



EPIDEMIOLOGICAL SURVEILLANCE REPORT

Malaria in Greece, 2017

Introduction

Malaria is a parasitic infection, transmitted through the bite of the infected female *Anopheles* mosquito. Five species of *Plasmodium* cause disease to humans: *Plasmodium falciparum*, *P. vivax*, *P. ovale*, *P. malariae* and *P. knowlesi*. *P. falciparum* and *P. vivax* are the most common.

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* and *P. ovale* 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.

Ongoing transmission of malaria is currently recorded in 91 countries around the world (WHO, World Malaria Report, 2017), mainly in sub-Saharan Africa, Asia and Latin America. Until the mid-twentieth century, several countries in Europe and North America were malaria endemic, but after an intense malaria control program it was eradicated.

Malaria surveillance in Greece

Data are derived from the reports of laboratory-confirmed malaria cases and the enhanced surveillance systems of the Hellenic Center for Disease Control & Prevention (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, with the collaboration of local public health authorities, for every locally acquired malaria case throughout Greece. In addition, in specific areas with recorded cluster of locally acquired malaria cases over the last years, systematic pro-active detection of malaria cases, door-to-door, is implemented (see below).

Malaria surveillance data in Greece, 2009 – 2016

Greece was declared free from malaria in 1974, following an intense control program (1946- 1960). Since then and up until 2017, several (20-110 cases) imported cases were reported annually to the HCDCP referring to patients infected abroad (returning travelers or migrants from malaria endemic countries). Increasing numbers of imported malaria cases is expected due to the increase of travels and population movements worldwide, and is observed in all developed countries. According to the European Centre for

Disease Control and Prevention (ECDC), in 2015 more than 6,000 malaria cases were recorded in EU/EEA countries (https://ecdc.europa.eu/sites/portal/files/documents/AER_for_2015-malaria.pdf).

Additionally, since 2009 a number of locally acquired *P. vivax* malaria cases have been recorded in various areas of the country (i.e., among patients without travel history to a malaria endemic country), mainly as sporadic introduced cases but also in clusters (in 2011- 2012). Most areas where locally acquired cases were recorded over the last years were rural close to wetlands with high number of persons from endemic countries.

The number of malaria cases in Greece reported to the HCDCP by year of symptom onset (for imported cases) or infection (for locally-acquired cases) and by epidemiological classification (imported/ locally-acquired) is presented in Table 1. Table 2 presents locally acquired *P. vivax* malaria cases by probable Region and Regional Unit of exposure, years 2009-2016.

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 - 2016².

Year of symptom onset/ infection	Case classification	
	Imported cases	Locally-acquired cases ³
2009	44	7
2010	40	4
2011	54	42
2012	73	20
2013	22	3
2014	38	0
2015	79	8
2016	111	6

1. Cases with no information regarding symptom onset were classified according to the year of hospitalization or notification to the HCDCP.
2. Two malaria cases of unknown classification (in 2016) are not included in the Table.
3. Recorded *P. vivax* relapses and locally-acquired *P. malariae* cases attributed to previous transmission periods (two cases in 2012) are not included in the Table.

Table 2: Locally acquired *P. vivax* malaria cases by probable Region and Regional Unit of exposure and year of infection, Greece, 2009-2016.

Region	Regional Unit	Year of infection							
		2009	2010	2011	2012	2013	2014	2015	2016
Peloponnese	Lakonia	6	1	36	10	0	0	1	0
Attica	East Attica	1	1	2	4	0	0	2	0
Sterea Ellada (Central Greece)	Viotia	0	2	1	2	0	0	1	0
	Evoia	0	0	2	0	0	0	0	0
Thessaly	Karditsa	0	0	0	2	1	0	0	0
	Larisa	0	0	1	0	0	0	3	1
	Trikala	0	0	0	0	0	0	1	0
	Magnesia & Sporades	0	0	0	0	0	0	0	1
East Macedonia & Thrace	Xanthi	0	0	0	2	0	0	0	0
	Evros	0	0	0	0	2	0	0	0
Central Macedonia	Thessaloniki	0	0	0	0	0	0	0	2
Western Greece	Ahaia	0	0	0	0	0	0	0	1
	Ileia	0	0	0	0	0	0	0	1
Total		7	4	42	20	3	0	8	6

This case classification is based on epidemiological criteria (e.g. history of 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. These cases concerned immigrants from malaria endemic countries in 2011 (n=9) and 2012 (n=11), who were residing in the Municipalities of Evrotas Lakonia and Sofades Karditsa (data to be published).

