The Species Composition of Malaria Mosquitoes in the Kharkov Region (Ukraine): Natural Factors of Malaria Spread

Ukrayna’daki Kharkov Bölgesi’ndeki Sıtma Sivrisineklerinin Tür Bileşimi: Sıtma Yayılımasının Doğal Faktörleri

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ABSTRACT

Objective: Article describes the species composition of malaria mosquitoes dominating in the Kharkov region, Ukraine, season of their possible effective infection, as well as antimalarial precautions taken.

Methods: When collecting the material, the conventional methods of evaluation of abundance of mosquitoes were used. Collection of larvae and pupae was carried out with standard butterfly net or photo tray with subsequent recalculation per m².

Results: On the territory of the region were studied 30 species of bloodsucking mosquitoes of such three genera as Anopheles, Culex, Aedes were found.

Conclusion: Facts demonstrate the favorable environmental conditions for malaria spread such as; increase in the number of vectors, increase in precipitation, long temperature period of transmission of infection.

Key Words: Malaria, Anopheles genus, epidemiology, evaluation of abundance, hydrotechnical measures

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INTRODUCTION

Bloodsucking mosquitoes (Diptera, Culicidae) are numerous annoying bloodsuckers and vectors of pathogens of dangerous diseases of humans and animals-parasitic invasions, viral and bacterial infections. Change in abundance and the species composition of bloodsucking mosquitoes have a significant impact on the course of the epizootic process, and therefore, on the epidemiological safety of the area, the health status of the population and domestic animals. Many authors have investigated the fauna of bloodsucking mosquitoes, but today the issues of ecology and the epidemiological significance remain relevant all over the world.

In the longitudinal study conducted in Sekong Province in the southern region of Laos was studied the prevalence of malaria mosquitoes in three malaria endemic villages. Of the 16 species of mosquitoes of Anopheles genus being under study An. dirus A, An. maculatus sl. and An. jeyporiensis appeared to be infected with sporozoites was observed high correlation between the sporozoite index and humidity of the malaria epidemiological season. It was also noted the ambivalence of mosquitoes in the choice of food since about 50% of insects with equal probability attack humans both indoors and outdoors (1). According to the studies conducted in the malaria endemic areas of such villages as Lenia, Kuala Lipis, Pahang in Malaysia the population of Anopheles maculatus Theobald mosquitoes was 31.0%. High frequency level of attacks of Anopheles maculatus Theobald on humans was recorded in December, and in January the activity of attacks decreased. Larval stage of mosquitoes was taken by a rapid flow of the river, thereby causing a reduction in their number. Of the five dominant species of Culicidae family only An. annulatus has a significant positive correlation of abundance with monthly precipitation. Activity of attacks of An. maculatus was captured from 10:00 to 11:00 p.m. (2). According to the studies conducted by the Center for Control of Diseases in Papua New Guinea when catching mosquitoes of Anopheles genus using bats and insect light traps Anopheles koliensis Owen was caught most often, then An. punctulatus Dönitz, An. karwari (James), An. farauti Laveran (sensu lato), An. longirostris Brug and An. bancroftii Giles followed. Percentage of mosquitoes affected by sporozoites of Plasmodium falciparum Welch and P. vivax in light traps was much higher than in mosquitoes caught by the “on oneself” method. It implies the attractiveness of light traps for older mosquitoes. An. punctulatus and An. farauti were more often affected by sporozoites (3). In Western and East Georgia three related species of malarial mosquitoes of the An. maculipennis complex – An. maculipennis Meigen, 1818; An. melanoon Hacket, 1934; An. sacharovi Favre, 1903 were identified (East Georgia) (4). Entomological observations of malaria-transmitting mosquitoes were conducted in the area of the Korean demilitarized zone (Paju, Gyeonggi Province) from April to October 1999 where there were cases of malaria. Trapping of mosquitoes of the adult stage was performed using the dark field and light traps with ultraviolet radiation in five and two stations, respectively. Weekly capture of the larval stages was also conducted in five rice fields located close to the stations of trapping of adult species. Malarial index appeared to be higher in mosquitoes of 11 species selected throughout the long season of activity in 1999 was 47 (5). Infall of mosquitoes was caught in dwelling houses and cattle barns. In all five observation stations mosquitoes of Anopheles genus were caught in ultraviolet light traps from May, and they were the most numerous in the stations located near ponds and rice fields. Percentage of the population density of the larval and adult stage commonly grew since June and reached its maximum value in the second decade of July (112 females/trap/night). Cross correlation showed a significant relationship between the number of adult females of Anopheles genus and the number of larvae collected on the same day, previous day, as well as 3 and 7 days ago (5).

According to the data of the European Center for Control and Prevention of Diseases Anopheles labranchiae species is of special interest of researchers. It is the endophagic species and a harmful bloodsucker involved in transmission of malaria in Spain, Portugal, France, Corsica in recent years, and in 2011 – in Italy. Anopheles labranchiae was and is the most important link in spreading malaria (6). An. labranchiae was involved in transmission of malaria in Spain, Portugal, France and Italy (6). Anopheles labranchiae is known as a dangerous vector in Egypt and several other southern and tropical regions of the world (7). It takes two to ten days for mosquitoes of Anopheles labranchiae to mature from egg to adult and to give rise to the reproductive cycle of the species (8). In addition, they are considered to be the most important vectors of malaria in Africa, where they are distributed from the Mediterranean coast to eastern Africa (9).
All mosquito species registered on the territory of the Kharkov region are susceptible to the species of human malaria parasites currently known. Moreover, dominant species in urban landscapes are An. maculipennis and An. gambiae. These species are necessary to be considered a dangerous vector of malaria. They are well infected with three main species of human malaria parasites (24).

On the territory studied under the conditions of urban landscapes the gonoaactive females occurred within 3.5–4 months, and the larval stages in ponds – approximately within 4.5 months. Maximum number of species was observed in mid-July. Due to the high number and activity of the attack in the years is, as well as the proximity of breeding places to human settlements such species as An. maculipennis, An. messeae are of the greatest epidemiological risk (25).

### DISCUSSION

As previously noted, in order to correctly identify malaria control the knowledge concerning the species composition of Anophelinae that are prevalent in the given area, epidemiological values of each species, subspecies and biology of major vectors is required. Control measures against a vector must be based on the knowledge of its biology and the seasonable changes. Rational duration of antimalarial precautions is determined primarily by seasonal phenomena in the life of malaria mosquitoes. When planning and implementing the measures for prevention of malaria in Ukraine the scientifically proven terms for conducting such measures based on the long-term study of phenology of malaria mosquitoes are used. Best evaluation criterion of anti-mosquito measures is the age composition of female malaria vectors. Malaria transmission occurs by Anopheles mosquitoes in the presence of favorable temperatures for the maturation of malarial parasites in the body of a mosquito (25).

According to the data of the Kharkov regional hydrometeorological center the end of spring in 2013 was hot. Temperature reached +30°C. Summer of 2013 was moderate with sufficient rainfall. Daytime temperatures, as a rule, did not exceed the level of +35°C. July was the hottest month, the average temperature of the month was +25°C. Maximum temperature observed in August 7 (+37 °C). Autumn was warm and rainy, temperatures, as a rule, did not exceed the level of +35°С. July was the end of the season of effective infection of mosquitoes with malaria (25).

### CONCLUSION

Aforementioned facts demonstrate the favorable environmental conditions for malaria spread: increase in the number of vectors, increase in precipitation, long temperature period of transmission of infection.

Conflict of interest

No conflict of interest was declared by the authors.

**REFERENCES**


