



NATIONAL PUBLIC
HEALTH ORGANIZATION

EPIDEMIOLOGICAL SURVEILLANCE REPORT

Malaria in Greece, 2021, up to 24/09/2021

Introduction

Greece is considered free from malaria since 1974, following an intense control program (1946-1960). Since then, several (20-110 cases) imported cases are reported annually to the Hellenic National Public Health Organization in Greece (NPHO), referring to patients infected abroad (returning travelers or migrants from malaria endemic countries). Increasing number of imported malaria cases are expected due to the increase of travels and population movements worldwide, a phenomenon that is observed in all developed countries.

Additionally, since 2009 a number of locally acquired/introduced *P. vivax* malaria cases have been recorded in some areas of the country (i.e., among patients without travel history to a malaria endemic country), mainly as sporadic introduced cases (1st generation transmission) but also in clusters (in 2011-2012). Regarding these introduced cases, the *Plasmodium* transmission was mosquito-borne, through mosquitoes that got infected from imported cases. Since 2009, no malaria transmission through blood transfusion has been recorded.

You can find more information regarding epidemiological malaria data at the NPHO website (<https://eody.gov.gr/en/epidemiological-statistical-data/annual-epidemiological-data/>).

Malaria surveillance data, Greece, 2021, until 24/09/2021

In 2021, up to 24/09/2021, a total of twenty-five (25) laboratory diagnosed and confirmed malaria cases have been reported to the NPHO (Table 1): twenty-one (21) cases were classified as imported (i.e., were infected abroad), and four malaria cases were classified as locally acquired (1st generation transmission); three *P.falciparum* malaria cases and one *P.vivax* case.

Among the 21 imported cases, fourteen (14) were immigrants from malaria endemic countries (13 immigrants from Africa and one from South Asia) and seven (7) cases were travellers (five travellers from Africa and two from the Indian Subcontinent).

Among the 14 cases in immigrants from malaria endemic countries, ten cases concerned immigrants visiting friends and relatives at their country of origin.

In 2021, up to 24/09/2021, four malaria cases were classified as locally acquired (1st generation transmission):

- Three *P.falciparum* malaria cases, with symptom onset during the weeks 25-26/2021, were classified as locally acquired (1st generation of transmission). The most likely place of exposure of these patients was a hospital (where there was an epidemiological link with an imported malaria case), in Attica region. The most likely route of transmission of the hospital-acquired malaria was through nosocomial practices

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during patients' health care, which may contributed to the blood-borne transmission, while the exact mode of the nosocomial transmission was not possible to be confirmed; however, these practices did not include blood transfusion. During the re-active case detection, no more malaria cases were detected (among the other co-hospitalized patients). This event is considered a single and rare event. Similar events have been recorded in the literature, in Europe (including Greece, with single cases previously recorded, in 2017 and in 2020), and worldwide. According to the consultation of the competent "Working Group for the designation of vector-borne disease (VBD) affected areas", the area was not defined as "malaria affected", given the very low possibility of ongoing malaria transmission.

- One *P.vivax* case was classified as introduced (1st generation of transmission), with probable place of exposure at the Municipality of Delta, Regional Unit (RU) of Thessaloniki, in Central Macedonia Region. The patient had onset of symptoms in week 36/2021 (06-12/09/2021). No more malaria cases were detected in the area, during the field investigation (reactive case detection).

Table 1 presents the reported malaria cases in Greece by epidemiological case classification (imported/locally acquired), status (immigrants/ travellers) and *Plasmodium* species.

Table 1. Malaria cases by epidemiological classification, status and *Plasmodium* species, Greece, 2021, up to 24/09/2021 (n=25)

Epidemiological classification and status		<i>P.vivax</i>	<i>P.falciparum</i>	<i>P.ovale</i>	<i>P.malariae</i>	Total
Imported cases	Immigrants	1	10	2	1	14
	Travelers	2	4	0	1	7
Locally acquired cases (1 st generation of transmission)		1	3	0	0	4

Activities for the management of malaria

Since 2012, NPHO has developed and continuously implements an Action Plan for the Management of Malaria. In addition, in 2015 the Ministry of Health published the "National Action Plan for the Management of Malaria".

