

<https://doi.org/10.33266/2070-1004-2022-2-26-31>
UDC 578.834.1:614.76

Review report
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NEW CORONAVIRUS PANDEMIC WORLDWIDE: SOME LESSONS FROM COVID-19 CONTROL

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Abstract. *The aim of the study was to perform a comparative analysis of COVID-19 epidemic process in selected countries of the world during the first pandemic wave in 2020 and during the rise of SARS-CoV2 variant Omicron.*

Materials and research methods. Analysis of the COVID-19 epidemic process was based on data from the Wordometers website (<https://www.worldometers.info/coronavirus/#countries>). In addition, scientific and popular science articles and official documents on the history, epidemiology, and response to the pandemic in different countries of the world in 2020-2022 were analyzed. The authors' own observations were also used.

Results of the study and their analysis. Restrictive measures adopted in the People's Republic of China (PRC), mass screening of the population, observation of those arriving in the country and hospitalization of all those infected made it possible to virtually reduce the circulation of the virus to zero. In the Russian Federation, timely simultaneous epidemic control measures throughout the country resulted in a significant decline in the intensity of the epidemic, both early in the pandemic and after local Omicron transmission, and prevented explosive growth of cases. In the USA, Italy and Sweden, untimely or lenient restrictive measures and low testing during selected periods of the pandemic led to an avalanche of cases and deaths.

Thus the epidemic process of COVID-19 in the analysed countries depended on the timeliness, duration and extent of restrictive and quarantine measures.

Key words: *anti-epidemic measures, COVID-19 pandemic, epidemic process, Italy, restrictive measures, People's Republic of China, Russian Federation, SARS-CoV2 Omicron, Sweden, United States of America*

Conflict of interest. The authors declare no conflict of interest

For citation: Pshenichnaya N.Y., Lizinfeld I.A., Zadoroshnyy A.V. New Coronavirus Pandemic Worldwide: Some Lessons From Covid-19 Control. *Meditsina Katastrof = Disaster Medicine.* 2022;2:26-31 (In Russ.). <https://doi.org/10.33266/2070-1004-2022-2-26-31>

<https://doi.org/10.33266/2070-1004-2022-2-26-31>
УДК 578.834.1:614.76

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ПАНДЕМИЯ НОВОЙ КОРОНАВИРУСНОЙ ИНФЕКЦИИ В РАЗНЫХ СТРАНАХ МИРА: НЕКОТОРЫЕ УРОКИ БОРЬБЫ С COVID-19

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Резюме. *Цель исследования – выполнить сравнительный анализ эпидемического процесса COVID-19 в отдельных странах мира во время первой волны пандемии в 2020 г. и в период подъема заболеваемости, вызванной вариантом SARS-CoV2 Омикрон.*

Материалы и методы исследования. Анализ эпидемического процесса COVID-19 основывался на данных сайта Wordometers (<https://www.worldometers.info/coronavirus/#countries>). Кроме того, были проанализированы научные и научно-популярные статьи, официальные документы по истории, эпидемиологии и противодействию пандемии в разных странах мира в 2020-2022 гг. При работе над статьей использовались также собственные наблюдения авторов.

Результаты исследования и их анализ. Принятые в Китайской Народной Республике (КНР) ограничительные меры, массовое тестирование населения, обсервация приезжающих в страну, госпитализация всех заболевших позволили практически свести к нулю циркуляцию вируса. В Российской Федерации благодаря своевременному и одновременно начатым на всей её территории противоэпидемическим мероприятиям была существенно снижена – как в начале пандемии, так и после возникновения местной трансмиссии варианта Омикрон – интенсивность эпидемического процесса, не допущен взрывной роста числа больных. В США, Италии и Швеции несвоевременно вводимые или мягкие ограничительные меры и низкий объем тестирования в отдельные периоды пандемии привели к лавинообразному увеличению числа больных и росту количества летальных исходов.

Таким образом, эпидемический процесс COVID-19 в анализируемых странах зависел от своевременности, длительности и объема вводимых ограничительных мер и санитарно-карантинных мероприятий в различные периоды пандемии.

