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**PUBLIC HEALTH CENTER OF THE MOH OF UKRAINE**

# *Study on the prevalence of arboviral pathogens, including Dengue virus, West Nile virus, Zika virus, and Chikungunya virus, in Ukraine.*

Kyiv 2026

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## Abbreviations

CHIKV – Chikungunya virus

DENV – Dengue virus

DTRA - Defense Threat Reduction Agency

ELISA – enzyme-linked immunosorbent assay

GAT – Gravid Aedes Trap

IgG – Immunoglobulin G

IgM – Immunoglobulin M

MOH – The Ministry of Health of Ukraine

PCR – polymerase chain reaction

PFUO – prolonged fever of unknown origin

WNV – West Nile virus

ZIKV – Zika virus

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## Project Background

The goal of the project was strengthening the epidemiological surveillance over arboviruses through entomological field research, clinical data collection, seroprevalence research and laboratory diagnostics. The work was aimed at supporting the development of the Integrated Mosquito Control Program through collecting data on the distribution of mosquito vectors, the circulation of arboviruses, and patterns of human exposure to them. The project was implemented to enhance Ukraine's national capacity for epidemiological surveillance of emerging and re-emerging arboviral threats. The initiative focused on the collection and analysis of entomological, clinical, and serological data to improve early detection of arboviruses, strengthen public health alert systems, and support rapid response strategies.

The project activities included:

- Entomological surveillance to document the distribution of the types of mosquitos and sample collection to test for arboviruses.
- Clinical research of Acute Undifferentiated Fever (AUF) to detect potential acute arboviral infections in healthcare facilities.
- Seroprevalence study to estimate the level of arboviral infection in general population.
- Laboratory diagnostics (PCR, ELISA) to detect and confirm the presence of arbovirus pathogens in the blood samples from humans and infection vectors
- Capacity building, including training of entomologists, clinicians and laboratory staff, and the preparation for the development of the Integrated Mosquito Control Program

The Project was implemented in context of active war which resulted in certain logistic limitations and reduced the achievable scale. Nevertheless, basic data sets were created to improve the institutional readiness to arbovirus detection.

# Study relevance

Arboviral infections, including the Dengue virus (DENV), Zika virus (ZIKV), Chikungunya virus (CHIKV), and West Nile virus (WNV), pose a significant global public health threat due to their potential to cause outbreaks and severe disease. These viruses are transmitted to humans through the bites of infected mosquitoes. The primary vectors of DENV, ZIKV, and CHIKV are mosquitoes of the genus *Aedes*, while West Nile virus (WNV) is mainly transmitted by mosquitoes of the genus *Culex*.

The current epidemiological surveillance data demonstrate that many pathogenic viruses, including arboviruses, circulate in the Black Sea region. In the last decade, laboratory confirmed cases of Crimean-Congo hemorrhagic fever and infection with the virus causing Q fever. Climate change is leading to the expansion of subtropical zones, which in turn facilitates the spread of invasive mosquito species into areas where they were not previously observed. Since countries in this region share similar climatic conditions, we assume that both the spread of invasive mosquito species and virus transmission primarily occur in subtropical areas and subsequently extend into other climatic zones.

Lately the world becomes increasingly concerned about the spread of the arboviral infections and their impact which is exacerbated by such factors as urbanization, globalization, climate change and environmental disturbances. Ukraine, located in the Eastern Europe, is not protected from the threats of arboviral infections, as their sporadic cases and outbreaks are registered in various regions.

Despite recognized importance of arboviruses, comprehensive data about seroprevalence and related risk factors in adult population of Ukraine are limited. Understanding seroprevalence of the arboviruses and determining the risk factors related to their transmission, is of utmost importance for the justification of the public health response, including vector control measures, patient epidemiological surveillance and targeted vaccination campaigns.

Moreover, the prevalence and distribution of arboviral vectors remain insufficiently studied. Entomological investigation of mosquitoes and the establishment of a vector reference library are essential components for understanding the epidemiology of arbovirus transmission. Furthermore, this will provide indirect insights into the impact of climate change in the regions and into the species composition of blood-feeding insects.

This study aimed to address this gap by conducting comprehensive research that included several key components: an investigation among individuals with cases of prolonged fever of unknown origin, a seroprevalence study in the general population, and an entomological assessment of vectors in Ukraine. The findings will contribute to a better understanding of the epidemiology of arboviral infections in Ukraine and will support the development of evidence-based strategies for disease prevention and control.

