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Russo-Ukrainian war: An unexpected event during the COVID-19 pandemic

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Dear Editor,

We are already in the third year of the ongoing coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which has killed over 6.0 million people worldwide to date. Several variants of parental viral strain (SARS-CoV-2) have been reported, including variants of concern (VOCs) and variants of interest (VOIs) [1]. Currently, no definitive therapy for the COVID-19 pandemic, though vaccines have been developed but remain elusive. The only practical preventatives are social isolation, face mask-wearing, and hygiene [2]. Many countries are seeking to tackle the COVID-19 pandemic by implementing various strategies, including mass vaccination with second and booster doses. With the emergence of the SARS-CoV-2 Omicron variant, the Russia-Ukraine war came as a new challenge for both countries. Still, its disastrous impacts will surely extend to other countries. This correspondence highlights the effects of the Russia-Ukraine war during the ongoing COVID-19 pandemic.

Ukraine's significance stems from the fact that it is located between Central Europe and Russia, and it's a vital role in regional stability (Fig. 1A). Besides oil, gas, and minerals, Ukraine possesses black soil which makes it one of the world's most productive farming areas. On February 24, 2022, Russia started an invasion of Ukraine that has forced many Ukrainian people (around 5.0 million) to immigrate to neighboring European countries, such as Poland, Romania, Russia, Hungary, Moldova, Slovakia, and Belarus (BBC News, <https://www.bbc.com/news/world-60555472>) (Fig. 1B), and that considers the fastest-growing refugee crisis in Europe since World War II.

The initial stages of the pandemic, prior to the war, the situation of Ukrainian health care was ill-prepared to diagnose the COVID-19 spread and respond effectively due to inadequacies in an overburdened healthcare system. That was due to insufficient hospital logistical devices, adequate personal protective equipment (PPE), lack of skilled professionals, the distribution of infectious diseases departments across Ukraine's regions, insufficient surveillance, and authorized test labs, indicating that Ukraine is already grappling to cope with the COVID-19 pandemic, which worsens due to the ongoing war.

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Diseases spread out during wars, conflicts, and natural disasters. The conflict threatens years of health progress in Ukraine, possibly making Ukraine a potential hotspot for the emergence of another future coronavirus pandemic hitting firstly Europe. Vaccination is the first defence line against diseases. On February 24, 2021, the national COVID-19 vaccination campaign started with an Indian-made jab, with rising vaccination rates since early June. However, Ukraine still has the lowest vaccination coverage in Europe. The Ukrainian community suffered destroyed primary healthcare services and a lack of access to basic preventative medicine throughout the invasion [3]. Additionally, vaccination campaigns for COVID-19 and routine immunization have practically come to a halt across the country. Ukraine has a 44.1 million population, wherein 4.99 million people (11.31%) have already been infected with COVID-19 and more than 0.1 million deaths as of April 22, 2022. Additionally, 15 million people (34%) in Ukraine have been fully-vaccinated (World Health Organization, <https://covid19.who.int/region/euro/country/ua>).

Nowadays, Infectious diseases are ravaging the Ukrainian population, wherein Ukrainians have been forced to seek refuge from the fighting in basements and underground metro stations, where ventilation is poor and clean water is scarce. Additionally, COVID-19 testing has been declining since the conflict began, implying that undetected transmission is likely. Outbreaks of polio and measles are very likely, wherein a 3-week campaign to vaccinate nearly 0.14 million children against polio has been interrupted accompanied by also disrupted polio surveillance. By 2020, national coverage with two doses of measles-containing vaccine was up to 82%. Worryingly, vaccine coverage was less than 50% in several oblasts like Kharkiv, where vast numbers of people are fleeing the conflict. Tuberculosis (TB) and human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS) treatments are being interrupted [4]. Ukraine's HIV response has been patchy, hampered by low socioeconomic conditions, restricted external funding, and upheaval in separatist areas in the east. The continuation of HIV treatment and prevention programs in Ukraine is currently jeopardized [5]. Ukraine has one of the highest rates of multidrug-resistant