Ключевые слова: *SARS-CoV2 Омикрон, Италия, Китайская Народная Республика, ограничительные меры, пандемия COVID-19, противоэпидемические мероприятия, Российская Федерация, Соединенные Штаты Америки, Швеция, эпидемический процесс*

Конфликт интересов. Авторы статьи подтверждают отсутствие конфликта интересов

Для цитирования: Пшеничная Н.Ю., Лизинфельд И.А., Задорожный А.В. Пандемия новой коронавирусной инфекции в разных странах мира: некоторые уроки борьбы с COVID-19 // *Медицина катастроф.* 2022. №2. С. 26-31. <https://doi.org/10.33266/2070-1004-2022-2-26-31>

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Introduction

The COVID-19 pandemic led to rethinking of human values, putting health as the main criterion for evaluating nation's rating. Strategies and tactics to fight for life and health determined the ability to resist the pandemic in every country [1]. Much of the key to the success of the fight against the new coronavirus infection was related to the counteraction to SARS-CoV2 during the first months of the virus' spread across the planet. These months predetermined the further development of COVID-19 epidemic process.

The fight against the COVID-19 pandemic had its own distinctive features in different countries [2, 3]. On the one hand health, on the other hand socio-economic interests of the state and economic interests of business were put on the scales [1].

The aim of the study was to analyze the epidemic process of COVID-19 in selected countries of the world during the first pandemic wave (2020) and during the wave caused by the SARS-CoV2 Omicron variant.

Materials and research methods. We analyzed our own experience with COVID-19 in the Russian Federation, the World Health Organization (WHO) missions to the People's Republic of China (PRC) in February 2020, the Russian humanitarian mission to Italy in March-April 2020, and scientific articles and publications devoted to the history, epidemiology and organization of pandemic response in different countries in 2020-2022. COVID-19 incidence statistics were taken from the Wordometers website (<https://www.wordometers.info/coronavirus/#countries>).

Study results and their analysis.

People's Republic of China. The first country to face a COVID-19 pandemic was the People's Republic of China. It should be noted that the PRC already had experience with the 2002-2003 SARS pandemic. A major mistake made at that time was the PRC's delay in responding to cases of SARS. This led to the spread of the infection to 29 countries around the world before restrictions were put in place. China was the country most affected by the first SARS pandemic, with 7,083 cases — 87.5% of the world's cases. But lessons have been learned from this mistake. Special hospitals with isolated ventilation systems were built to treat patients with highly dangerous airborne infections (SARS). And other measures have been taken to ensure an anti-epidemic regime [4, 5].

COVID-19 was already being countered in the PRC under a completely different scenario. As of December 30, 2019, there were 27 patients with interstitial pneumonia of unknown etiology in hospitals in Wuhan. All cases of pneumonia were reported in the city during the month. In this regard, the City Health Committee issued a message of special importance with information about cases of pneumonia of unknown etiology. In this way the whole world was informed about the infection that caused the subsequent COVID-19 pandemic [6].

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Transparent reporting of COVID-19, unlike the SARS pandemic, allowed PRC health leaders to avoid a number of strategic omissions. Although there were some miscalculations related to inadequate infection control in the first 2 months of infection control. This led to nosocomial spread of the disease among inpatients and infections among health care workers. As of February 11, 2020, 1,716 healthcare workers were infected in 422 hospitals [7].

In the fight against the new coronavirus infection, PRC authorities have taken unprecedented measures. Strict measures on social distancing and mask compliance have been introduced. COVID-19 management protocols were continuously reviewed and improved. Large-scale PCR testing was deployed. The training of health care workers and the use of telemedicine consultations were introduced. The bed capacity was increased. The production and supply of medicines and personal protective equipment was increased. IT technology, including the WeChat mobile app, tracked contacts down to the sixth in the chain. A huge health education work was conducted among the population. Volunteer movement and the work of public organizations that provided great support to the state in the fight against the pandemic were widely deployed [8]. In the country everybody who fell ill with COVID-19 was hospitalized. That is, the position of "zero tolerance" to the virus was observed. The construction of hospitals out of quick-mounted structures was unfolding. As a result, all measures to counteract the new coronavirus infection had an effect on the epidemic process within one or two weeks (see figure). As early as the beginning of February 2020, the daily detected number of COVID-19 cases went down. This allowed the PRC to lift the national quarantine on March 25, 2020. Thereafter, during the pandemic, all visitors from other countries were required to comply with a strict 14-day quarantine in a hotel-observatory with no leaving the room until the quarantine ended and daily PCR testing. This prevented the spread of other, later variants of the coronavirus to the PRC. Although small outbreaks of COVID-19 (200-250 cases per day), caused by local transmission of the virus, were periodically detected. This led to the introduction of severe restrictive measures in various provinces of the country. Nevertheless, the highly transmissible variant of Omicron could not be avoided in the PRC. However, a significant (by PRC standards) morbidity increase (3602 cases/day) was not recorded until March 15, 2022. By mid-April 2022 the situation with Omicron morbidity had stabilized (see figure).