## Entomological surveillance and mapping insect distribution

Field work of collecting and mapping mosquito species were conducted in Odesa (fig. 1) and Zakarpattia (fig. 2) regions of Ukraine during the period between August 14, 2024 and September 12, 2025.

In Odesa region, field samples were collected in August and October 2024 and in May, June and September 2025. Field works in Zakarpattia were conducted in June through August 2025.

The study covered the following areas: in the Odesa region—the Odesa, Bilhorod-Dnistrovskyi, and Izmail districts; in the Zakarpattia region—the Mukachevo, Uzhhorod, and Khust districts (Figs. 1–2).
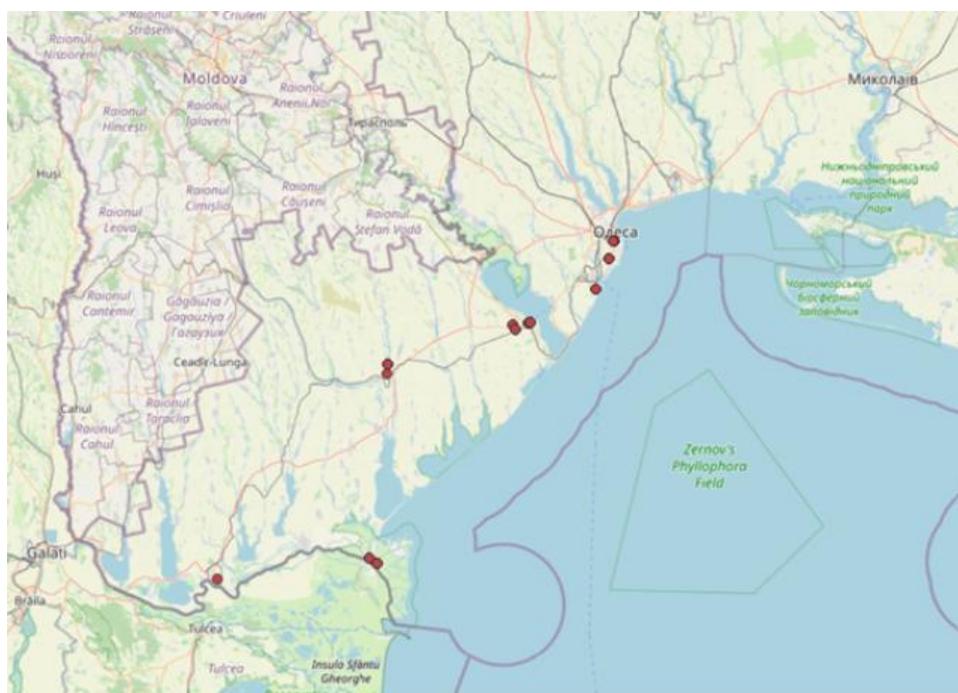
Figure 1. Sites of entomological sample collection in Odesa region (Odesa, Belhorod-Dnistrovskyi, and Izmail districts)
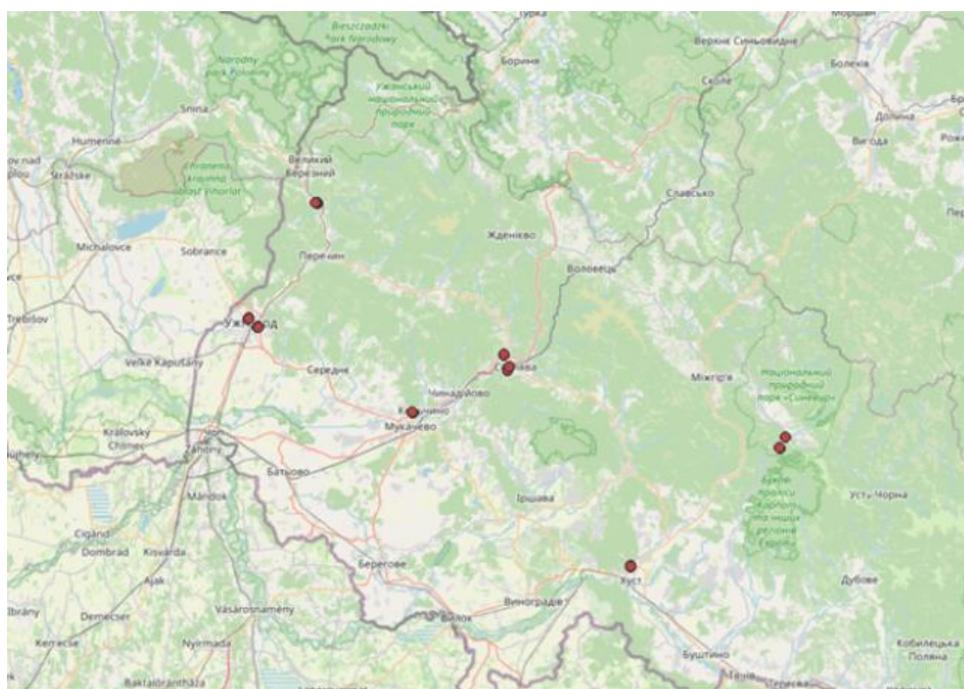