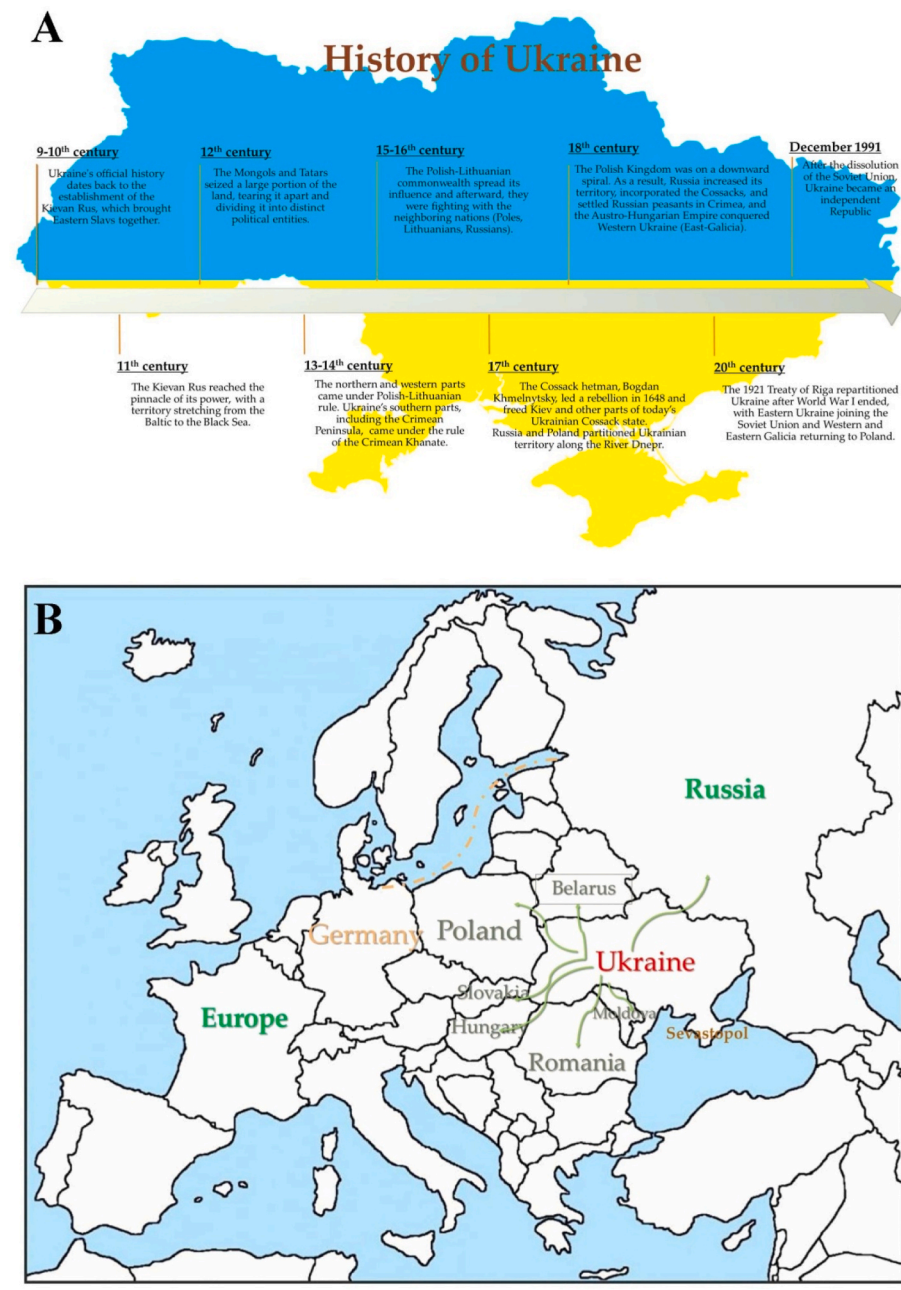


Fig. 1. A. Summary of the geopolitical situation of Ukraine since its emergence until independence and its importance to Russia. **B.** Ukraine was a cornerstone of the Soviet Union, the archrival of the United States during the Cold War. Behind only Russia, it was the second most populous and powerful of the fifteen Soviet republics, home to much of the union's agricultural production, defense industries, and military, including the Black Sea Fleet and some of the nuclear arsenal. Sevastopol in Crimea, which is strategically significant for Russia, is home to the Russian Black Sea Fleet. It has a role in the geopolitical origin of the military conflict in Ukraine. Nord Stream 2 pipeline, which Russia completed its construction in mid-2021. It runs under the Baltic Sea to Germany, moving gas, but not through Ukraine. Arrows show the immigration moves of 3.6 million people have left Ukraine into neighboring countries to date.

tuberculosis (MDR-TB) in the world, and 22% of patients with TB are also HIV-positive; additionally, the primary cause of death among HIV-positive people is TB [4]. Furthermore, Russia has the highest HIV prevalence in Eastern Europe and Central Asia, and the sanctions are also expected to have an impact on the Russian Federation's already restricted funding for health services [5].