Thus, stringent and early restrictive measures, strong social mobilization of the population, and a rapid increase in medical resources and testing volumes enabled PRC health care to successfully cope with the COVID-19 pandemic.

Russian Federation. Russian public health care, which incorporated the best of China's pandemic experience, based on its many years of experience in responding to biological threats, was also able to adequately respond to the first wave of the COVID-19 pandemic. Since the end of

January 2020, Russia began to implement a total testing of all arrivals from COVID-19-unfavorable countries. This made it possible to quickly identify the first imported cases. All newcomers were placed in home quarantine. There, they were closely monitored during the incubation period. After local transmission of SARS-CoV2 began to be recorded on March 16, restrictive measures were implemented in all regions of Russia, including distant work and study modes. From March 30, due to the beginning of an increase in the number of local transmission cases, restrictions were imposed nationwide, and a self-isolation regime was introduced. These measures made it possible to increase inpatient capacity, reassign hospitals, and deploy mono-hospitals to treat COVID-19 patients. Construction of hospitals out of quickly erected structures was organized, medical workers were trained, test systems with increased production volumes were developed, and the development of vaccines began. Volunteer work was organized, social support for pensioners and low-income people was provided.

Early sanitary-quarantine control, organization of anti-epidemic measures and social mobilization of the population prevented a rapid increase in the incidence of COVID-19 and significantly reduced the public health burden. Although, as in the PRC, "zero tolerance" to the coronavirus was not fully achieved. In April 2020, the number of patients increased significantly. And in the regions, as the bed capacity was filled, they began to hospitalize only those who had significant risks of developing a severe form of the disease or developing respiratory failure. Medical triage was conducted to identify patients prioritized for inpatient treatment. On May 11, 2020, after more than 2.5 incubation periods since the first thousand COVID-19 patients were registered, Russia reached the first peak in morbidity. The mortality rate was 0.9% (see figure). Beginning May 11, 2020 the country began to gradually lift the COVID restrictions, flexibly regulating their repeal at both the federal and regional levels. They were guided by the rate of increase/decrease in the number of cases and the utilization of hospital beds, while preserving the basic measures of nonspecific prevention [9, 10]. Testing was carried out not only in medical institutions and points of entry into the country, but also in enterprises and educational institutions. On August 11, 2020, the world's first COVID-19 vaccine, Sputnik-V, was registered in Russia. This marked the beginning of mass vaccination of the population. As a result, all anti-epidemic measures allowed to avoid further lockdowns, not to stop the work of enterprises, to restore routine vaccination and to gradually increase the volume of medical care to the population for other diseases. There was no increase in social tension in the country, and business was not seriously affected.

The variant SARS-CoV2 Omicron, first registered in Botswana and the Republic of South Africa (RSA) in November 2021, arrived in Russia in early December. The country's health authorities made thorough preparations for its arrival. From November 28, entry to Russia for tourists from South Africa, Botswana, Lesotho, Namibia, Zimbabwe, Mozambique, Madagascar, Tanzania, Hong Kong and Eswatini was restricted, and a 14-day quarantine was introduced for those entering from South Africa and other countries infected with Omicron [10].

As a result of these anti-epidemic measures, sporadic local cases of Omicron transmission were registered only

at the end of December. A palpable increase in the incidence of the disease began after the New Year holidays, beginning in the second decade of January 2022. Time was bought to deploy beds for COVID-19 patients, mobilize medical personnel and other medical resources, and increase the volume of testing. As a result, the Omicron wave arrived in Russia 1-1.5 months later than in European countries. After stealth-Omicron arrived in the country in early February 2022, there was no new rise as the Omicron and stealth-Omicron waves layered up, and gradually by April 2022 stealth-Omicron had supplanted its predecessor against the background of the continuing decline in COVID-19 morbidity.

Timely and simultaneous restrictive measures and early sanitary-quarantine measures combined with large-scale testing of the population and rapid build-up of medical resources have significantly reduced the incidence of COVID-19 and the activity of the epidemic process in the Russian Federation.