Figure 2. Figure 1. Sites of entomological sample collection in Zakarpattia region (Mukachevo, Uzhhorod, and Khust district)

## Sample collection methodology

Passive GAT (Gravid Aedes Trap) traps were placed both in natural and anthropogenic biotopes in the selected sites of Odesa and Zakarpattia regions. Each trap was baited with "herbal infusion" and equipped with a cotton pad soaked in a sugar syrup colored with food dye. Depending on route logistics and weather conditions, the traps were checked at scheduled intervals, after which the mosquitoes were collected with an aspirator and transferred into cardboard cups covered with gauze. The cups were then placed in a polystyrene container with frozen ice packs to immobilize the insects. Subsequently, the mosquitoes were identified and transferred into labeled cryovials. Each cotton pad was also placed into a separate labeled cryovial.

All samples were immediately frozen in the field using liquid nitrogen (Dewar flask) to ensure preservation during subsequent transportation to the Reference Laboratory for Diagnostics of HIV/AIDS, Viral and Especially Dangerous Pathogens of the Public Health Center of the Ministry of Health of Ukraine for testing for arboviruses (Dengue, Zika, Chikungunya, and West Nile).

## Results

As a result of project implementation, maps of mosquito distribution were drawn for the geographical sites where entomological field works were conducted in Odesa and Zakarpattia regions. Since the mosquitos were collected only using passive traps, the obtained distribution maps may not reflect the actual presence and number of the mosquito species in the regions of interest.

Overall, in Odesa and Zakarpattia regions 486 identified mosquito samples and 242 samples from non-identified mosquitos were collected.

Table 1. The results of mosquito samples collection in Odesa and Zakarpattia regions, 2024-2025

| Mosquito samples | Number | | |
|---|---|---|---|
| | Odesa region | Zakarpattia region | Total |
| *Aedes albopictus* | 133 | 21 | 154 |

| | | | |
|---|---|---|---|
| *Culex pipiens* | 26 | 26 | 52 |
| *Coquillettidia richiardii* | 9 | 0 | 9 |
| *Uranotaenia unguiculata* | 1 | 0 | 1 |
| *Culex modestus* | 1 | 0 | 1 |
| *Aedes caspius* | 228 | 0 | 228 |
| *Anopheles hyrcanus* | 3 | 0 | 3 |
| *Aedes cinereus* | 1 | 2 | 3 |
| *Aedes detritus* | 1 | 2 | 3 |
| *Aedes geniculatus* | 1 | 14 | 15 |
| *Aedes cantans* | 0 | 12 | 12 |
| *Aedes vexans* | 0 | 3 | 3 |
| *Anopheles maculipennis sl* | 0 | 2 | 2 |
| Smear samples (non-identified mosquitos) | 158 | 84 | 242 |
| Total | 562 | 166 | 728 |

The prevailing species in the two oblasts were *Aedes albopictus* (154 identified samples) and *Culex pipiens* (52 identified samples). In addition, in Odesa region 228 samples of 228 *Aedes caspius* not present in Zakarpattia, were identified.

The data obtained made it possible to create preliminary maps of mosquito species distribution in the studied regions and to determine basic quantitative indicators of their abundance. Thus, the entomological component of the project provided an initial dataset on the species composition of potential arbovirus vectors in two regions of Ukraine.

However, the limitations of the study should be taken into account. The geographic coverage and sample size do not allow for a full-scale extrapolation of the results to the national level. Furthermore, the use of exclusively passive traps may affect the representativeness of the data regarding the actual presence and abundance of individual species in biotopes.

