NATIONAL PUBLIC HEALTH ORGANIZATION

Annual epidemiological report for West Nile virus human infection, Greece, 2019

This report aims to present an overview of the reported cases and public health response to West Nile Virus (WNV) infection in humans in Greece for transmission period 2019.

Data presented in this report was derived from the notifications of laboratory diagnosed human cases of WNV infection sent to the 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 Department of Epidemiological Surveillance and Intervention of the NPHO undertook a verification procedure through communication with the treating physicians and the patients, as necessary.

In 2019 period, a total of two hundred and twenty seven (227) laboratory diagnosed cases of WNV infection were reported to NPHO, one hundred and forty (140) of which presented with neuro-invasive disease (WNND, encephalitis and/or meningitis and/or acute flaccid paralysis) and eighty seven (87) cases with mild symptoms (febrile syndrome) (Table 1). Thirty five (35) deaths were recorded, concerning patients older than 60 years of age (median age of the deceased=81 years).

Table 1. Number of reported cases of WNV infection, Greece, period 2019

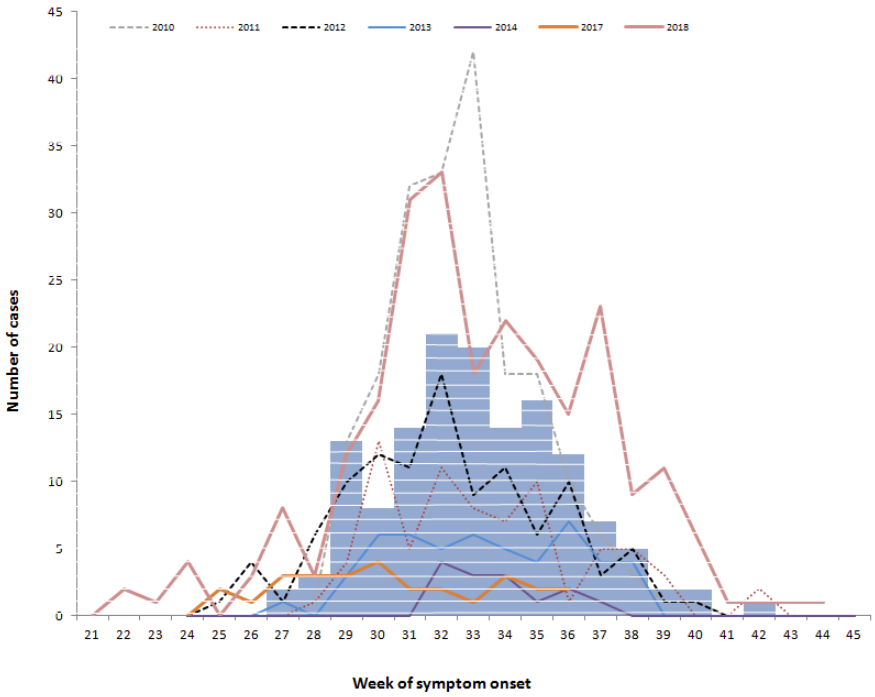
	Number of cases **with** central nervous system (CNS) manifestations [1]	Number of cases **without** CNS manifestations	**Total number of cases**	**Number of deaths** [2]
Number of WNV cases and deaths	140	87	**227**	**35**

1. Refers mainly to encephalitis, aseptic meningitis and meningoencephalitis cases
2. The number of deaths is included in the total number of cases

For the first diagnosed case of WNV infection for transmission period 2019 (case without WNND), the reported onset of symptoms was on 21st June 2019 (wk 25/2019), and the last recorded case reported onset of symptoms on 17 October 2019 (wk 42/2019). Figure 1 shows the reported WNND cases by week of symptom onset.

Twenty-five (25) out of the 227 patients diagnosed with WNV infection in 2019 were hospitalized in an Intensive Care Unit, whereas eleven (11) patients were not hospitalized.

Figure 1. Number of laboratory diagnosed WNND cases by week of symptom onset, Greece, 2010-2019*.



* Each blue box represents one laboratory diagnosed case of WNND reported to NPHO in transmission period 2019.

Table 2 and Figure 2 show the geographic distribution of the notified human cases with laboratory diagnosed WNV infection at the level of suspected Municipalities of exposure. The patient's suspected place of exposure is a rough indicator of the area of WNV circulation.