You can find more information regarding epidemiological malaria data at the HCDCP website (www.keelpno.gr)

Malaria surveillance data, Greece, 2017

In 2017, a total of one hundred and seven (107) laboratory diagnosed malaria cases were reported to the HCDCP;

- 100 cases were classified as imported: 85 (85%) cases among immigrants from malaria endemic countries and 15 cases among travelers (returning from Africa). Of the 85 cases in immigrants from malaria endemic countries:
 - 67 were in immigrants from the Indian Subcontinent/ South Asia and 18 from Africa,
 - 19 cases concerned immigrants visiting friends and relatives at their country of origin,
 - 8 cases were recorded among immigrants/refugees residing in camps/ reception centers in Aegean islands (and two more in detention centers).
- Six (6) *P.vivax* malaria cases were classified as introduced locally acquired. Case investigation of these introduced cases suggested the following probable places of exposure:
 - one case with probable exposure at the Municipality of West Ahaia, Regional Unit (RU) of Ahaia, Region of West Greece (with onset of symptoms in the week 18/2017 (01-07/05/2017)),
 - two cases with probable exposure at the Municipality of Andravida-Kyllini, RU of Ileia, Region of Western Greece (with onset of symptoms in the weeks 18/2017 (01-07/05/2017) and 29/2017 (17-23/07/2017)),
 - one case with probable exposure at the Municipality of Thiva, RU of Viotia (with onset of symptoms in week 28/2017 (10-16/07/2017)),
 - one case with probable exposure at the Municipality of Messolonghi, RU of Aitolokarnania (with onset of symptoms in week 29/2017 (17-23/07/2017)), and
 - one case with probable exposure at the Municipality of Karditsa, RU of Karditsa (with onset of symptoms in week 44/2017 (30/10- 5/11/2017)).
- One sporadic locally acquired *P.falciparum* case was recorded, with onset of symptoms in week 29/2017 (17-23/07/2017). For this particular case the most likely place of exposure was a health care facility, while from the case investigation it was not possible to define the exact mode of transmission (mosquito vector or nosocomial transmission). The particular case is considered a rare sporadic event; a limited number of cases with similar history of exposure has been reported in the literature from European and other countries.

No locally acquired malaria case was directly linked to the presence of refugee/migrant camps in the area.

[Table 3](#) presents the reported malaria cases in Greece by epidemiological classification (imported/ locally acquired), status (immigrants/ returning travelers) and place of residence (for the imported cases) or probable exposure (for the locally acquired cases).

Table 3. Malaria cases by epidemiological classification, status and *Plasmodium* species, Greece, 2017 (n=107)

Epidemiological classification and status		<i>Plasmodium</i> species					Total
		<i>P.vivax</i>	<i>P.falciparum</i>	<i>P.ovale</i>	<i>P.falciparum</i> and <i>P.ovale</i>	<i>P.falciparum</i> and <i>P.malariae</i>	
Imported cases	Immigrants	67	14	2	1	1	85
	Travelers	0	15	0	0	0	15
Locally acquired cases		6*	1	0	0	0	7

*All cases were introduced.