At the same time, the collected material provided a sufficient pool of mosquito vector samples for laboratory testing for arbovirus infections and further analytical processing.

According to the results of laboratory testing of the collected materials, Chikungunya virus RNA was detected in two samples: in one *Aedes albopictus* specimen and in one swab sample from a trap in which no mosquitoes were found at the time of inspection (Odesa region).

In Zakarpattia region, chikungunya virus RNA was detected in one swab sample, while dengue virus RNA was detected in another swab sample.

After all necessary data were recorded, the samples were disposed of in accordance with established biosafety requirements. In cases where arboviruses were detected, the relevant samples were stored in an ultra-low temperature freezer (−80 °C) for further molecular genetic testing.

Conclusions based on the results of the entomological component:

The quantitative and spatial data obtained form the basis for the development of an Integrated Mosquito Management Program (IMMP).

To transition to full-scale program modeling, the following is necessary: expanding the geographic scope of research, increasing the sample size, and combining passive and active trapping methods.

The main challenges encountered during the project's implementation included: limitations associated with the use of passive traps, insufficient geographical coverage, delays in the delivery of consumables due to military operations, and the project's early termination.

These factors necessitate the continuation of entomological surveillance within the routine epidemiological monitoring system in order to accumulate a sufficient dataset for the development of the IMMP.

# Seroprevalence study in the population

The objective of this component was to identify seroprevalence of arboviral infections and related risk factors, including the Dengue virus (DENV), Zika virus (ZIKV), Chikungunya virus (CHIKV), and West Nile virus (WNV) in adult population of Ukraine.

## Study design and methodology:

In this study, cross-sectional design was employed that required recruitment of a sampling of asymptomatic adults from two geographic regions of Ukraine. The blood samples were drawn and tested for specific arbovirus antibodies. A survey was conducted among all participants whose blood was drawn for serological testing. A statistical analysis was performed to estimate seroprevalence and identify the associated risk factors based on the laboratory data and survey results.

To implement this study component, a protocol was developed based on generic project description prepared by the international research group, and a data collection template (a questionnaire for the survey participants and a form for biological sample data collection). Study protocol and tools underwent ethics review and were approved by the Ethics Committee of the Public Health Center of the Ministry of Health of Ukraine. In the process of preparation for implementing the research, four healthcare facilities specializing in infectious diseases, were involved in two regions: the city of Kyiv (the largest community of Ukraine) and Odesa region located on Black Sea shore. Data was collected in the following facilities:

1. Communal non-profit enterprise "Kyiv St. Michael clinical hospital" of Kyiv City Council
2. Communal non-profit enterprise "City clinical hospital for infectious diseases" of Odesa City Council
3. Communal non-profit enterprise "Kyiv city clinical hospital # 9" of Kyiv City Council
4. Communal non-profit enterprise "Chornomorsk hospital" of Chornomorsk City Council, Odesa district, Odesa region

To facilitate the collection of biological samples from study participants, detailed instructions were developed for healthcare professionals regarding venous blood collection, serum preparation, storage, and transportation, in accordance with the study protocol and approved procedures for handling human biological specimens. Only qualified healthcare professionals with appropriate medical education and experience in venous blood collection and serum preparation were involved in data and sample collection. Certified, high-quality single-use consumables were used for blood collection and the preparation of biological specimens for subsequent testing.

Biological component of the study – blood sample collection from participants. To determine the presence of antibodies to arboviral pathogens, a single venous blood sample was collected from each participant. Blood samples from all participants were centrifuged, serum was separated, and stored in cryovials at −20°C. Subsequently, the frozen samples were tested using an ELISA method to detect class G immunoglobulins (IgG antibodies), indicating past arboviral infection.

For data collection from study participants, a short questionnaire was programmed on the REDCap online platform. The structured questionnaire was used to collect demographic information (age, sex, place of residence), behavioral risk factors (travel history, outdoor activities, occupational risks), and general information on public awareness of arboviral and other vector-borne infections. The online questionnaire was completed by designated healthcare professionals based on participants' responses at each of the four participating facilities. The questionnaire was designed to assess associations between selected factors and serologically confirmed past arboviral infection. To ensure confidentiality, the questionnaires did not include names or other personal identifiers.

The online questionnaire was filled in by healthcare professionals from the words of the survey participants, in each of the 4 participating facilities. The questionnaire was developed to identify the relationships between certain factors and serologically confirmed history of arboviral infection. The questionnaires did not contain patients' names or other identifiers to protect their confidentiality.