According to these plans, a series of activities are implemented nationwide for the prevention and management of malaria, with the collaboration of national, regional and local authorities:

- 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 locally acquired/ introduced malaria cases reported since 2009, and other local risk factors (entomological, environmental and demographic data). The area Risk Level defines the activities to be implemented.
- II. **Enhanced malaria surveillance and intervention activities:**
 - **Case finding:** In order to promptly detect all malaria cases, awareness raising among health professionals nationwide and active case detection activities in high risk areas are implemented, as well as support for the laboratory diagnosis of malaria.
 - **Case investigation:** NPHO investigates all notified malaria cases. For locally-acquired/ introduced cases, an in-depth interview with the patient is conducted, in order to identify the most likely place of exposure and mode of transmission, and the risk for further local transmission.

- **Immediate communication to stakeholders and health professionals** at national and local levels, after the reporting of each locally-acquired/ introduced malaria case to the NPHO:
 - 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 (MoH),
 - vi. Hellenic National Blood Transfusion Center, responsible for the relevant blood safety measures,
 - vii. Coordinating Centre for Haemovigilance and Surveillance of Transfusion of NPHO,
 - viii. Physicians practicing in the affected area, to raise their awareness for investigating suspect cases.

- **Focus investigation – reactive case detection:** NPHO investigation teams are deployed after the notification of each locally acquired/ introduced 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 reports of the introduced malaria cases in 2021, the NPHO, in collaboration -as applicable- with the hospital’s infection control committee or the regional public health authorities, organized and performed reactive case detection: i) for the hospital-acquired *P.falciparum* malaria testing for malaria of other patients linked/co-hospitalised in the same ward with the cases was performed, and ii) for the introduced *P.vivax* malaria case (mosquito-borne transmission) focus investigation was performed, including door-to-door field visits, screening for malaria compatible symptoms and testing for malaria of the local and migrant population accordingly, in the proximity of the case, as well as communication activities for health professionals and the public in the area.

- **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 collaboration with regional and local authorities, in order to identify *Anopheles* breeding sites and other risk factors for local transmission.
- **Proactive malaria case detection (PACD) in Evrotas Municipality, Lakonia** (where clusters of locally acquired *P.vivax* cases were recorded in 2011-2012): The NPHO, in collaboration with the Region of Peloponnese, the Municipality of Evrotas, the University of Thessaly and Doctors Without Borders (2012), supported from 2011-2014 a field team in the area for the pro-active detection of malaria cases. Since 2015, the field team -with staff from the University of Thessaly and field education from the NPHO- 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 migrants 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. During the mosquito circulation season, fever screening visits are performed every 7-15 days in migrants and other high risk groups in the particular area.

III. Enhancing laboratory diagnosis of malaria: Since 2012, NPHO 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, areas hosting large travelers' populations), aiming at prompt diagnosis and treatment of malaria cases. In 2020-2021, NPHO provided RDTs to a total of >200 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, NPHO supports the Reference Malaria Laboratory (RML, School of Public Health, University of West Attica) for the (free-of-charge) testing for malaria of every suspected case, and recommends the transportation of samples from any laboratory in Greece to the RML 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 and management guidelines developed by the NPHO with the input of experts in infectious diseases. NPHO infectious diseases specialists are available for counseling. NPHO also maintains a stockpile of anti-malarial medicines (e.g., the national stockpile of artesunate for parenteral injection, for severe cases), for the timely distribution of the proper anti-malarial treatment to Health Units in cases of emergency.
- V. Increase awareness amongst health professionals** for the diagnosis and management of malaria. NPHO staff delivers presentations and organizes seminars -as necessary- for health professionals in Health Centers/Hospitals in areas with recently recorded locally acquired cases. The NPHO provides guidelines for the recognition and diagnosis of malaria and the recommended laboratory investigation and case management (mailings and website, <https://eody.gov.gr/disease/elonosia/>). NPHO communicates annually (through informative letters) to all Hospitals/Health Centers and Medical Associations of the country about malaria.
- 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 NPHO website.
 - **Information material** for the public (leaflets, posters) is distributed according to the needs. In June 2021, NPHO sent -via email- informative material to regional and local authorities, and sent informative leaflets for the protection against mosquito bites to all Regions of Greece, in order to be distributed to the public.
 - In areas with introduced cases recorded, the NPHO field team informs the local population, and raises awareness about malaria and the necessary protective measures against mosquitoes, during the focus investigations (door-to-door), and urgently provides informative leaflets.
- 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) considers all available epidemiological and laboratory data for each locally-acquired/ introduced case and decides on the characterization of malaria affected areas in Greece. This designation is then used by the Hellenic National Blood Transfusion Center to issue guidance on blood safety. The list of affected municipalities is published on our website (www.eody.gov.gr) and updated regularly according to recorded locally acquired cases. Post donation and post transfusion information to donors and other haemovigilance measures are in place following relevant guidance from the Coordinating Centre for Haemovigilance and Surveillance of Transfusion of NPHO.