Activities for the management of malaria

Since 2012, HCDCP has developed and continuously implements an Action Plan for the Management of Malaria, which was updated for the 2017 period. In addition, during summer 2015 the “National Action Plan for the Management of Malaria” of the Ministry of Health was published. According to these, a series of activities are implemented nationwide for the prevention and management of malaria, with the collaboration of national, regional and local authorities. These activities for the management of malaria include:

- I. **Risk assessment for the re-emergence of malaria:** All areas (Regions, Municipalities) are assigned a Risk Level from 0-3, taking into consideration the malaria cases reported since 2009, and other local risk factors (entomological, environmental and demographic data). The Risk Level defines the activities implemented in each area.
- II. **Enhanced malaria surveillance and intervention activities:**
 - **Case finding:** In order to promptly detect all malaria cases, raise awareness among local health professionals and active case detection activities in high risk areas are implemented and support is provided for the laboratory diagnosis of malaria.
 - **Case investigation:** HCDCP investigates all notified malaria cases. For locally-acquired cases, an in-depth interview with the patient is conducted, in order to identify the estimated place of exposure and the risk for further local transmission.
 - **Immediate communication to stakeholders and health professionals** at national and local level, after the reporting of each locally-acquired malaria case to the HCDCP:
 - i. Hierarchy of the Ministry of Health (MoH),
 - ii. Regional public health authorities,
 - iii. Municipalities,
 - iv. MoH Committee for the Prevention and Management of Tropical Diseases,
 - v. Working Group for the designation of vector-borne disease (VBD) affected areas,
 - vi. National Centre for Blood Donation, responsible for the relevant blood safety measures,
 - vii. Physicians practicing in the affected area, to raise their awareness for investigating suspected cases.
 - **Focus investigation – reactive case detection:** HCDCP investigation teams are deployed after the notification 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 individuals in the focus are screened for malaria compatible symptoms and tested for malaria accordingly. Following the report of the locally acquired malaria cases in 2017, the HCDCP, in collaboration with local public health authorities, organised and performed focus investigation of the cases, as well as communication activities amongst health professionals and the public in the areas.
 - **Environmental and vector investigation** is performed in the area after the recording 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 (PACD) in Evrotas Municipality, Lakonia:** The HCDCP, in collaboration with the Region of Peloponnese, the Municipality of Evrotas, the University of Thessaly (www.malwest.gr) and Doctors Without Borders (2012), supported from 2011-2014 a

field team in the area for the active detection of malaria cases. Since 2015, the field team -with coordination from the HCDCP- is supported by the Region of Peloponnese to continue the PACD programme, undertaking also the radical treatment and focus investigation of all recorded malaria cases. A significant number of immigrants from malaria endemic countries (mainly Pakistan) 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. In April-December 2017, fever screening visits were performed every 7-15 days in immigrant and Roma residences, with a total of approximately 1,000 immigrants screened in 12 villages in the particular area.

- III. Enhancing laboratory diagnosis of malaria:** Since 2012, HCDCP has distributed Rapid Diagnostic Tests (RDTs) for malaria to Hospitals and Health Centers in areas with recently recorded malaria transmission, and in areas with large populations of immigrants from endemic countries (i.e., large urban centers, in refugee/migrant camps and the nearby Health Units), aiming at prompt diagnosis and treatment of malaria cases. In 2017, HCDCP provided RDTs to a total of 171 Health Units/facilities nationwide. RDTs have contributed significantly to the early detection of malaria cases in our experience and have been proven a valuable field tool.

In addition, HCDCP recommends and supports the transportation of samples from any laboratory in Greece to the reference laboratory (Department of Parasitology, Entomology and Tropical Diseases of the National School of Public Health) for verification of diagnosis and further identification (and genotyping) of *Plasmodium* species.