The survey participants were selected based on the following inclusion criteria:

1. Adults 18 y.o. and older;
2. Residents of urban and rural areas of Ukraine;
3. Readiness to provide a blood sample for serological testing;
4. Absence of acute respiratory disease symptoms at the moment of testing;
5. Absence of fever of unknown origin at the moment of testing.

The field works included simultaneous data collection and survey started on July 2, 2025 and ended on September 19, 2025.

## Results:

During the period of data and biological sample collection from patients in the four study sites, 246 adults meeting the inclusion criteria, were involved, including 116 participants in Kyiv and 130 – in Odesa region. Each study participant gave written informed consent for the participation, then a brief survey was conducted and one blood sample was drawn from each participant for further serology testing. All serum samples were stored frozen and latter were transported on dry ice to the Reference Laboratory for Diagnostics of HIV/AIDS, viral and especially dangerous pathogens of the Public Health Center of the Ministry of Health of Ukraine in Kyiv for further testing.

## Description of the total sample:

The sample included 246 persons 18 y.o. and older from two target regions of Ukraine (Odesa region and the city of Kyiv), with the following breakdown by the socio-demographic factors:
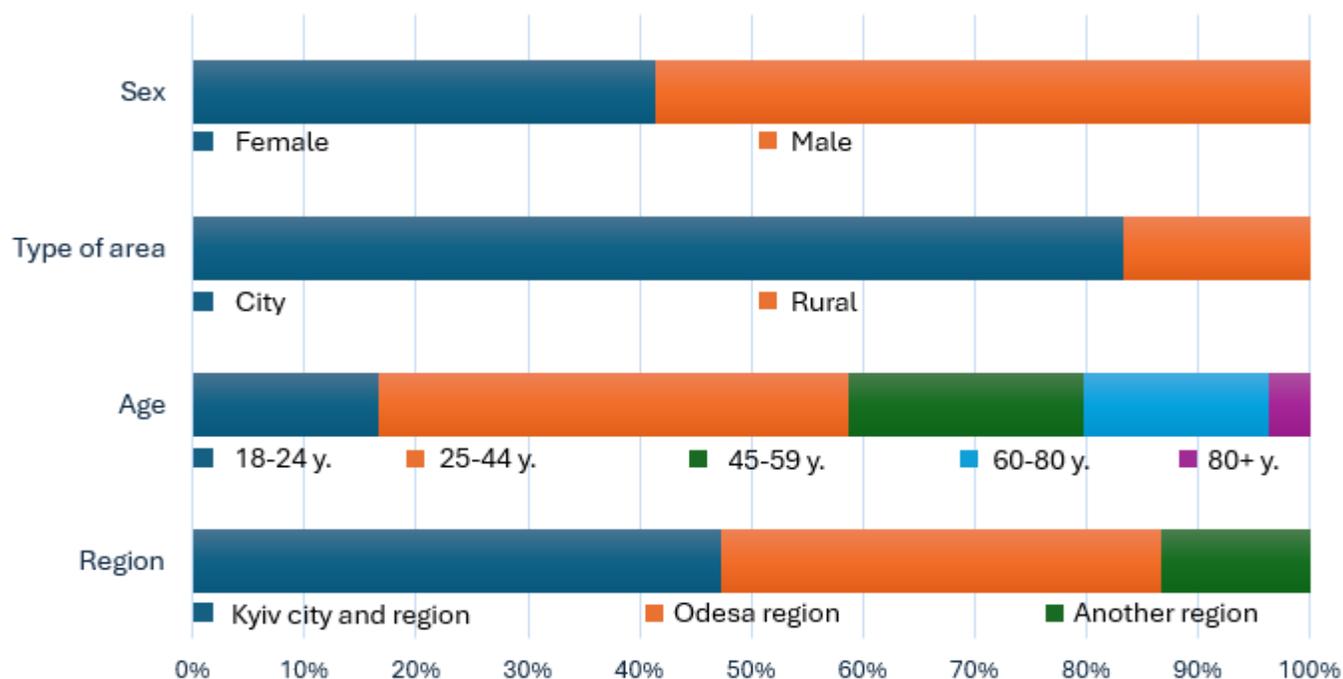
## Distribution by socio-demographic indicators



Figure 3. Total sample breakdown by main socio-demographic factors

Occupational data analysis showed that military personnel that are exposed to higher risk of vector-borne infections constituted 17% of the total sampling.

