

## SPECIFICS OF COVID-19 IN SIBERIA

TIKHONOV D.G.

<http://doi.org/10.33384/26587270.2021.05.01.08e>

The geographical area of Siberia is about 13,100,000 sq. km, which is more than the territories of the United States, China, Canada, Brazil, Australia, and India, but its total population as of January 1, 2021 is only 31,140,697 people [1]. Due to its harsh climate, many diseases, including infectious ones, have their own specific development patterns in this territory.

As of May 14, 2021, 161,818,233 people contracted COVID-19, and 3,358,164 patients died as a result of it globally [2]. For the first time, COVID-19 was diagnosed in Siberia on March 15, 2020 in the Tyumen Region. The peak of incidence of the first wave was reached on July 13, 2020, when the number of cases in Siberia reached 1,980 per day. After

that, the incidence began to decline and the lowest rate was reached on August 28, 2020 – 912 cases per day. The peak of the second wave was registered on November 27, and it amounted to 4,024 cases (Fig. 1).

The incidence peak in Siberia was observed in the height of summer (June and July), and the second wave—in the coldest winter months (November through January). In some regions of Siberia, the same ranges were observed with a small difference (Fig. 2).

Unlike other regions of Siberia, the third wave of COVID-19 has begun in Yakutia (Fig. 3). The peak of the first wave was recorded on May 30, 2020, and amounted to 114 cases per day. The number of diagnosed patients declined to 41 cases

on August 31, and then the second wave started, which peaked on November 23, 2020 with 244 infected people. On March 26, 2021, the number of cases decreased to 25, but on April 14, an increase in incidence began and on May 10, 115 new patients were registered (Fig. 3) [3]. The third wave of coronavirus infection in Yakutia was caused by the introduction of the British SARS-Cov-2 strain to the area.

The number of COVID-19 cases in Yakutia has a negative correlation with the average daily temperature (Fig. 3). For example, the Spearman's rank correlation coefficient  $r$  calculated using the IBM SPSS program is  $-0.347$  ( $p < 0.001$ ), Kendall's test  $-0.219$  ( $p < 0.001$ ), and the Pearson correlation coefficient  $-0.488$

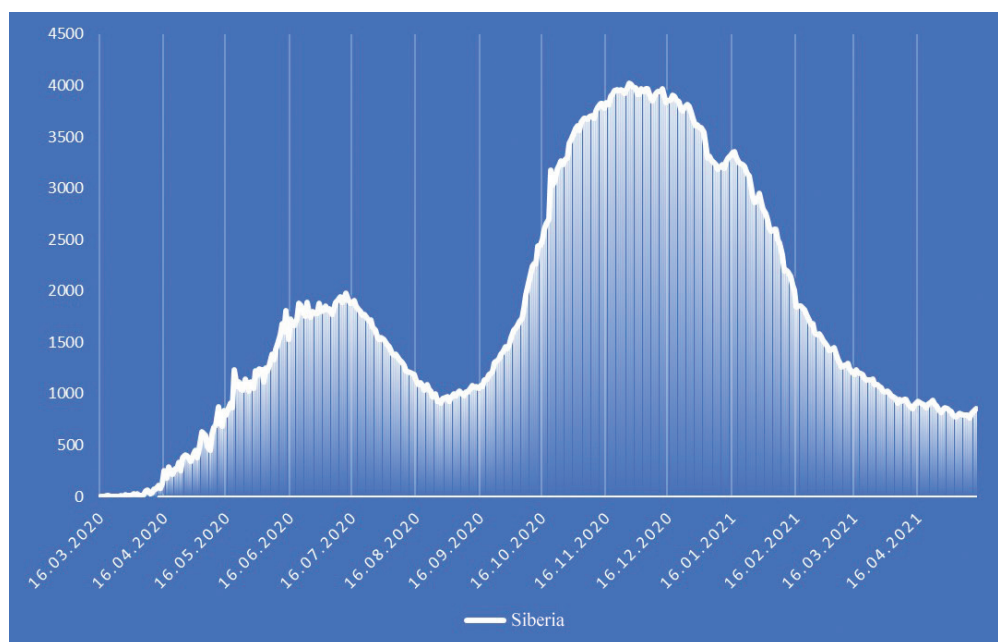


Fig. 1. Number of daily new cases of COVID-19 in Siberia  
Data on the number of COVID-19 cases were obtained from the Yandex DataLens database [3]

