measures against mosquitoes:
- Educational material on malaria and protective measures against mosquitoes is available on the KEELPNO website (www.keelpno.gr) and leaflets are available for each use.
 - In the focus area of the 2015 recorded local transmission in the Regional Unit of Trikala, the field team informed the local population, door-to-door, and raised its awareness on the malaria

disease and the suggested protective measures against mosquitoes, during the focus investigation.

VI. Coordination of an intersector Working Group (WG) on the designation of affected areas by vector borne diseases. This WG considers all available epidemiological data and decides on the characterization of affected areas, which is then used by the National Centre for Blood Donation to issue guidance on blood safety. The list of affected municipalities is published on our website (www.keelpno.gr) and updated regularly according to reported cases.

VII. Vector control activities - Entomological surveillance:

- **Raising awareness about vector borne diseases and guidance to Regional Authorities:** HCDCP communicates regularly with all Regional Authorities in Greece recommending the timely planning, organization and implementation of integrated vector control programmes, identifying the high risk areas. Detailed technical guidance is timely communicated by the HCDCP to the Regional Administrations all over the country, in order to assist them to implement on time the calls for tender for integrated vector control programs.
- **Distribution and placement of Long Lasting Insecticide-treated Nets (LLINs) to immigrants:** According to WHO and ECDC guidance, HCDCP distributes (since 2013, in each transmission period) LLINs to immigrants, along with mosquito repellent coils, in the Municipality of Evrotas, Lakonia, after obtaining a special permit from the Ministry of Agriculture.
- **Participation in the implementation of indoor residual spraying (IRS):** The HCDCP field team was responsible for indicating immigrants' residencies in Evrotas Municipality. The first round of IRS in this area was conducted in June 2015 by the Regional authority of Peloponnese.
- **Entomological surveillance:** The HCDCP, in collaboration with the Department of Parasitology, Entomology and Tropical Diseases of the National School of Public Health, and with the voluntary participation of Regions, local authorities and the subcontractors of the local mosquito control programs, implements -for the 2015 transmission period- active entomological surveillance in limited areas. The entomological data (mosquito species identification) are immediately communicated to all national, regional and local stakeholders.
- **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

As indicated by the recent surveillance data, and despite Greece being malaria-free since 1974, the risk of re-establishment of the disease in specific areas of the country exists, where the presence of adequate numbers of *Anopheles* mosquitoes (the competent vector of the disease) is combined with the presence of patients coming from endemic countries.

After the recent peak of the local malaria transmission in 2011, the number of recorded locally acquired malaria cases kept declining in the consecutive years and zeroed in 2014. A number of intense and costly public health interventions were implemented, with the collaboration of various stakeholders at the

national, regional and local level, which have contributed to the successful prevention of the re-emergence of malaria in Greece.

In 2015 -up to 26/08/2015- one sporadic locally acquired malaria case has been recorded in Greece, in a new -vulnerable and receptive- area. The appearance of such sporadic introduced malaria cases in vulnerable and receptive areas in Greece has been recorded in the previous years (2009-2013) and is partially expected, since a significant increase in the migrant population coming from endemic countries is recorded in the same time. Page | 7

In order to prevent the re-introduction of malaria in specific areas of the country, it is necessary to secure the maintenance of high level of health and public health services, physician awareness, and systematic implementation of integrated vector control programmes (including vector surveillance). Furthermore, free access to health services for immigrants (including undocumented ones) for timely diagnosis and treatment of malaria, communication with the immigrants and achieving a minimum standard of their living conditions and well-being constitute determinant factors for preventing malaria re-establishment.

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 high risk areas of the country.

Advice for travelers in Greece:

The HCDCP, based on the surveillance data available until now and the implemented prevention 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. Chemoprophylaxis for malaria is not recommended** for visitors to areas where locally acquired malaria cases have occurred until today. Personal protective measures against mosquitoes are encouraged.