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 cases with laboratory diagnosed WNV infection (with and without WNND) by suspected Municipality of exposure, Greece, transmission period 2019 (n=227 [1]).

Regional Unit	Suspected Municipality of exposure	Number of cases with WNND	Incidence of WNND per 100,000 population [2]	Number of cases without CNS manifestations (non WNND)
Xanthi	Topeiros	7	60,6	5
	Avdira	8	42,1	5
	Xanthi	6	9,2	2
Kavala	Nestos	11	49,3	16
	Thasos	3	21,8	5
	Kavala	1	1,4	4
	Paggaio	1	3,1	0
Drama	Doxato	4	27,6	0
Evros	Soufli	1	6,7	0

	Didymoteicho	0	0	1
	Orestiada	0	0	1
Rodopi	Iasmos	5	36,2	0
	Arrianoi	1	6,0	1
	Maroneia- Sapes	1	6,8	1
	Komotini	2	3,0	0
Larisa	Larisa	8	4,9	8
	Tirnavos	5	20,0	0
	Kileler	2	9,6	4
	Tempi	2	14,6	1
	Agia	2	17,4	1
	Farsala	3	16,2	0
	Elassona	2	6,2	3
Trikala	Trikkeon (Trikala)	2	2,5	3
	Pyli	0	0	1
Karditsa	Sofades	2	10,6	0
	Karditsa	3	5,3	1
	Palama	1	6,0	0
Thessaloniki	Kordelio-Evosmos	1	1,0	0
	Lagadas	2	4,9	0
	Chalkidona	0	0	3
	Pavlos Melas	2	2,0	0
Chalkidiki	Nea Propontida	1	2,7	0
	Aristotelis	0	0	1
	Sithonia	0	0	1
Pieria	Katerini	4	4,7	0
	Pydna-Kolindros	1	6,6	0
	Dion- Olympos	1	3,9	0
Pella	Pella	6	9,5	2
	Skydra	2	9,9	0
Kilkis	Paionia	1	3,5	0
Imathia	Veria	2	3,0	3
	Alexandreia	2	4,8	5
	Heroic City Naoussa	2	6,2	1
Serres	Irakleia	6	28,4	1
	Serres	3	3,9	0
	Sintiki	1	4,5	0
Kozani	Eordaia	1	2,2	0
Voreios Tomeas Athinon	Penteli	1	2,9	0
Kentrikos Tomeas Athinon	Athens, 2nd District	1	1,0	0

East Attica	Spata-Artemida	5	14,8	1
	Markopoulos	5	25,0	1
	Pallini	3	5,5	1
	Lavreotiki	0	0	1
	Rafina-Pikermi	1	4,9	0
	Paiania	1	3,7	0
	Saronikos	1	3,4	3
Unknown place of infection		1[1]	-	0
Total Greece		**140**	**1,3**	**87**

1. For one patient with WNND the suspected place of exposure could not be determined due to complex medical history.
2. Calculations based on 2011 census data (Hellenic Statistical Authority).

Figure 2: Map showing the suspected Regional Unit of exposure of reported cases with laboratory diagnosed WNV infection, Greece, 2019 (n=226[1]).

1. For one patient with WNND the suspected place of exposure could not be determined due to complex medical history.

In 2019, human WNV cases were recorded in Regional Units (NUTS3) with previously recorded human cases, in the Regions of Thessaly, East Macedonia & Thrace, Central Macedonia, Attica, and West Macedonia (with higher incidence in the Regions of East Macedonia & Thrace and Thessaly.

The median age of WNND cases was 73 years (8 - 96 years). Out of the 227 cases, 123 (54%) were male and 104 (46%) were female. Tables 3 and 4 show the number and incidence of WNND cases per age-group and gender respectively.