- IV. Case management - Standardization of the malaria treatment in Greece,** according to treatment guidelines developed by the HCDCP with the input of experts in infectious diseases. HCDCP also maintains a small stockpile of anti-malarial medicines for timely distribution to Health Units in cases of emergency.
- V. Increase awareness amongst health professionals** for the diagnosis and management of malaria. HCDCP staff delivers presentations and organizes seminars for health professionals in Health Centers/Hospitals in areas with recently recorded locally acquired cases. Informative letters are also sent to all hospitals and Medical Associations on an annual basis.
- VI. 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 HCDCP website.
 - **Information material** (leaflets, posters) is distributed according to the needs.
 - In areas with locally acquired cases recorded, the HCDCP field team informs the local population, and raises awareness about malaria and the necessary protective measures against mosquitoes, during the focus investigations and informative meetings.
- VII. Designation of affected areas - Blood safety and haemovigilance measures:** An inter-sectoral Working Group (WG) on the designation of VBD affected areas (under the MoH Committee for the Prevention and Management of Tropical Diseases) considers all available epidemiological and laboratory data for each locally-acquired case and decides on the characterization of malaria affected areas in Greece. This designation 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 the reported locally acquired cases. Post donation and post transfusion information to donors and other haemovigilance measures are in place following relevant guidance from the Coordinating Haemovigilance Centre/ HCDCP.

VIII. Vector surveillance and control activities:

- **Raising awareness and guidance to Regional Authorities:** HCDCP communicates regularly (workshops, meetings, letters and technical guidance) with all Regional Authorities in Greece recommending the timely planning, organization and implementation of integrated vector control programmes particularly in high risk areas.
- **Monitoring of the vector control programme implementation across the country.**
- **Distribution and placement of Long Lasting Insecticide-treated Nets (LLINs):** According to WHO and ECDC guidance, HCDCP distributes (since 2013, in each transmission period) LLINs to immigrants, in the Municipality of Evrotas, Lakonia, after obtaining a special license from the Ministry of Rural Development and Agriculture. The distribution, placement and monitoring of the proper use of the nets is implemented by the PACD field team, which conducts the active case detection in the area.
- **Participation in the implementation of indoor residual spraying (IRS):** The Region of Peloponnese implements every summer indoor residual spraying (IRS) in migrant residences in the area of Evrotas. The PACD field team participates in the activity by indicating migrant residences in the area. HCDCP continues to recommend this vector control method in this area.
- **Entomological surveillance:** The HCDCP, in collaboration with the Department of Parasitology, Entomology and Tropical Diseases of the National School of Public Health (NSPH), the Benaki Phytopathological Institute, the MALWEST project (2012-2014), Universities, Regions, local authorities and subcontractors of the local mosquito control programmes has implemented, participated or coordinated -from 2010 to 2015- active vector surveillance programme. HCDCP recommends that local authorities should perform vector surveillance annually, especially in areas with risk factors for local malaria transmission (e.g. rural areas with large populations of immigrants from malaria endemic countries).

IX. 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.

X. Due to the increased **migrant/ refugee population residing in the country** in reception and accommodation camps, a series of targeted activities have been organized in these camps, including: strengthening malaria surveillance and diagnosis, distribution of rapid diagnostic tests to the camp clinics and nearby Health Units, recommendation for systematic entomological surveillance in the area, risk assessment (collection of available entomological, environmental and demographic data) and, if necessary, intensification of mosquito control measures, personal protection measures against mosquitoes for the hosted migrants.

Conclusions

As indicated by the malaria surveillance data, the risk of reintroduction of the disease in specific -vulnerable and receptive- 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 malaria patients coming from endemic countries.

Following a peak of locally acquired malaria cases in 2011-2012, their number declined steadily in the following years. This coincided with a number of intense and costly public health interventions implemented since 2011, with the collaboration of various stakeholders at the national, regional and local level, which have contributed to the successful prevention of the re-establishment of malaria in Greece.

However, sporadic introduced locally acquired malaria cases were still recorded up to 2017, in vulnerable and receptive areas around the country indicating the need to sustain the activities for the prevention of the disease a priority for the public health authorities.

Early detection and eradication treatment of malaria cases, together with mosquito protection and effective vector control measures represent the main components of the public health strategy to prevent *P. vivax* reintroduction in high risk areas of the country. In this context, the maintenance of high level of preparedness and awareness of health and public health services is needed. In addition, important determinants for the prevention of local malaria transmission in Greece include the continued offer of free access to health services for migrants for the timely diagnosis and treatment of malaria, the open communication with the migrant population and achieving a minimum standard for their living conditions and well-being.

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 strongly encouraged during the mosquito circulation season.