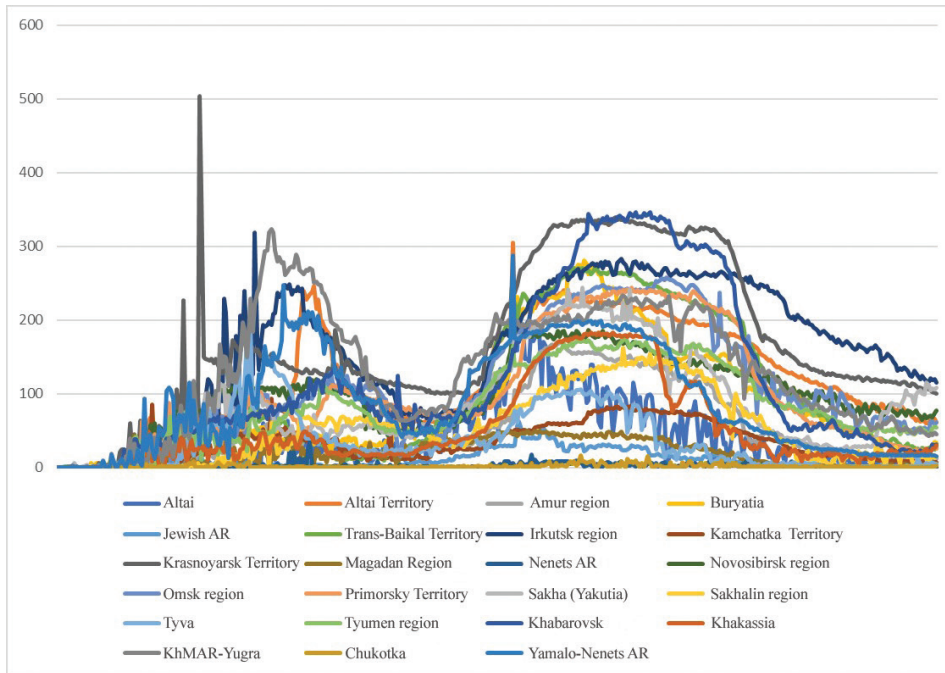


Fig. 2. Daily new cases of COVID-19, breakdown by regions of Siberia [3]

( $p < 0.001$ ). This phenomenon is probably due to the fact that people mostly stay at home during periods of low temperatures in the North. Overcrowd and inability to air the premises during  $\sim 40\text{ }^{\circ}\text{C}$  frosts are predisposing factors for increased morbidity in the winter months in

Siberia. There is a trend of a repeating annual cycle of COVID-19 morbidity in Yakutia, as since April 14 there, again, has been an increase in the number of newly diagnosed cases.

Having worked as an infectious disease specialist in my younger

years, I noticed that with the onset of summer, the incidence of intestinal infections grows, and the onset of cold weather is associated with a growing number of respiratory infection cases. The incidence pattern of COVID-19 in Siberia resembles an intestinal infection, on the one