Italy. Italy timely, immediately after the registration of the first imported cases from Hubei Province of China, closed its borders with China on January 31, 2020. But at the same time it did not carry out emergency restrictive measures, being guided by the interests of business [12]. The match in Milan on February 19, 2020, later called "a biological bomb" and the opening of the Venice Film Festival at the same time, led to a catastrophic increase of COVID-19 patients in the provinces of Veneto and Lombardy. There was a shortage of beds (no one over 65 years old was hospitalized), medical personnel (10% of all diseased were health workers). Students and retired doctors were recruited. Cases of hospital-acquired infection in somatic wards, outbreaks in prisons and nursing homes, shortages of personal protective equipment (PPE) and ventilators appeared. Restrictive measures were not imposed all at once. First, on 22-23 February, they were imposed in the "red" regions, and only on 9 March, nationwide. Twelve days later, on March 21, a ban was imposed on movement in Italy, which practically meant a lockdown. As a result of the delay in taking restrictive measures, the growth of COVID-19 was rapid. It took less than one maximum incubation period (see figure) for the first wave to peak from the time the first thousand cases per day were reported. In mid-March 2020, the mortality rate from COVID-19 was 7.7%. Due to overcrowding of hospitals, preference was given to people of working age. Thus, the chances of survival decreased for people over 65-70 years old, who were even denied palliative care [11-14]. The Italian government had to ask for help from outside. Russia, which had successfully coped with the COVID-19 epidemic, came to the rescue first [15]. The situation with COVID-19 in Italy had stabilized by the summer of 2020. But later on, the country would face new morbidity rises, new restrictions for citizens and businesses, and new blows to the economy.

SARS-CoV2 variant Omicron reached Italy in mid-November 2021. This led to new restrictions for citizens and businesses in preparation for the Christmas holidays. The first day of 2022 saw a spike in Omicron cases to 200,000 cases or more per day. They continued to be recorded until mid-January (see figure). The declining Omicron variant was replaced by stealth Omicron in early February. This again led to a rise in the epidemic curve to 98,000 cases per day by the third decade of March 2022

and caused an extension of the emergency situation (in effect January 31, 2020), until March 31, 2022. Thus, further errors in the organization of anti-epidemic measures for the Omicron variant caused new turmoil for society and the economy.

Untimely and ill-timed restrictive measures in Italy, both in the first phase of the pandemic and after the emergence of the Omicron variant, contributed to an explosion of cases, health care overload and deaths.

Sweden. This country chose a particular way to deal with COVID-19, eschewing strict quarantine measures and motivated by the need to protect the economy from shocks. Sweden did not impose strict restrictions. Restaurants, cafes, non-food stores, and schools operated.

Nevertheless, by the end of June 2020 Sweden had the world's 12th highest rate of infection per million inhabitants, but it still had the highest fatality rate at 11.2% (see figure). The rate was even higher (up to 50%) in nursing homes. This was associated with the late introduction of a ban on visiting residents. Among more overcrowded migrants, the mortality rate was as high as 40%. There was also low testing coverage, at 30,000 tests per week against a target of 100,000.

Sweden, however, could not avoid economic problems, as a state of emergency was imposed in the other countries surrounding it. This led to a sharp restriction of cross-border contacts, affecting the country, whose economy depended on production in other states. As a result,