Table 3. Number of cases, number and incidence of WNND cases per age-group, Greece, 2019

Age-group (years)	Number of cases (n=227)	Number of WNND cases (n=140)	Incidence of WNND (per 100,000 population)*
0-19	5	3	0,1
20-29	6	0	0,0
30-39	13	3	0,2
40-49	10	3	0,2
50-59	25	18	1,3
60-69	42	26	2,3
70-79	62	43	4,2
≥80	64	44	7,5

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

Table 4. Number of cases, number and incidence of WNND cases per gender, Greece, 2019

Gender	Number of cases (n=227)	Number of WNND cases (n=140)	Incidence of WNND (per 100,000 population)*
Male	123	78	2,3
Female	104	62	1,9

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

Among the 140 WNND cases, 88 (63%) exhibited symptoms of encephalitis, 39 (28%) symptoms of meningoencephalitis and 13 (9%) cases symptoms of meningitis. Four cases had also acute flaccid paralysis (simultaneously presented with encephalitis/ meningitis signs).

PUBLIC HEALTH MEASURES SUPPORTED BY THE NPHO, 2019

In every mosquito circulation season, the National Public Health Organization -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 disease in humans**:

- **Awareness raising of physicians** about the WNV infection: Testing for West Nile virus 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 2019 period, an informative letter was sent to all Health Units and Medical Associations of the country for vigilance regarding West Nile Virus, in mid May 2019. In addition, following the recording of cases in an area, local Health Units are 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 Laboratory 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 suspected place of exposure, the risk factors and the severity of the disease. The clinical condition of all hospitalized patients is followed up on a daily basis and the final outcome until discharge is recorded.
- **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, Municipalities).
- **Weekly surveillance reports on human WNV infection cases** (uploaded on the NPHO website).

II. **Communication and health promotion activities for the public:** Educational material for the public regarding West Nile Virus infection and the recommended protective measures against mosquito bites is available in the NPHOs website. In 2019, NPHO:

- Published two Press Releases (in mid May 2019 regarding the recommended prevention measures, and on 19th June 2019 with clarifications on the virus circulation in the country).
- Updated the information leaflet "Protect yourselves from mosquitoes" (in Greek and English).
- Produced informative leaflet "West Nile Virus: Learn and protect" (in Greek).
- Distributed electronically the TV spot "Protect yourselves from mosquitoes" in national and local channels since April 2019.
- Sent via email the new informative material (leaflets and TV spot) to local authorities, in mid May 2019.

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 2019, NPHO sent relevant awareness letters in January 2019 (with a brief guide to the key steps to achieve timely implementation of the vector control program) and urgently informed local authorities of the recently affected areas regarding the recommended preventive and response measures (intensified mosquito control and raising awareness of the local population). In addition, following the initiative of the General Secretary of Public Health of the Ministry of Health, NPHO organised, in cooperation with the Benaki Phytopathological Institute, in May 2019, workshops with all regional public health authorities,

regarding the preventive actions for mosquito-borne diseases and especially the vector control programmes.

- **Entomological surveillance**: NPHO, in collaboration with the School of Public Health of the University of West Attica (former National School of Public Health), 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. For the 2019 period, NPHO performed an active vector surveillance programme (September-November) in various areas of the country 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

In 2010-2014 and 2017-2018, cases of West Nile virus infection were recorded in humans in various areas of Greece, while virus circulation was recorded in almost 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 (as in each season).

In 2019, human cases of WNV infection have been recorded in Greece, in some Municipalities in the Regional Units (RU, NUTS3 level) of Xanthi, Kavala, Rodopi, Evros, Drama, Larisa, Karditsa, Trikala, Voreios Tomeas Athinon, Kentrikos Tomeas Athinon (Central Section of Athens), East Attica, Thessaloniki, Pella, Pieria, Chalkidiki, Kilkis, Imathia, Serres and Kozani.

The occurrence of human cases in 2010-2014 and 2017- 2019 suggests that **WNV has been established in our country, as well as in other European and neighboring countries**; **its circulation and 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 2019, human WNV infection cases were also recorded -besides Greece- from Germany, Romania, Italy, Cyprus, Hungary, Slovakia, France, Bulgaria, Austria, Turkey, Republic of North Macedonia, Serbia and Israel (source: ECDC, Weekly updates: 2019 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 seasonal 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**.

National public health authorities have taken timely preventive measures, including communication activities regarding the recommendation for personal protection measures against mosquito bites. General information regarding personal protection measures against mosquitoes is available at: https://eody.gov.gr/wp-content/uploads/2019/04/mosquito_brochure_2019.pdf

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

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