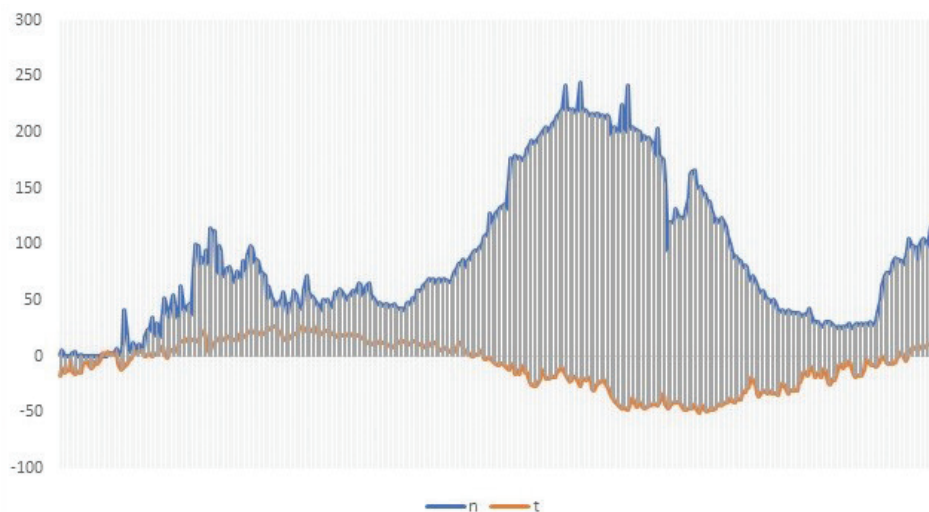


Fig. 3. Daily new cases of COVID-19 in the Republic of Sakha (Yakutia) from the beginning of the epidemic to May 14, 2021.

n – number of COVID-19 patients; t – average daily temperature. Average daily temperature in Yakutsk was obtained from the Weather and Climate website [4]

hand, and a respiratory infection, on the other hand. We call this pattern the “Siberian phenomenon” as its cause is unclear. What is the “Siberian phenomenon” of COVID-19? We believe that it is due to the very nature of the COVID-19 infection, that in some patients a mild disease has intestinal symptoms, while in others, severe signs of a respiratory infection predominate [5]. It is known that SARS-CoV-2 survival in the gastrointestinal tract depends on the pH of gastric secretions. In a cold climate, the human body adapts to the cold through increasing energy spent for heat production and saving it in other systems. The proton pump of the gastric mucosa is a very energy-consuming mechanism, so the body has adapted to synthesize pepsin, which is able to digest protein foods at low pH levels. Therefore, it should be noted that in cold climates hypoacid and anacid conditions of the gastric mucosa are frequent [6]. It is likely that such conditions contribute to SARS-

CoV-2 infection through the gastrointestinal tract.

The incidence of COVID-19 in Siberia varies significantly by regions (Fig. 4). The underlying factors are not clear. For example, the incidence in the Altai Republic and in the Yamalo-Nenets Autonomous Region (YaNAR) is almost the same, although the per capita gross domestic product in the Altai Republic in 2019 was more than 20 times lower than in the Yamalo-Nenets Autonomous Region, i.e. 268,657.4 rubles versus 5,710,467.4 rubles per capita, respectively [7].

In our opinion, the incidence of COVID-19 is determined by the nature of anti-epidemic measures carried out by the regional authorities. Thus, the lowest incidence was recorded in the Novosibirsk Region, where, unlike other regions of Siberia, the strictest restrictions were imposed with the closure of cafes, restaurants, bars, and other institutions and enterprises of mass gatherings, etc. In this region, 100% test-

ing for SARS-CoV-2 is carried out in all patients with acute respiratory diseases; constant monitoring of the population’s compliance with epidemic prevention measures is carried out, and as of May 14, 2021, almost 15.4% of the Novosibirsk Region population has been vaccinated [8]. The state authorities of the People’s Republic of China can set an example of efficient anti-epidemic measures. China remains the only country (along with the Pacific Island States) to have had only one wave of the pandemic. Until now, the country has successfully prevented new outbreaks of the disease. In this regard, it should also be noted that China is the only country that has established control over the possible transmission of SARS-CoV-2 via cold chain. These measures probably play a role in curbing the epidemic. On the other hand, in the West, bars and restaurants are the main sources of infection, and mass coronavirus infections at weddings and mass events with feast celebrations