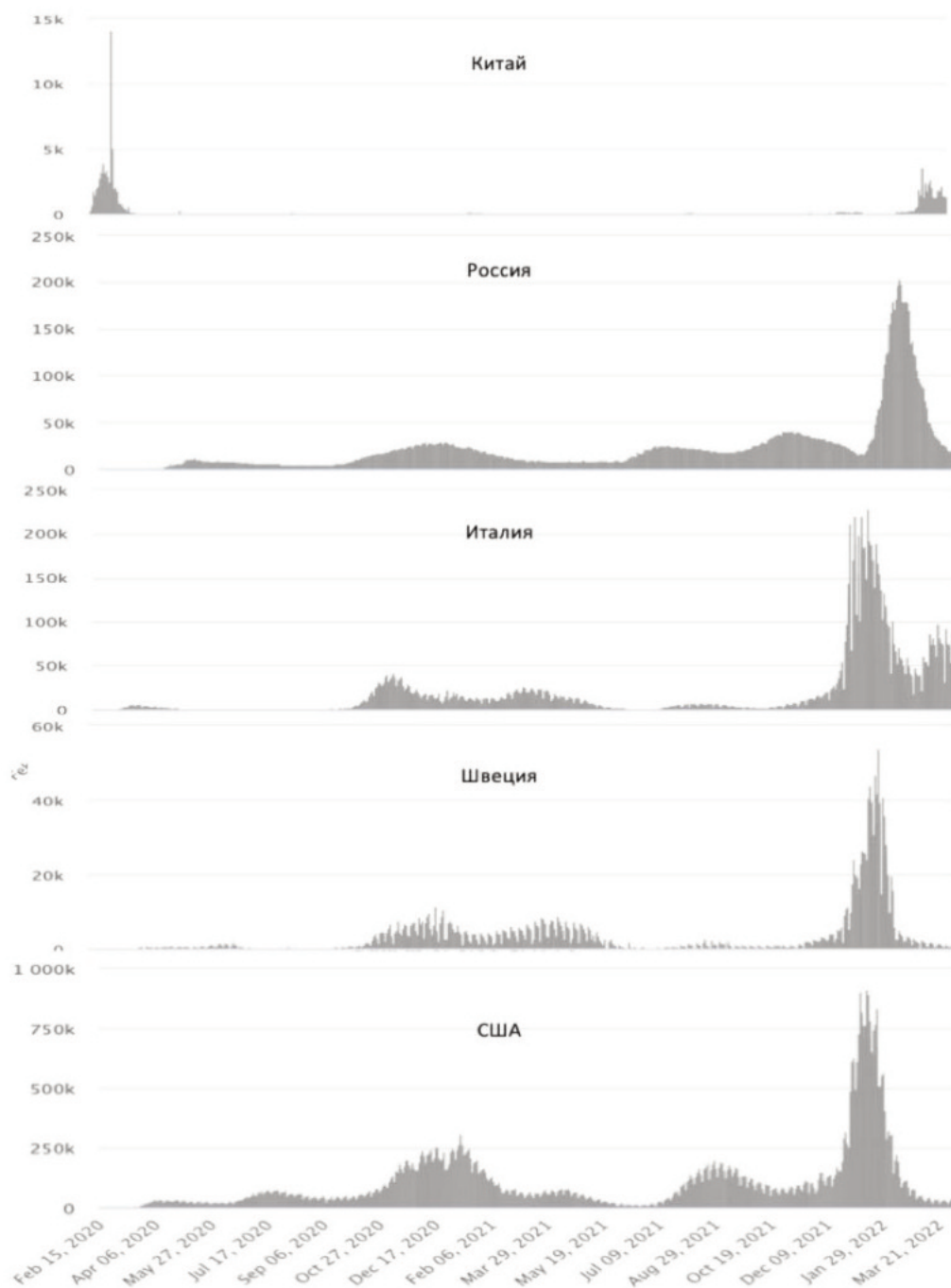


Рисунок Эпидемические кривая заболеваемости COVID-19 в Китае, России, Италии, Швеции и США в январе 2020 – апреле 2022 гг., по данным сайта www.worldometers.info

Picture. Epidemic curve of the incidence of COVID-19 in China, Russia, Italy, Sweden and the USA in January 2020 - April 2022 (according to website www.worldometers.info)

Число заболевших (чел.) на 100 тыс. населения в отдельных странах мира, по состоянию на 10 апреля 2022 г.
Number of Cases per 100 Thousand Population in Selected Countries of the World, as of April 10, 2022

Страна Country	Заболеемость COVID-19 The incidence of COVID-19	95%-ный ДИ 95% CI	Максимальное число заболевших на пике волны Омикрона Maximum cases at the peak of the Omicron wave	95%-ный ДИ 95% CI
США/ USA	24,2	23,0–25,41	272,5	258,9–286,1
Швеция/ Sweden	24,29	22,94–25,42	525,4	498,7–551,1
Италия/ Italy	25,37	24,10–26,61	379,6	360,08–398,4
Россия/ Russia	12,37	11,74–12,98	140,1	133,0–147,1
Китай/ China	11,3	10,71–11,85	0,25	0,237–0,283

the chief state epidemiologist of Sweden, A. Tegnell, admitted that the strategy chosen by the country contributed to a large number of victims from SARS-CoV2 [16].

