NATIONAL PUBLIC HEALTH ORGANIZATION

Annual epidemiological report for West Nile virus human infection, Greece, 2021

This epidemiological report aims to present an overview of the epidemiological data on West Nile Virus (WNV) human infection, the reported cases and the public health response to WNV in Greece for transmission period 2021.

Data presented in this report was derived from the notifications of laboratory diagnosed human cases of WNV infection sent to the Hellenic National Public Health Organization (NPHO) by the treating physicians and from the daily communication with diagnostic laboratories: i) the National Reference Centre for Arboviruses, Aristotelian University of Thessaloniki, ii) the Department of Microbiology, School of Medicine, University of Athens, iii) the Hellenic Pasteur Institute, iv) the Laboratory of Clinical Virology, School of Medicine, University of Crete.

The Vector-borne Diseases Department of the Directorate of Epidemiological Surveillance and Intervention for Infectious Diseases of the NPHO undertakes a verification procedure and investigates all reported cases within 24 hours, through communication with the treating physicians and the patients, in order to identify the probable place of exposure, the characteristics of the disease and the risk factors. In addition, the health status/ outcome of hospitalized cases is daily updated.

In 2021 period, fifty-nine (59) laboratory diagnosed cases of WNV infection were reported to NPHO, thirty-eight (38) of which presented with neuro-invasive disease (WNND, with central nervous system (CNS) manifestations, encephalitis and/or meningitis and/or acute flaccid paralysis) and twenty- one (21) cases with mild symptoms (e.g., febrile syndrome, without CNS manifestations, “West Nile Fever”) (Table 1). One imported case (infected abroad) with WNND is not included in the abovementioned total number of cases and in the following analysis. Eight (8) deaths were recorded, concerning patients with WNV disease older than 69 years of age (median age of the deceased= 79 years), with underlying diseases.

Table 1. Number of reported locally acquired cases of WNV disease and deaths, Greece, period 2021[1]

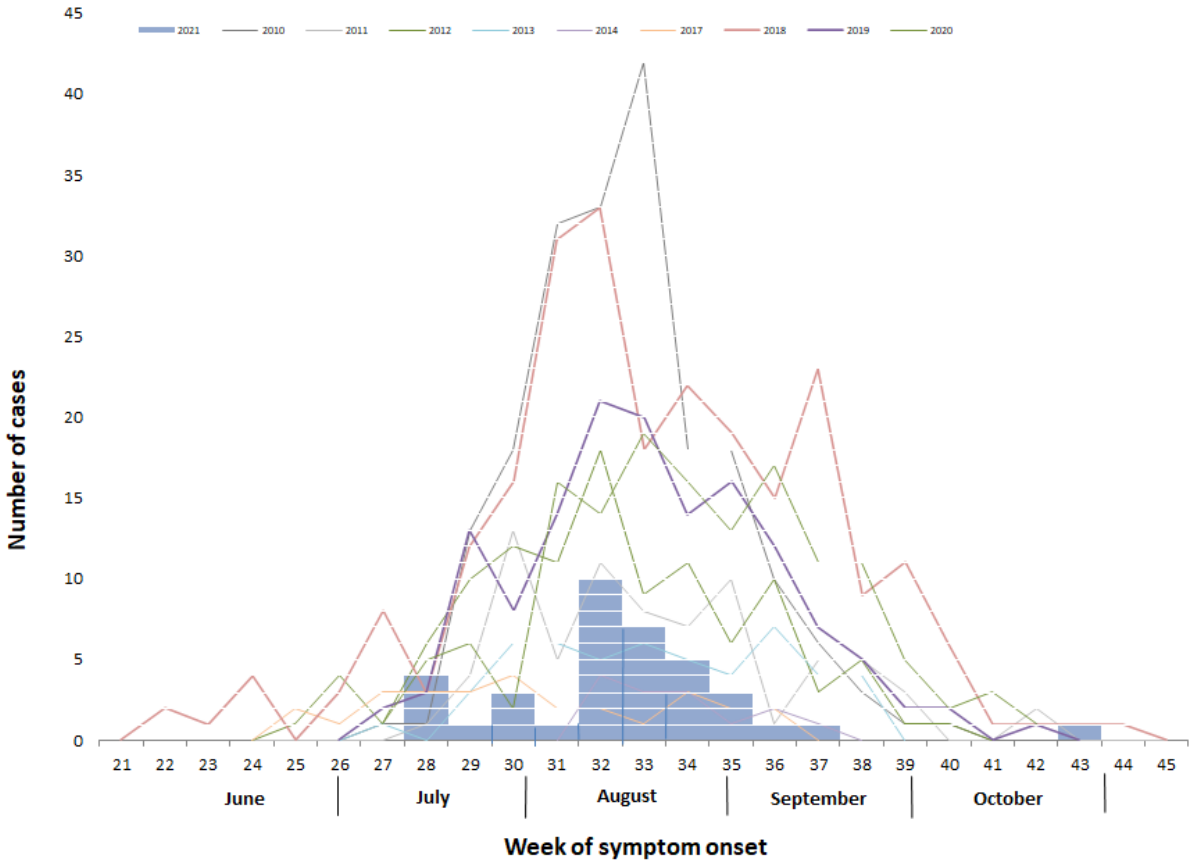
	Number of cases **with** central nervous system (CNS) manifestations [2]	Number of cases **without** CNS manifestations	**Total number of cases**	**Number of deaths** [3]
Number of WNV cases and deaths	38	21	**59**	**8**