Russia has reported 18.11 million COVID-19 cases to date, with approximately 0.37 million mortalities (World Health Organization, <https://covid19.who.int/region/euro/country/ru>). Sputnik V vaccine is developed by Gamaleya Research Institute, part of Russia's Ministry of Health, and has been authorized in 71 countries with a total population of more than four billion people. The ongoing war may affect the production of the Sputnik V vaccine, leading to less supply of the COVID-19 vaccine globally.

Currently, Ukraine's health situation and the Ukrainian citizens' migration should be strictly monitored to mitigate the continuing disastrous impact of the pandemic. The 2022 Russo-Ukrainian conflict

puts now another pressure on the economies, the endeavours taken, and the supplies needed for mitigating the consequences of the COVID-19 pandemic (Table 1). Countries already suffering from the pandemic-induced economic crisis cannot withstand the cost of and economic consequences caused by this conflict.

USA and European Union (EU) have implemented harsh sanctions on Russia due to the invasion. But, the resultant consequences are globally deleterious, wherein wheat and gas prices have soared with fears about Russia's natural gas supply being cut off (Table 1).

Finally, an urgent ceasefire is the first priority, as the ongoing war will have a negative impact globally, among them worsening the situation in the ongoing pandemic from the epidemiological and economical point of view. Furthermore, the COVID-19 pandemic has not been over yet, and ramping up vaccination in humans as well as animals [6,7] is urgent, besides keeping an eye on other possible public health threats such as the NeoCoV and Deltacron as well.

Table 1

The consequences of the 2022 Russo-Ukrainian conflict.

Sl.	Medical Consequences
1.	Wiggled response of diseases, such as COVID-19 and HIV.
2.	Increased burden of health systems in refugees-hosting countries to guarantee continuity of health services.
3.	The interruptions in the care of Ukraine patients with multidrug-resistant tuberculosis could be catastrophic.
4.	Interrupted access to clean and reliable energy in healthcare facilities
5.	A decline in diagnostic levels of COVID-19.
6.	Trauma patients will overwhelm emergency departments and intensive care units, leaving little room to treat other conditions.
7.	Due to a shortage of energy services or excessive energy prices required to offer health services, access of many people to important health care is jeopardized.
8.	The large frequency of infections may necessitate hospitalization and ventilation for many Ukrainians.
Sl.	Community Consequences
1.	Taking precautions against COVID-19 is not going to be a priority for most people.
2.	Individuals lose their jobs and income.
3.	Many people may lose reliable access to basic energy services as a result of the lack of continuous income induced by COVID-19.
Sl.	Economic Consequences
1.	Pandemic- and conflict-induced economic crisis
2.	Gas prices in the world are at an all-time high for decades.
3.	Without assistance on energy prices, companies and jobs will be lost, as in Spain.
4.	Businesses of many companies, which not only use gas as an energy source but also as a raw material in the chemical and pharmaceutical industries, will be crashed.
5.	Supply chain disruptions in Ukraine to other countries like Germany.
6.	Tourism recovery in the Eastern European destination will be suffered.

CRediT authorship contribution statement

Om Prakash Choudhary: Conceptualization, Data Curation, Writing - Original Draft, Writing - review & editing. **AbdulRahman A. Saied:** Conceptualization, Data Curation, Writing - Original Draft, Writing - review & editing. **Priyanka:** Writing - Original Draft, Writing - review & editing. **Rezhna Kheder Ali:** Writing - Original Draft, Writing - review & editing. **Sazan Qadir Maulud:** Writing - Original Draft, Writing - review & editing. All authors critically reviewed and approved the final version of the manuscript.

Ethical approval

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Declaration of competing interest

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