In Sweden, Omicron arrived two weeks later than in Italy, at the very end of November 2021. Therefore, the peak of the disease occurred in the twentieth days of January 2022 (see figure). Stealth Omicron was also detected in Sweden in mid-January 2022. As a result, the rise in Omicron incidence has smoothly turned into a rise caused by stealth Omicron. The change in circulating strains did not result in a clearly delineated second peak. The incidence then went into a decline. By the second decade of February 2022, it had stabilized at low numbers, leading to the lifting of all few restrictions. Thus, in Sweden, the layering of two waves of morbidity — Omicron and stealth Omicron — has similar features to Russia. But it occurred in an earlier period of time. That's because the initial measures aimed at preventing localized Omicron transmission were weaker and did not include a 14-day observation of those returning from countries unfavorable for the incidence of this variant of SARS-CoV2.

Weak restrictive measures imposed in Sweden to save the economy and low testing volumes resulted in a high incidence of severe COVID-19 in risk groups, but did not prevent economic losses to the state.

United States of America. The United States is the world leader in the number of people infected and the number of deaths. The virus entered the western and eastern U.S. states simultaneously, presumably in mid-February 2020. At that time, there were no more than 100-150 tests per day in the country, allowing SARS-CoV2 to spread unimpeded. Quarantine measures were weak. Restrictions were imposed at different times in different states and were far from complete. The imposition of restrictions mainly depended on which of the two major political parties — Republican or Democratic — the state governor belonged to. In the early days of SARS-CoV2, Republicans imposed restrictions an average of 2.7 days later than Democrats, directly affecting the number of people infected. This approach was dictated by the economy and business, which forced more lenient and less time-consuming restrictive measures than in Europe and China. There was also significant bureaucratic desynchronization. It contributed to the shortage of some medicines, equipment, consumables and PPE [16]. The country reached its first disease peak in early April 2020, 1.5 incubation periods after reaching a daily incidence rate of 1,000. Then, after a slight decline, due to weak restrictions, a second, more powerful wave of infections set in. It peaked at the end of

July (see figure). At this time there was a temporary respite in the vast majority of other countries that had experienced a rise in incidence in the spring. The original CDC PCR tests for the coronavirus used 3 rather than 2 "probes" to detect SARS-CoV2 genomic fragments. The third genome fragment gave an indeterminate result. It took several weeks to correct the error. Initially, the time needed to contain the COVID-19 pandemic was missed. Subsequently, the missed time affected the entire course of the COVID-19 epidemic process, which was the most active in the United States [17].

The Omicron variant was imported into the United States from South Africa on November 22, 2021, and was diagnosed in a patient on November 29 while he was on self-isolation. More lenient restrictions on those returning from Omicron-disadvantaged countries contributed to the rapid spread of the new SARS-CoV2 variant in the United States. It took just over a month for the country to reach the highest incidence rate in the world during the pandemic — more than 900,000 cases per day between 7 and 13 January 2022 (see figure). As a result, the U.S. became the "record holder" for fatalities as well, with more than 1 million deaths during the entire pandemic.

Low testing volumes and problems with test system specificity during the first wave of the pandemic in the United States, weak and inconsistent restrictive measures, and interagency inconsistencies all led to overburdened health care systems and shortages of medical supplies, the highest numbers of patients and deaths from COVID-19.

As a result, the countries — China and Russia — that prioritized preserving the nation's health rather than economic interests from the beginning of the pandemic handled the pandemic much better. They took the last 2 places both among the countries compared in terms of morbidity during the entire pandemic period and in terms of the number of cases at the peak of the Omicron-induced SARS-CoV2 wave (see table). This demonstrates the effectiveness of the anti-epidemic measures implemented in these countries throughout the pandemic period.

Conclusion

The epidemic process of COVID-19 in these countries depended on the timeliness, duration and scope of restrictive and quarantine measures introduced during different periods of the pandemic. Detailed analysis of pandemic management at each stage in different states with different economic and medical circumstances and different government and societal attitudes towards restrictive measures is needed to improve pandemic preparedness plans for respiratory viral pandemics.

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Материал поступил в редакцию 13.04.22; статья принята после рецензирования 11.05.22; статья принята к публикации 23.06.22
The material was received 13.04.22; the article after peer review procedure 11.05.22; the Editorial Board accepted the article for publication 23.06.22