VIII. Vector surveillance and control activities:

- **Raising awareness and guidance to Regional Authorities:** NPHO communicates regularly (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. NPHO sent relevant awareness letters in early February 2021 underlying the high risk areas, and recommending the intensification of vector control in areas with risk factors for local transmission. In addition, NPHO timely informs the regional and local authorities of areas with recorded malaria cases, and -after risk assessment- recommends prevention and response measures, including the urgent intensification of vector control in the area, in order to reduce the mosquito vector population.
- **Monitoring of the implementation of vector control programmes across the country** (through a structured questionnaire).
- **Distribution and placement of Long Lasting Insecticide-treated Nets (LLINs):** According to WHO and ECDC guidance, NPHO provided/ distributed (in 2013) LLINs to immigrants, in the Municipality of Evrotas, Lakonia, under a special license from the Ministry of Rural Development and Agriculture. Since then, 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.
- **Entomological surveillance:** For the 2021 period, NPHO organizes/participates in/performs an active vector surveillance programme in various areas of the country, in collaboration with local/regional authorities, private mosquito control sub-contractors, the School of Public Health-University of West Attica and the Benaki Phytopathological Institute. MoH and NPHO 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) and tries to collect the available vector surveillance data.

IX. Communication with international public health stakeholders: The NPHO 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.

In addition, due to the increased **immigrant/ 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 vector surveillance in the area, risk assessment (collection of available vector, environmental and demographic data) and, if necessary, intensification of mosquito control measures, personal protection measures against mosquitoes and communication activities (leaflets distribution) for the hosted immigrants/ refugees.

Conclusions

As indicated by the malaria surveillance data of the last years, and despite the malaria eradication in Greece since 1974, the risk of re-introduction of the disease in specific vulnerable and receptive areas of the country exists, especially 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 *P.vivax* malaria cases in 2011-2012, their number declined steadily in the following years. This decrease is the result of 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-appearance of malaria in Greece.

Sporadic events of *P.vivax* malaria introduction (single cases or small clusters, 1st generation of transmission) are still recorded over the last years in few vulnerable and receptive rural areas, with a mosquito-borne *P.vivax* transmission (through mosquitoes infected from imported cases from malaria endemic countries), indicating the need to sustain malaria prevention activities as a priority for the preparedness of public health authorities.

Additionally, the recording of rare events of hospital-acquired malaria transmission indicates the intense need for systematic and strict implementation of all recommended prevention measures during the health care of malaria patients, in order to minimize the possibility of further malaria transmission, through any possible route; either through mosquitoes, in areas with competent vectors, or through nosocomial practices during the patients' health care which may contribute to blood-borne transmission.

Early detection and eradication treatment of malaria cases, together with **appropriate investigation and effective integrated vector control measures** represent the main components of the public health strategy to prevent malaria reintroduction and re-appearance in high risk areas of the country. In this context, high level of preparedness and awareness of health and public health services should be maintained. In addition, important determinants for the prevention of local malaria transmission in Greece include the immigrants' health care and access to health services, for the timely diagnosis and treatment of malaria, the communication with the immigrant population and achieving a minimum standard for their living conditions and well-being.

Advice for travelers in Greece:

The NPHO, based on the surveillance data available until now and the implemented prevention measures in the areas where locally acquired/ introduced malaria cases have been reported, maintains that **the risk to travelers for malaria infection in Greece is extremely low. Chemoprophylaxis for malaria is not recommended for visitors to any area in Greece** (including areas where locally acquired/ introduced malaria cases have been recently recorded). Nevertheless, personal protective measures against mosquitoes are encouraged during the mosquito circulation season (given also the seasonal circulation of West Nile virus in some areas in the country).