

UDC 614.449.57

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БИОЛОГІЧНІ НАУКИ

**ASSESSMENT OF THE MALARIAGENIC SITUATION
IN THE KIROVOGRAD REGION IN MODERN CONDITION**

Summary. Malaria is a common infectious disease in the world caused by protozoa of the genus *Plasmodium*. In humans, 4 species of malarial plasmodia (*P. falciparum*, *P. vivax*, *P. malaria* and *P. ovale*) parasitize, of which *P. falciparum* and *P. vivax* are the most common and *P. falciparum* is the most dangerous. *Plasmodium malaria* in humans causes tropical, three-day, four-day and three-day (oval) types of malaria. The pathogen enters the human body through the bite of mosquitoes of the genus *Anopheles*, whose saliva may contain malaria plasmodia. *Plasmodium falciparum* infects human red blood cells (erythrocytes). According to the World Health Organization, in 2020 there were 241 million cases of malaria in the world, 627,000 people died of malaria. A disproportionately high proportion of malaria cases are reported in Africa. According to the World Health Organization, this region accounts for 95% of all cases worldwide and 96% of deaths, respectively. Among those affected in the African region, 80% of malaria deaths are among children under 5 years of age [1; 3].

Key words: Malaria, *Plasmodium*, *Anopheles*, analysis, infection.

Aim. Study and analysis of the malariagenic situation in Kirovograd region.

Materials and methods. The research was conducted by specialists of the Department of Biological Factors Research of the Kirovograd Regional Center for Disease Control and Prevention of the Ministry of Health of Ukraine. The paper used accounting forms of entomological research of the laboratory of particularly dangerous infections, form № 2 “Report on individual infectious and parasitic infections”, own entomological observations in different administrative territories of Kirovograd region. Methods of epidemiological diagnostics were used: retrospective epidemiological analysis, operative epidemiological analysis, descriptive and evaluative methods.

Results and discussion. According to the Global Malaria Strategy for 2016–2030, the number of new malaria cases and deaths from it is planned to be reduced by at least 90%; also eliminate malaria in at least 35 countries and prevent malaria from returning to non-malaria countries [2]. But the risk of malaria in the European region has increased in recent years due to global climate change, intense migration, and declining health concerns among malaria.

In Ukraine, cases of malaria imported from endemic countries are mainly registered. Imported malaria infects foreigners and citizens of Ukraine in malaria-prone countries. These are mainly sailors, pilots, tourists, businessmen, people who work under contract in tropical countries of Africa, South America, Asia, etc. There is a significant risk of transboundary introduction of malaria into Ukraine by transport vessels on international transport corridors, particular the import of infected mosquitoes, etc. [4].

Malaria is one of the most serious infectious diseases transmitted to humans through mosquito bites of the genus *Anopheles*. Malaria is characterized by a cyclic form of flow. An attack of exacerbation often lasts from 6 to 10 hours. At this time, the patient may experience a sharp rise in body temperature to 40–41 degrees; fever with a constant change of heat, then chills; headache; muscle pain; weakness; nausea; vomiting; fatigue, etc. After the acute phase of the disease passes, the body temperature drops to normal or sub febrile. At this time, there is heavy sweating and deep sleep, which lasts from 2 to 5 hours. Recurrence occurs in 48–72 hours [5; 7].

Almost half of the world’s population in 2020 was at risk of malaria. The incidence of malaria infection and severe forms is much higher among

infants, children under 5 years of age, pregnant women and patients with HIV, AIDS, and low-immunity individuals arriving in malaria-intensive countries [3].

Epidemiological surveillance (surveillance) of malaria involves the continuous and systematic collection, analysis and interpretation of data on malaria, the use of such data in the planning, implementation and evaluation of practical health measures. Improving epidemiological surveillance of malaria and deaths from malaria helps the health care system identify the most at-risk regions and populations, and allows countries to track trends in morbidity. Reliable systems for epidemiological surveillance of malaria allow the development of effective measures to protect public health and evaluate the effectiveness of programs to combat malaria [2; 8].

In Ukraine, the incidence of malaria in the period 2017–2021 ranges from 0.05 per 100,000 populations to 0.11 per 100,000 populations. In the Kirovograd region, sporadic cases of malaria imported from endemic countries have been registered over the years of observation. Incidence rates range from 0.01 per 100,000 populations to 0.42 per 100,000 populations. In 2017 and 2021, cases of malaria in the Kirovograd region were not registered. In 2021, 4 patients who returned from malaria-endemic countries were registered as having malaria in previous years. According to the results of systematic medical observation and laboratory examination of malaria patients, these patients were removed from the dispensary register. Intensive rates of malaria in the Kirovograd region and in Ukraine for the period 2017–2021 are presented in Figure 1.

Determining the endemicity of malaria in the territory of Ukraine and Kirovograd region requires strengthening the entomological and hydraulic supervision of vectors of this disease. Systemic

monitoring of malaria vectors and entomological and hydraulic interventions are influenced by reforms in the health care and public health systems, including a reduction and significant reduction in the number of professionals, most of whom have no experience in medical entomology.