Based on laboratory testing of serum samples from all participants, 50 samples tested positive for IgG antibodies to arboviral pathogens, specifically to West Nile virus (46 samples) and Dengue virus (40 samples).

Thirty six out of 50 positive samples were ELISA-positive for both mentioned arboviral infections (West Nile virus and Dengue virus) which can be associated with serological cross-reactivity to both pathogens. No sample with positive serological response to the Zika and Chikungunya viruses was identified.

Table 2. The results of serology testing for arboviral infections.

| Serology testing indicators | Kyiv city | Odesa region | Total |
|---|---|---|---|
| Number of participants | 116 | 130 | 246 |

| | | | |
|---|---|---|---|
| Number of serologically positive samples (to all pathogens) | 15 | 35 | 50 |
| Overall seroprevalence (to all pathogens) | 12.93% | 26.92% | 20.33% |
| Number of WNV positive samples | 12 | 34 | 46 |
| WNV seroprevalence | 10.34% | 26.15% | 18.7% |
| Number of DENV positive samples | 10 | 30 | 40 |
| DENV seroprevalence | 8.62% | 23.08% | 16.26% |
| Number of CHIKV positive samples | 0 | 0 | 0 |
| ZIKV seroprevalence | 0 | 0 | 0 |

According to the study findings, overall arboviral infection seroprevalence rate in general population was estimated as 20.33%.

The obtained results substantially exceed the estimated seroprevalence of arboviral infections in the general population. The rates were particularly high in Odesa region, reaching nearly 27%. These findings may be attributable to the low specificity of the diagnostic assays used in the study. In addition, the higher-than-expected seroprevalence may be associated with challenges in the differential diagnosis of communicable diseases and the clinical recognition of arboviral infections in Ukraine.

Table 3. Arboviral infection risk and protective factor prevalence among people with positive serological response and general population.

| Risk and protective factors | Seropositive | Total |
|---|---|---|
| Trips abroad in the past 5 years | 16% | 16.26% |
| Frequent mosquito bites | 42% | 54.47% |
| The use of repellents | 34% | 29.27% |
| Residence in proximity to stagnant water bodies | 24% | 26.83% |
| Use of mosquito nets | 82% | 81.71% |
| Increased mosquito activity in the area of residence | 28% | 28% |
| Regular outdoor recreation | 10% | 9.76% |
| Agricultural activities | 6% | 6.5% |
| Fever of unknown origin in the last 5 years | 14% | 15.87% |

When assessing selected risk factors and the use of mosquito protection measures, and comparing these between participants with a positive serological result and the overall study sample, no association was identified between any specific factor and seropositivity (the differences between groups were not statistically significant).

An important observation was that 28% of participants reported noticing an increase in mosquito activity in their area of residence in recent years, which may

be associated with climatic changes in Ukraine. The most commonly used protective measure was mosquito nets, with nearly 82% of participants reporting that nets were installed on their home windows. However, the use of repellents during outdoor activities (work or leisure) was less common and was reported by only 30% of participants. Furthermore, the survey indicated that only a small proportion of respondents were aware of the potential risks associated with mosquito bites and the importance of using protective measures.

Interestingly that almost 16% of all survey participants had a history of disease characterized by acute fever in the past 5 years, and most of them were diagnosed with COVID-19. This can indicate certain hyperdiagnostics during the pandemic.

The study results cannot be considered representative for each region, as only 30% of the expected sampling was recruited due to premature project termination. The prevalence rates identified based on the obtained data, exceeded the expected level and do not meet arboviral infections identification rates in Ukraine. This can indicate the need for building the capacity in differential diagnostics of diseases characterized by fever, in physicians working in infectious disease units. In addition, it is important to raise the public awareness about the risks of mosquito bites and the importance of using insect protection measures.

## Prevalence estimation of arbovirus-related infections

**Study objective:** estimate the prevalence of such arboviral infections as Dengue virus (DENV), Zika virus (ZIKV), Chikungunya virus (CHIKV) and the West Nile virus (WNV), among patients presenting with Acute Unknown Fever (AUF) in Ukraine.

Study design and methodology

This is a prospective study of individuals with suspected arboviral infection presenting with the clinical signs that may indicate arboviral infection, such as fever and at least two clinical signs of arboviral infection. Clinical data and whole blood samples were collected from patients who presented to selected healthcare facilities with AUF. The laboratory testing for arboviruses was conducted with the use of serology and molecular diagnostic tests.

