

Impact of war on the dynamics of COVID-19 in Ukraine

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On 24 February 2022, Russia unreasonably attacked Ukraine. The current estimated number of victims in Ukraine is 18 million.¹ In addition to the destruction and humanitarian crisis caused by the war, Russia's military intervention in Ukraine came at the peak of the wave of COVID-19 caused by the Omicron strain. The calculated predictive incidence of COVID-19 in Ukraine at the beginning of March, modelled by our group as part of the National Research Foundation of Ukraine project 2020.02/0404,² was about 30 000 new cases daily. War significantly exacerbates the situation with COVID-19 in Ukraine, which is confirmed by our analysis of six key factors in the spread of infection.

Identification of cases: sick people in the occupied territories and territories where hostilities are taking place do not have the opportunity to seek medical help because medical facilities have been destroyed, and medical personnel are in short supply. Consultations with family doctors are carried out online.

Diagnostics: diagnosis is difficult due to hostilities. In the territories occupied by Russian troops, medical facilities practically do not work, there is no laboratory diagnostics, and PCR and rapid tests are not done. In the east and south of Ukraine, in the territories controlled by Ukraine, including cities with more than 1 million people, such as Kyiv and Kharkiv, 2.5%–3% of the capacity of laboratories providing COVID-19 diagnostic services is operating. In this way, only severe cases requiring hospitalisation are diagnosed.

Registration: throughout Ukraine, the electronic system for recording COVID-19 incidence is limited, and data are transmitted by telephone from places where there is connection. This leads to a significant decrease in reported cases of COVID-19 compared with real ones. Thus, the Worldometers dashboard shows the incidence of 5000 cases per day,³ which is six times less than predicted. The Johns Hopkins University dashboard does not

show data for Ukraine at all.⁴ Thus, it can be concluded that only severe cases of COVID-19 requiring hospitalisation are registered.

Treatment: hospitalisation of seriously ill patients is severely limited due to the overcrowding of hospitals with wounded military and civilians. The number of specific beds has been drastically reduced due to reprofiling to provide emergency medical care to the wounded. This results in reduced access to oxygen. Active hostilities and occupation make it impossible to deliver medicines to such territories. The sharp increase in fatal cases makes it impossible to diagnose COVID-19 after death, and autopsies are not performed. Among the internally displaced population, the provision of medical care is complex because attached family doctors remain in other territories of Ukraine. Contacting a doctor without a declaration is possible only through ambulances, which accept applications only in severe cases requiring hospitalisation.

Antiepidemic measures: people in the territories not controlled by Ukraine and territories with active hostilities are forced to hide from artillery and airstrikes in bomb shelters, basements and subways. These places are characterised by high population density, lack of social distancing, lack of mask regime, low ventilation, which increases the intensity of the circulation of the virus. The mask regime is not observed in connection with the introduction of martial law. It is impossible to trace, test and isolate contact individuals in military conditions, and it is impossible to identify epidemic chains. In the context of hostilities, self-isolation is impossible, and people with symptoms continue to infect others. An essential factor in increasing the spread of the virus is the high population density during the evacuation, both in trains and at stations. At the same time, most of the evacuees are children. In Ukraine, children under 12 years of age were not



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vaccinated, and vaccination of children from 12 years of age began on 13 January 2022, so the vaccination coverage of children is low.

Prevention: the vaccine campaign against COVID-19 in Ukraine began on 24 February 2021, exactly 1 year before the war. Only 36.93% of the population were vaccinated with two doses. Such a low level was associated, among other things, with an active antivaccination information campaign conducted by Russia.⁵ The population who received two vaccine doses on the schedule should receive a booster dose. However, in the uncontrolled territories of Ukraine and in the territories where active hostilities are taking place, vaccination has been completely stopped. In Western Ukraine, the vaccination campaign continues but with much lower throughput. This is due to the high burden on medical institutions caused by a large number of internally displaced people (6.7 million¹) as well as the fact that part of the medical staff was evacuated to neighbouring countries.⁶ In connection with the introduction of martial law throughout Ukraine, mandatory vaccination of special categories of citizens (teachers, civil servants, etc) has been cancelled. Vaccination history is not controlled.

The chaos of war and accompanying psychological factors have forced the problem of COVID-19 out of the minds of people in Ukraine. Military operations and the humanitarian aspects force people to live in unsanitary conditions without observing COVID-19 prevention measures. The pandemic is no longer the top priority of Ukraine's healthcare system. This is an essential factor in increasing the dynamics of the spread of coronavirus infection in the country. The war in Ukraine is a critical factor in the new outbreak

of COVID-19. This only exacerbates the humanitarian catastrophe in Ukraine caused by Russia's military intervention.

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Data Availability Statement Data are available in a public, open access repository.

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