



## Assessment of the Potential Epidemic Significance of the New Coronavirus Infection (COVID-19) and the Prevention Vaccine Based on the Materials of the Osh Region of the Kyrgyz Republic

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### Abstract

### Original Research Article

The article provides information about the epidemiological situation in the Osh region on COVID-19, assesses the effectiveness of vaccination in relation to the course of the disease, mortality. The typification of the side effect after immunization is given in order to evaluate the effectiveness of vaccination to rationalize the complex of preventive measures in the existing system of epidemiological surveillance. Materials and methods. Research methods retrospective epidemiological analysis, retrospective cohort study, statistical analysis using R software, specifically version 4.0.3 from the R Foundation for Statistical Computing. Statistical reporting data on morbidity from the website of the Department of State Sanitary and Epidemiological Surveillance, and data from the register of vaccinated in the Southern region. Results and discussion. Osh region (102.2) is included in the territories with an average level of diseases, high mortality with high morbidity is the city of Osh: in 2020, 38 deaths from a total of 345 morbidity. The proportion of vaccinated persons in the Osh region is 50.2%, with the largest number of vaccines with Vero Cell (68%), followed by AZD-1222 (8.1%). The disease rate of fully vaccinated is less than 0.1%, partially vaccinated 21% and not vaccinated 46%, with the least (less than 1%) fatal outcome in fully and partially vaccinated. Conclusion. Given the rare adverse events resulting from the use of vaccines, continue booster vaccination among people.

**Keywords:** COVID-19, pandemic, epidemiology, vaccines, district, Osh region.

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## INTRODUCTION

**Relevance of the problem:** according to WHO, due to the COVID-19 pandemic at the end of 2022, the number of infected people amounted to 656.6 million, of which 6.6 million people died [WHO, 2023]. The COVID-19 pandemic continues and since then, what has been happening leads to an increase in the number of people with post-Covid-19 syndrome and statistically significant phenomena injections. Therefore, the experience of almost all issues of the new coronavirus infection continues to consolidate.

Today, it is determined: atypical pneumonia Sars-Cov-2 remains an ongoing infection outside the framework of seasonality despite the development and implementation of vaccine prophylaxis; the virus

mutates with the appearance of variants with a greater possibility of spread; there is no direct antiviral drugs for treatment; problems remain in providing effective care for severe illness in the intensive care unit and intensive care; an increasing problem acquires postcovid syndrome, about which there are more unresolved issues than reliably established. World experience has shown that the unpreparedness of countries to counteract a pandemic can have huge negative consequences associated with the loss of labor resources and economic damage. Statistical analysis and constant monitoring of the incidence of coronavirus infection is one of the important tasks of each state. Constant monitoring, current and retrospective analysis allows you to identify threatening rates of morbidity in time, and act in your own time, preventing the further spread of infection. Also, the assessment of morbidity makes it possible to

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predict the further scenario of the situation, which is extremely important for determining the list of preventive measures [1, 2].

Despite the announcement of a green zone for coronavirus infection, the relevance of the virus remains at the moment. The primary prevention of COVID-19 was not taken seriously by the residents of Kyrgyzstan and the subsequent state regulation around the world. Interdistrict, long-distance travel of people within two to three months has acquired the scale of the epidemic. Since the beginning of the epidemic in Kyrgyzstan, our domestic employees have been actively researching issues of epidemiological significance [3], clinical and laboratory characteristics [4], damage to the respiratory organs [5], nervous system [6], digestive system [7], endocrine system [8], diagnostic measures [9], treatment [10], nutrition [11], rehabilitation of patients with a new coronavirus infection [12] in order to improve the epidemiological situation and save the lives of patients. Due to the lack of a vaccine, the main preventive measures of the public health system are aimed at non-specific approaches generally accepted throughout the world, including personal hygiene, isolation of patients and contact persons, physical distancing, closure of public places and restrictions on movement and travel. Identification of risk areas was one of the main tasks in the system of epidemiological surveillance of infectious diseases. I hope for help in the main fight against COVID-19, given the approval of the vaccine, possibly to prevent infection with SARS-CoV-2.

## OBJECTIVE

To analyze the incidence of COVID-19, to evaluate the effectiveness of vaccination in relation to the severity of the disease in residents of the Osh region in order to rationalize the complex of preventive measures in the existing system of epidemiological surveillance.