1. One imported case is not included.
2. Refers mainly to encephalitis, aseptic meningitis and meningoencephalitis cases.
3. The number of deaths is included in the total number of cases.

Eight (8) out of the 59 patients diagnosed with WNV infection in 2021 were hospitalized in an Intensive Care Unit, whereas nine (9) patients were not hospitalized.

Figure 1 shows the reported locally acquired WNND cases by week of symptom onset. For the first diagnosed case of WNV infection for transmission period 2021 (case with WNND), the reported onset of symptoms was on 14th July 2021 (wk 28/2021), and the last reported case had symptoms onset on 25th October 2021 (wk 43/2021).

Figure 1. Number of laboratory diagnosed locally acquired WNND cases by week of symptom onset, Greece, 2010-2021 [1,2].



1. Each blue box represents one laboratory diagnosed case of WNND reported to NPHO in transmission period 2021.
2. For one patient, the date of symptom onset is unknown.

Table 2 and Figure 2 show the geographic distribution of the notified locally acquired cases with laboratory diagnosed WNV infection at the level of probable Municipalities of exposure (Table 2) and probable Regional Units (NUTS3) of exposure (Figure 2). The patient's probable place of exposure is a rough indicator of the WNV circulation areas.

According to a serosurvey conducted in 2010 by the NPHO and the National School of Public Health, at the epicentre of the 2010 WNV outbreak in Central Macedonia, it was estimated that WNND disease develops in 1:140 infected persons.

Table 2. Reported locally acquired cases with laboratory diagnosed WNV infection (with and without WNND) by probable Municipality of exposure, Greece, transmission period 2021 (n=59)

Region	Regional Unit	Probable Municipality of exposure	Number of cases with WNND	Incidence of WNND per 100,000 population[1]	Number of West Nile Fever cases (non WNND)
Central Macedonia	Pella	Pella	8	12.7	5
		Skydra	5	24.8	0
	Imathia	Veroia	5	7.5	4
		Alexandria	6	14.4	6
		Heroic City Naoussa	0	-	2
	Thessaloniki	Ampelokipi - Menemeni	3	5.8	0
		Delta	1	2.2	0
		Thermaikos	0	-	1
		Chalkidona	1	3.0	0
		Kordelio- Evosmos	1	1.0	0
	Serres	Irakleia	1	4.7	0
Attica	East Attica	Pallini	1	1.8	0
		Spata - Artemida	2	5.9	0
Central Greece (Sterea Ellada)	Viotia	Tanagra	1	5.1	0
	Evia	Chalkideon	1	1.0	0
East Macedonia & Thrace	Kavala	Paggaio	1[2]	3.1	1
		Kavala	0	-	1
	Drama	Drama	0	-	1
Undetermined place of exposure			1	-	0
Total Greece			**38**	**0.35**	**21**

1. Calculations based on 2011 census data (Hellenic Statistical Authority).
2. Due to a complex travel history, the most probable place of exposure of this patient was considered to be at the Municipality of Paggaio, Regional Unit of Kavala; however, the possibility of exposure to the Municipality of Amfipolis, Regional Unit of Serres, cannot be excluded.

Figure 2: Map showing the probable Regional Units (NUTS3) of exposure of reported cases with laboratory diagnosed WNV infection, Greece, 2021 (n=58 [1]).

Administrative boundaries: © EuroGeographics © UN–FAO © Turkstat.The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union. Map produced on: 11 Feb 2022

1. For one patient the probable place of exposure could not be determined.

In 2021, human WNV cases were recorded in Regional Units (NUTS3) with previously recorded human cases, in the Regions of Central Macedonia, East Macedonia & Thrace, Central Greece (Sterea Ellada) and Attica (with higher incidence in the Region of Central Macedonia).