During 2021, malaria and non-malaria mosquitoes were observed in the Kirovograd region, 4 species of malaria mosquitoes and 11 species of non-malaria mosquitoes were identified. 2769 reservoirs were subject to entomological accounting, of which 96.8% were certified. Of all certified reservoirs, 40.8% (1093) are anophelogenic. Anophelogenic area is 3032.6 hectares [6]. The average seasonal number of larvae of Anopheles per square meter is 11.6. Average seasonal indicators of the number of larvae of non-malarial mosquitoes of the genus Aedes — 16.8; Kulex — 10.7 and remain at the level of previous years.

In the epidemiological season of 2021, the main phenological phenomena of malaria mosquitoes were established during entomological observation. The beginning of the season of effective infection of mosquitoes with the malaria pathogen began on May 16, which is slightly earlier than in the previous 2020 (from June 1). The start of the season of possible malaria infection on June 20, 2021, which is approximately the same as in the previous epidemic season (June 19, 2020). The malaria epidemic season of 2021 was found to be 165 days long with the end of the malaria transmission season on October 27, 2021, one month earlier than 2020 (November 27, 2020) due for environmental temperature.

In order to detect the causative agent of malaria, the laboratories of health care facilities in 2021 conducted 240 studies, examined 108 people, including according to the clinical indications of 11 patients and 97 persons according to epidemic indications

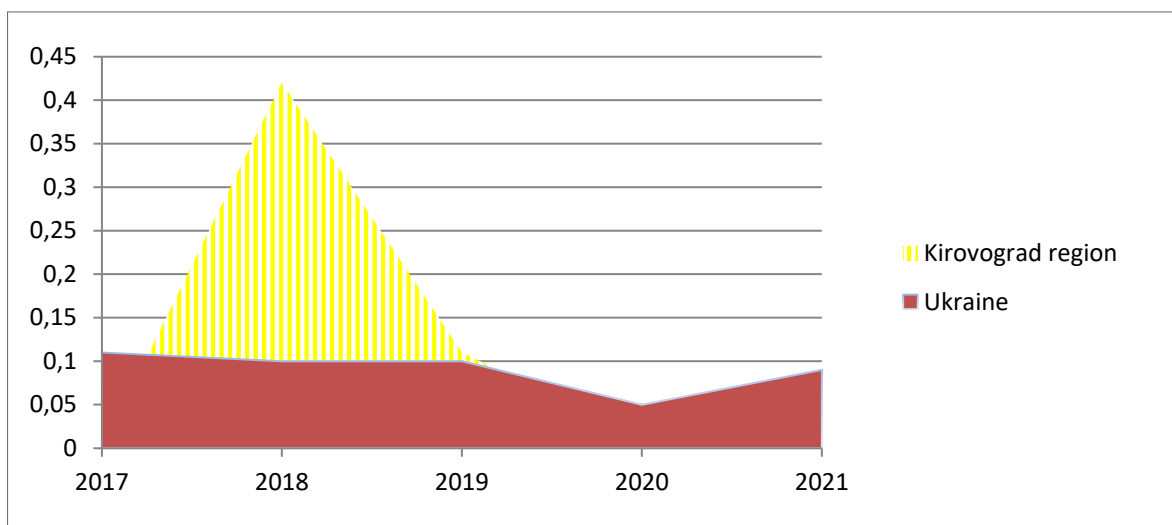


Fig. 1. Incidence rates of malaria in Ukraine and Kirovograd region in the period 2017–2021 per 100,000 populations

(citizens who returned from malaria-endemic countries). No malaria pathogens have been identified.

Direct treatment of water bodies against the larvae of malaria and non-malaria mosquitoes in the region in 2021 was not carried out due to the lack of epidemiological indications. As in previous years, one of the main methods of regulating the breeding of blood-sucking arthropods was to carry out hydraulic works (harvesting floating and mowing coastal vegetation). UAH 389.08 thousand was spent on hydraulic engineering measures in 2021, 58.0 ha of rivers, 18.0 ha of ponds, 76.0 ha of other watercourses, as well as 113.1 ha of coastal areas was put in order.

Conclusions. The population of malaria and non-malaria mosquitoes in the Kirovohrad region remains significant, which may complicate the ma-

lariagenic situation in the region. The number of blood-sucking mosquitoes of the genera *Aedes* and *Kulex* remains significant. Given the location of the region in the wettest part of the forest-steppe of Ukraine, optimal temperature, high numbers of vectors, import of malaria cases from endemic countries, especially in the season of transmission, the data indicate the presence of malaria difficult conditions in the region. This requires the need for systematic epidemiological surveillance of malaria, continuous assessment of the socio-economic situation and climatic determinants. Continuous preventive measures for timely detection of patients, isolation and treatment of malaria patients, systematic monitoring and regulation of the number of vectors of malaria pathogens and prevention of the spread of infected vectors from endemic areas.

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