## MATERIALS AND METHODS OF RESEARCH

To study the incidence of a new coronavirus infection, a retrospective epidemiological analysis was carried out in patients with a new coronavirus infection in the Osh region of the Kyrgyz Republic and data from the DGSEN from the website of the Department of State Sanitary and Epidemiological Supervision of the Ministry of Health of the Kyrgyz Republic for three years from 2020 to 2022 were used.

A retrospective cohort study was conducted among residents of the Osh region who received vaccinations against COVID-19, data from the register of vaccinated in the Southern region. This register

contained socio-demographic data (full name, gender, date of birth, place of residence, citizen identification number, profession, date of vaccination, dose and names of the vaccine), all these variables were used for analysis.

The number of COVID-19 breakthrough cases prevented by vaccination was determined by multiplying the number of vaccinated people by the total incidence among the unvaccinated population and subtracting the number of breakthrough cases.

For statistical analysis, R software was used, specifically version 4.0.3 from the R Foundation for Statistical Computing. During the analysis, morbidity indicators were calculated and visualized for vaccinated and unvaccinated populations for each day of the analysis, broken down by type of vaccine. Graphs showed the dynamics of morbidity during the study period.

## RESULTS AND THEIR DISCUSSION

Epidemiological characteristics for three years according to the results of PCR diagnostics in the Kyrgyz Republic, when differentiating the territories of the region by the number of patients, a variety was established for every three years. At the beginning of the 2020 pandemic, the Batken region (707.0 cases) was assigned to the group of territories with a very high level of cases (over 10,000 patients), and Bishkek (539.9) and Issyk-Kul region (325.6), Osh (322.2), Talas were assigned to the category with a high level (from 250 to 600 patients). area (251.4). The group with an average number of patients (from 100 to 249) included the Chui region (212.2), Jalal-Abad region (211.2), Osh region (102.2). The lowest incidence rate was shown by the Naryn region (11.7).

Table 1 shows the prevalence of coronavirus infection by PCR diagnostic methods. The most affected area is the area of a high degree of real epidemic danger for all these three years, the city of Bishkek accounts for 68549 (714.4 in intensive indicators), 2021 (450.7), 2022 (122.7) of the total incidence of new coronavirus infection. This is due to the fact that according to official data, the country's population lives in two large cities (in which 21% of the total population lives), medium-sized cities (13% of the population) and rural areas (66% of the population), i.e. internal migration. In practice, however, the share of small towns and rural areas in the total population is less than official statistics state, since many residents registered in these areas actually migrated to Bishkek and, slightly less, to Osh. Second, there may be a large number of hospitals (national, republican, city hospitals) and laboratories that have a high detectability.

**Table 1: Summary data of SARS-CoV-2 on ICD-10 07.1 RNA SaRS-CoV-2 by PCR in the Kyrgyz Republic from 2020 to 2022 (data dgsen.kg)**

Name of regions and cities	Number of inhabitants	Abs. number of patients		Abs. number of cases children under 14 years of age		Intensive indicators per 10,000 population	
		PCR(+)	PCR(-)	PCR+	IIIP-	всего	children under 14 years of age
Bishkek city	1098600	68549	9939	4506	117	714,4	42,0
Chuy r	985500	6125	9544	988	236	158,9	12,4
Issyk-Kul r.	505900	5817	3205	168	58	178,3	4,4
Naryn r.	294200	914	1122	35	9	69,2	1,4
Talas r.	274000	2163	539	81	2	98,6	0,3
Dzhalal-Abad r.	1282200	7581	4330	444	16	92,8	3,5
Batken r.	558600	8672	847	262	1	170,4	4,7
Osh r.	1414700	4837	4219	183	15	64,0	1,3
Osh city	333600	3862	1380	408	8	157,1	12,4
Total for Kyrgyzstan	6747300	108520	35125	7075	462	212,8	11,1

The state of the problem of the epidemic of a new coronavirus infection in 2022, there is a decrease in the incidence of 30.7 cases in intensive indicators in all regions of the Kyrgyz Republic.

Today, without exaggeration, it can be noted that epidemiological zoning has become an integral component of the basis for the organization of epidemiological surveillance in almost all nosological forms of infectious diseases. With the beginning of the pandemic, the Osh region took the 3rd-4th place in terms of the spread of morbidity, the implementation and observance of preventive measures, as well as the detection of diseases, plays an important role here.