The median age of WNND cases was 72 years (range: 12 - 90 years).

Out of the 59 cases, 34 (58%) were male and 25 (42%) were female. Tables 3 and 4 show the number and incidence of cases per age-group and gender respectively.

Table 3. Number of cases (total and WNND), and WNND incidence per age-group, Greece, 2021

Age-group (years)	Number of cases (n=59)	Number of WNND cases (n=38)	Incidence of WNND (per 100,000 population)*
0-19	1	1	0.05
20-29	1	0	0.0
30-39	0	0	0.0
40-49	4	2	0.1
50-59	11	3	0.2
60-69	12	8	0.7
70-79	15	12	1.2
≥80	15	12	2.1

* Calculations based on 2011 census data (Hellenic Statistical Authority).

Table 4. Number of cases (total and WNND), and WNND incidence per gender, Greece, 2021

Gender	Number of cases (n=59)	Number of WNND cases (n=38)	Incidence of WNND (per 100,000 population)*
Male	34	24	0.5
Female	25	14	0.3

* Calculations based on 2011 census data (Hellenic Statistical Authority).

Among the 38 WNND cases, 30 (79%) cases exhibited symptoms of encephalitis, four (10.5%) cases presented symptoms of meningoencephalitis, three (8%) cases symptoms of meningitis, and one (2.5%) patient presented acute flaccid paralysis.

Regarding the clinical symptoms of the WNND cases (with available relevant information), these included: fever (97%), malaise/fatigue (97%), confusion/consciousness level deterioration (84%), anorexia (72%), sleepiness (65%), chills (52%), headache (50%), dizziness (48%), vomiting (42%), myalgia/arthralgia (41%), tremor/extrapyramidal signs (34%), diarrhoea (31%), abdominal pain (19%), nausea (14%), limb paralysis (12%), ataxia/ gait disorders (11%), rash (11%), lymphadenopathy (11%), vision deterioration (11%), retro-orbital pain (7%), numbness (4%), cardiovascular implications (4%). Among the 38 WNND cases, 35 (92%) cases reported at least one underlying chronic disease.

Regarding the clinical symptoms of the symptomatic West Nile Fever cases (without CNS manifestations) (with available relevant information), these included: fever (100%), malaise/fatigue (95%), anorexia (76%), headache (74%), chills (57%), myalgia/arthralgia (53%), nausea (39%), rash (39%), lymphadenopathy (33%), retro-orbital pain (31%), dizziness (28%), sleepiness (26%), vomiting (17%), abdominal pain (11%), diarrhoea (11%), confusion/consciousness level deterioration (6%). One patient (without CNS manifestations) presented auditory neuropathy. Among the symptomatic cases without CNS manifestations, 79% reported at least one underlying chronic disease.

In addition, in the context of the enhanced surveillance of WNV infection in equids performed by the national animal health authorities/ Ministry of Rural Development and Food, one case of recent WNV infection in an equid was recorded, in the 2021 period, in the Regional Unit of Aitoloakarnania, Region of Western Greece, indicating the circulation of WNV in this area also.

PUBLIC HEALTH MEASURES SUPPORTED BY THE NPHO, 2021

In every mosquito circulation season, the Hellenic National Public Health Organization (NPHO) -in collaboration with other involved stakeholders- implements a series of preventive and response public health measures for the management of West Nile Virus infection, which include:

I. **Enhanced surveillance for WNV infection in humans**:

- **Awareness raising of physicians** about the WNV infection: Testing for WNV infection in suspected cases (such as cases with encephalitis, aseptic meningitis, acute flaccid paralysis, fever of undetermined etiology) is recommended. The NPHO provides guidelines for the recognition and diagnosis of WNV disease and the recommended laboratory investigation (mailings and website www.eody.gov.gr). For the 2021 period, an informative letter was sent to all Health Units and Medical Associations of the country for vigilance regarding West Nile Virus, in late May 2021. In addition, following the recording of cases in an area, local Health Units were urgently informed.
- **Daily communication and information exchange with laboratories** conducting diagnostic testing for WNV (active laboratory-based surveillance).
- **Enhancing laboratory diagnosis** of suspected cases, by supporting the National Reference Centre and other specialised diagnostic laboratories.
- **Case investigation:** The Vector-borne Diseases Department of NPHO undertakes the investigation of every reported WNV case within 24 hours after diagnosis, in order to determine the probable place of exposure, the risk factors and the severity of the disease. Health status of hospitalized cases is daily updated.
- **Immediate update of stakeholders** on the diagnosed cases (Ministry of Health, Ministry of Rural Development and Food, Hellenic National Blood Transfusion Center, Regions/ Directorates of Public Health and Social Welfare, Municipalities).
- **Weekly surveillance reports on human WNV infection cases** (uploaded on the NPHO website).