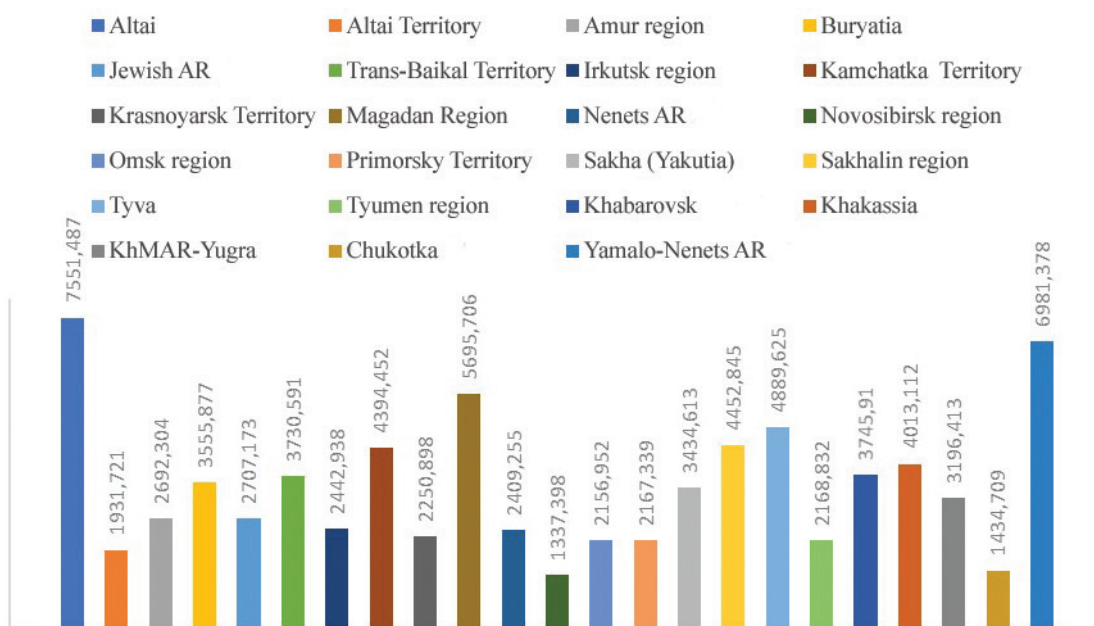


Fig. 4. The number of COVID-19 cases per 100,000 people by Siberia regions (from March 15, 2020 to March 15, 2021)

are common. Previously, outbreaks of intestinal infections were often linked to such events.

In conclusion, it should be noted that, there were two peaks in COV-

ID-19 incidence in Siberia: at the height of summer (during the July heat) and at the height of December frosts. It is assumed that the unusual summer peak in the incidence

of coronavirus infections in Siberia can be explained by body adaptation to the cold climate, which increases the risks of infection during summer.

## REFERENCES

1. Wikipedia. Federal districts of Russia [Electronic resource] // Wikipedia, free encyclopedia. 2021. URL: [https://en.wikipedia.org/wiki/Federal\\_districts\\_of\\_Russia](https://en.wikipedia.org/wiki/Federal_districts_of_Russia) (accessed: 14.05.2021).
2. Worldometer. COVID-19 CORONAVIRUS PANDEMIC [Electronic resource] // Worldometers. 2020. URL: <https://www.worldometers.info/coronavirus/> (accessed: 16.11.2020).
3. Yandex. Coronavirus: dashboard [Electronic resource] // Yandex DataLens • Public. 2021. URL: [https://datalens.yandex/7o7is1q6ikh23?tab=X1&utm\\_source=cbmain](https://datalens.yandex/7o7is1q6ikh23?tab=X1&utm_source=cbmain) (accessed: 14.05.2021).
4. Kazakov K. Pogoda i klimat [Weather and climate] [Electronic resource]. 2021. URL: <http://www.pogodaiklimat.ru/monitor.php?id=24959&month=5&year=2021> (accessed: 15.05.2021).
5. Tikhonov D.G., Vladimirtsev V. A. COVID-19. SARS-Cov-2 pandemic, transmission pathways, distribution features, and individual susceptibility // Siberian Research. 2020. 4(4). P. 00 - 00. <http://doi.org/10.33384/26587270.2020.04.02.06e>.
6. Tikhonov D.G. Arkticheskaya medicina [Arctic medicine]. Yakutsk: YANC SO RAN, 2010. 317 p.
7. Federal'naya sluzhba gosudarstvennoj statistiki. Valovyj regional'nyj produkt [Gross Regional Product][Electronic resource]. 2021. URL: <https://rosstat.gov.ru/storage/mediabank/cdiiD8yX/vrp.xlsx> (accessed: 16.05.2021).
8. Oficial'naya informaciya po situacii s koronavirusom v Novosibirskoj oblasti [Official information on the situation with coronavirus in the Novosibirsk region] [Electronic resource]. 2021. URL: <https://antivirus.nso.ru/> (accessed: 16.05.2021).