Similar to the seroprevalence study, a protocol, data collection forms and guidance on biological sample collection, handling and storage were prepared to implement this study component. The study documents were approved by the Ethics Committee of the Public Health Center of the Ministry of Health of Ukraine.

This study component was implemented in parallel with identification of arboviral infection seroprevalence in similar regions and healthcare facilities. Odesa region and Kyiv City are the key regions of Ukraine, with high population density and various demographic characteristics. These regions are important centers of healthcare service provision, covering a large number of travelers and migrants. The hospitals where data and biological samples were collected, were selected on the basis of their accessibility and capacity to provide care to patients with arboviral infection. These facilities are wel-equipped with diagnostics equipment and staffed with qualified healthcare personnel able to recognize and provide care to patients with febrile illnesses.

The qualitative component was the survey of the participants. To collect data, an online questionnaire was used to be filled in by a healthcare worker from patient's words using the REDCap data collection platform. The questionnaire contained questions on the socio-demographic data, overall clinical information about the patient and arboviral infection risk factors. The questionnaire aimed to identify the relationship between certain factors and arboviral infection.

Blood sample collection constituted the biological component of the study. To detect arboviral infection in patients with AUF, two whole blood samples were collected: one in the acute phase of the disease (4-5$^{th}$ day of the disease or upon patient's admission to hospital unit), and another one – in the convalescence (clinical recovery) period. Blood samples from all participants were centrifuged, serum was separated, and stored in cryovials at –20°C. The frozen samples were subsequently tested using an enzyme-linked immunosorbent assay (ELISA) to detect class M immunoglobulins (IgM), indicating acute infection, and class G immunoglobulins (IgG), indicating past arboviral infection. Following serological testing, the samples were also analyzed by polymerase chain reaction (PCR) to

confirm the results. Following serological testing, the samples were further analyzed by PCR to confirm the results.

The study participants were selected in the basis of the following inclusion criteria:

1. Age ≥ 18.
2. Patient with the clinical signs indicating arboviral infection:
   Fever and a least two clinical signs indicating arboviral infection including myalgia, retroorbital headache, reduced platelet count (if data available), digestive tract symptoms, etc.
3. Appearance of clinical signs indicating arboviral infection no more than 5 days prior to blood collection.
4. Patient who agreed to participate in the study by giving an informed consent for data collection, additional blood sample collection and the use of these samples.

## Results

During the period of data and biological sample collection in the four study sites, 12 cases of fever of unknown origin were identified among the patients that met the inclusion criteria. Out of 12 included cases, 10 were registered in Kyiv City and 2 – in Odesa region.  After each participant gave a written informed consent for participation in the study, a brief survey was conducted and blood samples were drawn for further serological testing. The total number of samples collected and tested under the study, was 21. Second blood serum sample was not obtained from three patients due to their early discharge from the hospital or transfer to another healthcare facility.

An acute arboviral infection, i.e., the presence of IgM to the Dengue virus, was identified only in one out of 12 study participants (in Kyiv City). According to the questionnaire, the participant travelled to the Canary Islands a few weeks before the onset of illness where he was bitten by mosquitos. The presence of the Dengue fever pathogen could not be confirmed by PCR test.

One participant tested PCR positive to the West Nile fever virus. The serology tests to all infections under study were negative. The participant denied travels outside of Ukraine prior to the disease, however, mosquito bites before the onset of fever were mention.

In addition, of the 12 participants with AUF, 4 had positive IgG ELISA tests to the Dengue virus (4 cases) and to the West Nile virus (2 cases). No positive ELISA or PCR tests for Zika or Chikungunya viruses were identified.

Table 4. Clinical data, history and laboratory test results of the participants with AUF

| № | Region | Clinical signs | Mosquito bites | Travel abroad | 1st specimen test | 2nd specimen test |
|---|--------|----------------|----------------|---------------|-------------------|-------------------|
| 1. | Kyiv City | Fever, headache, nausea, myalgia | Undefined | No | Negative | Negative |
| 2. | Kyiv City | Fever, headache, rhinitis | Yes | Tenerife Island | IgM WNV IgM DENV | IgM DENV |
| 3. | Kyiv City | Fever, headache, hemorrhagic rash, myalgia, artralgia | Yes | No | IgG WNV IgG DENV | IgG WNV IgG DENV |
| 4. | Kyiv City | Fever, headache, diarrhea | Yes | Yes | PCR WNV | No sample available |
| 5. | Kyiv City | Fever, headache, nausea | Undefined | No | Negative | Negative |