II. **Communication and health promotion activities for the public:** Informative material for the public regarding West Nile Virus infection and the recommended protective measures against mosquito bites is available in the NPHOs website (https://eody.gov.gr). In 2021, NPHO:

- Published an announcement (in June 2021) regarding the expected recurrence of cases in the current transmission period, and the recommended prevention measures.
- Published a Press Release (in 2nd of August 2021) regarding the diagnosis of the first two cases of West Nile Virus infection and the recommended prevention measures.
- Updated informative leaflets for the protection against mosquito bites and for West Nile virus infection.
- Sent -via email- the new informative material to regional and local authorities in mid June 2021.
- Sent informative leaflets for the protection against mosquito bites to all Regions of Greece, in order to be distributed to the public.
- In every affected Municipality, informative leaflets were urgently provided, if needed.

III. **Coordination of an intersectional Working Group (WG) on the definition of affected areas by vector borne diseases.** This WG, under the MoH Committee for the Prevention and Management of Tropical Diseases, considered all available entomological and epidemiological data and decided on the characterization of affected areas assisting the implementation of blood safety measures. The list of affected areas was published on NPHOs website and updated regularly. These were used by the Hellenic National Blood Transfusion Center to issue guidance on blood safety. In addition, the Coordinating Haemovigilance Centre of NPHO issued guidance for the haemovigilance competent authorities.

IV. Collaboration and exchange of information with the **Ministry of Rural Development and Food** regarding the West Nile virus infection in equids.

V. **Vector surveillance and control activities:**

- **Raising awareness and guidance to Regional Authorities:** NPHO communicates regularly (workshops, meetings, letters) with all Regional Authorities in Greece recommending the timely planning, organization and implementation of integrated vector control programmes. In 2021, NPHO sent relevant awareness letters in February 2021 (with a brief guide to the key steps to achieve timely implementation of the vector control program) and urgently informed local authorities of the affected areas regarding the recommended preventive and response measures (intensified mosquito control and raising awareness of the local population).
- **Entomological surveillance**: For the 2021 period, NPHO performed 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, and continued the effort to collect entomological data.
- **Communication with international public health stakeholders:** Frequent communication and weekly information exchange with ECDC (real-time reporting of the diagnosed cases in TESSy).

CONCLUSIONS

West Nile virus infection cases are recorded -on an annual basis- in many countries worldwide, including many European countries. In 2010-2014 and 2017-2020, cases of West Nile virus infection were recorded in various areas of Greece also, while virus circulation has been recorded in all regions. The recurrence of WNV infection cases was considered likely and expected in the country, as well as in other European and neighboring countries, in the 2021 period (as in each transmission season).

In 2021, a total of 59 human cases of WNV infection were recorded in Greece, from mid-July to late October, in some Municipalities in the Regional Units (NUTS3 level) of Pella, Imathia, East Attica, Viotia, Evia, Kavala, Drama, Serres and Thessaloniki.

The occurrence of human cases in an almost annual basis during the last decade (2010-2014 and 2017-2021) suggests that **WNV has been established in our country, as well as in other European and neighboring countries**; **its circulation and the occurrence of cases remain likely and expected in the following transmission periods**, in previously affected and in new areas.

In the EU Member States and EU neighboring countries, in transmission period 2021, human WNV infection cases were also recorded -besides Greece- in Italy, Servia, Hungary, Romania, Spain, Germany, and Austria (source: ECDC, Weekly updates: 2021 West Nile virus transmission season).

Epidemiological surveillance of the disease, systematic and early implementation of mosquito control programs and personal protective measures against mosquito bites are considered the most appropriate measures to control WNV infection outbreaks.

Since the circulation of WNV and its geographical distribution (i.e., the areas with recording of human cases) during each period cannot be predicted, **personal protective measures against mosquitoes are encouraged, during the period of mosquito activity.** General information regarding personal protection measures against mosquitoes is available at: https://eody.gov.gr/wp-content/uploads/2019/04/mosquito_brochure_2019.pdf

National public health authorities conduct a series of preventive and response measures, including enhanced surveillance, case investigation, information dissemination, and communication activities, and collaborate with regional and local authorities, aiming at the timely implementation of targeted response measures at local level.

In addition, during the transmission season, weekly surveillance reports are published on the NPHO website https://eody.gov.gr/en/disease/west-nile-virus/ (in english also), which include updated information.