| 6. | Kyiv City | Fever, headache, rash, nausea, myalgia, artralgia, diarrhea | Yes | No | IgG WNV IgG DENV | IgG WNV IgG DENV |
|---|---|---|---|---|---|---|
| 7. | Kyiv City | Fever, headache | Yes | Albania, Bulgaria, Greece | Negative | No sample available |
| 8. | Kyiv City | Fever, headache, myalgia, muscle seizures | Yes | France, Netherlands | Negative | Negative |
| 9. | Kyiv City | Fever, headache, myalgia | No | No | Negative | Negative |
| 10. | Kyiv City | Fever, headache, myalgia | No | No | IgG DENV | No sample available |
| 11. | Odesa region | Fever, artralgia, neck musle stiffness | Yes | No | Negative | Negative |
| 12. | Odesa region | Headache, myalgia, artralgia | Yes | No | IgG DENV | IgG DENV |

The most common clinical signs exhibited by 7 out of 12 study participants, were fever, headache and myalgia. One participant with serologically confirmed acute arboviral infection, also had rhinitis which is not typical for arboviral infections. The patient with positive PCR test for the West Nile virus, had fever accompanied by diarrhea.

Unfortunately, the results received under the clinical component of the study involving AUF cases, are not meaningful due to few participants and isolated confirmed cases of arboviral infection among the participants. Such results can stem from a very short data collection period. The data collection period was

terminated earlier due to the notice of project suspension. Since the majority of suspected arboviral infection cases were not laboratory confirmed, an assumption about the gaps in differential diagnostics of febrile illnesses in the healthcare facilities can be made. It is likely that the problem of vector-borne infections, including arbovirus infections, requires additional attention and training for physicians specializing in infectious diseases.

Conclusions based on the clinical component findings:

1. The obtained data on arboviral infection prevalence, namely, the West Nile and Dengue viruses, in the general population raise concerns, as the 20% prevalence rate significantly exceeds the estimates. Particular attention should be drawn to the high prevalence observed in Odesa region, reaching 27%. There must be a need in improving epidemiological surveillance of vector-borne infections in Ukraine but this issue required further research and analysis at the national level.

2. The results of AUF case review, along with retrospective detection of past arboviral infection and the history of AUF cases may indicate a gap in differential diagnostics of febrile illnesses. To improve the level of arboviral infection detection, further training focusing on arboviral infection diagnostics for primary healthcare professionals and infectious disease physicians may be relevant.

3. General level of population awareness about the risks associated with mosquito-transmitted infections and proper protection measures, is quite low. Therefore, there is a need in conducting a communication campaign in mass media, healthcare facilities and social networks to raise the public awareness of the vector-borne infections and measures of protection against insects.

# Conclusions

Overall conclusion based on the data obtained and analyzed under the project.

The obtained arboviral infection seroprevalence data at the level of 20% significantly exceed the estimated rate based on the case notification data. The issue of strengthening epidemiological surveillance of vector-borne infections requires further research and analysis at the national level.

The results of AUF case review, along with retrospective detection of past arboviral infection and the history of AUF cases may indicate a gap in differential diagnostics of febrile illnesses and a need in further training focusing on arboviral infection diagnostics for primary healthcare professionals and infectious disease physicians may be relevant.

Low overall level of population awareness about the risks associated with mosquito-transmitted infections and proper protection measures points at the need in conducting a communication campaign in mass media, healthcare facilities and social networks to raise the public awareness of the vector-borne infections and measures of protection against insects.

As a result of the project field component implementation, expansion maps of mosquito species – vectors of arboviral infections were developed to ensure the basic dataset for future development of the Integrated Mosquito Management Program.

Comparison of the results of laboratory testing of the samples collected under the entomological and clinical components of the study, revealed certain discrepancies, as the viruses detected in the mosquitos in Odesa region (Chikungunya virus) were not identified in the human population, while the viruses causing Dengue and the West Nile fever, identified retrospectively in the population, were not found in the entomological samples. Comparing data from Zakarpattia region with data from Kyiv city is irrelevant, as different types of samples were collected in these regions. The question of vectors and dissemination of vector-borne infections in the human population of Ukraine requires further research.

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