In the Osh region of the Kyrgyz Republic, the number of COVID-19 patients totaled 10,889 people, respectively, the number of patients diagnosed with coronavirus infection confirmed by laboratory tests (ICD code 10U07.1) there were 3084 cases, (2020 n = 1915;

2021 n = 1169); while of them clinical and epidemiological (ICD code 10U07.2) there were n=7805 cases (2020 n= 5979; 2021 n=1826) in Tables 2, 3. An analysis of the condition of patients diagnosed with coronavirus infection confirmed by laboratory studies in the Osh region by districts showed that high mortality with high morbidity is the city of Osh: in 2020, 38 deaths from a total of 345 morbidity, coronavirus infection confirmed by clinical and epidemiological was Uzgen district 48 deaths out of 1537.

During the COVID-19 pandemic, effective vaccination of the population to protect against the disease and reduce the incidence rate became an important task. One of the regions where active vaccination is carried out is the Southern region of the Kyrgyz Republic. In this region, studies are being conducted to assess the effectiveness of vaccination, as well as its impact on the dynamics of morbidity and mortality from COVID-19.

**Table 2: Number of patients diagnosed with coronavirus infection confirmed by laboratory tests (ICD- 10) U07.1 for 2020 in the Osh region of the Kyrgyz Republic**

Name of regions and cities	patients				ICD-10 U07.1 PHK SaRS-CoV-2 with PCR			
	2020y		N=1915		Discharged N=1809		Number of death N=99	
	n	%	n	%	n	%	N	%
Alay r	111	5,8	111	5,8	98	5,5	13	13,1
Aravan r	340	17,8	340	17,8	323	18,0	11	11,1
Kara-Suu r	318	16,6	318	16,6	303	16,7	14	14,1
Kara-Kuldja r	124	6,4	124	6,4	123	6,8	11	11,1
Uzgen r	278	14,5	278	14,5	268	14,7	5	5,1
Nookat r	347	18,1	347	18,1	335	18,4	6	6,1
Chon-Alay r	52	2,7	52	2,7	51	2,8	1	1,1
Osh city	345	18,1	345	18,1	308	17,1	38	38,3
Total	1915	100	1915	100	1809	100	99	100

Coronavirus vaccines have been developed and have passed thorough clinical trials [13], demonstrating their effectiveness and safety [14]. On March 29, 2021,

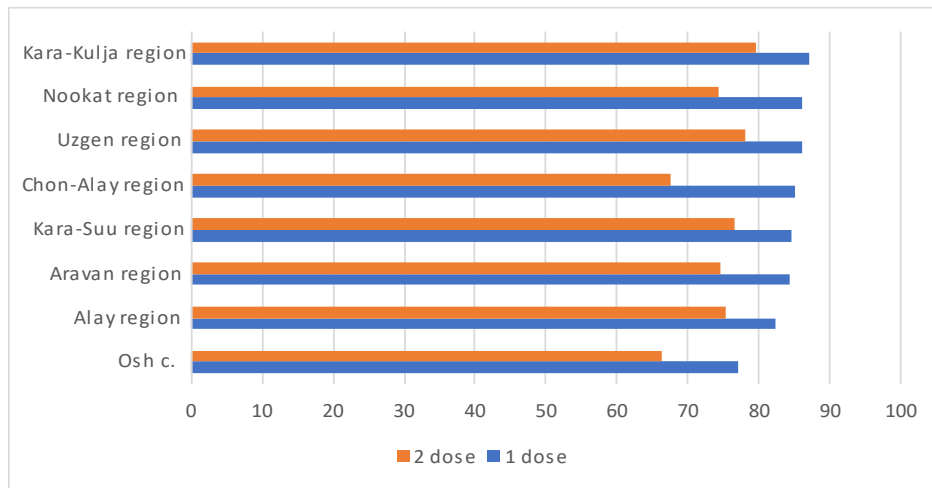
vaccination against COVID-19 began in the country, which was the result of a decrease in the incidence and a victory over the epidemic. As of 01.02.2022, 1122,155

people were vaccinated in Kyrgyzstan - 50.3% of the subject contingent. With the beginning of vaccination, mass vaccination is carried out in all regions in order to

acquire collective immunity, and this is shown by the results of the analysis of the proportion of vaccinated persons in the regions of the Osh region (Figure 1).

**Table 3: Number of patients diagnosed with coronavirus infection confirmed clinical and epidemiological (ICD - 10 U07.2) for 2020 in the Osh region of the Kyrgyz Republic**

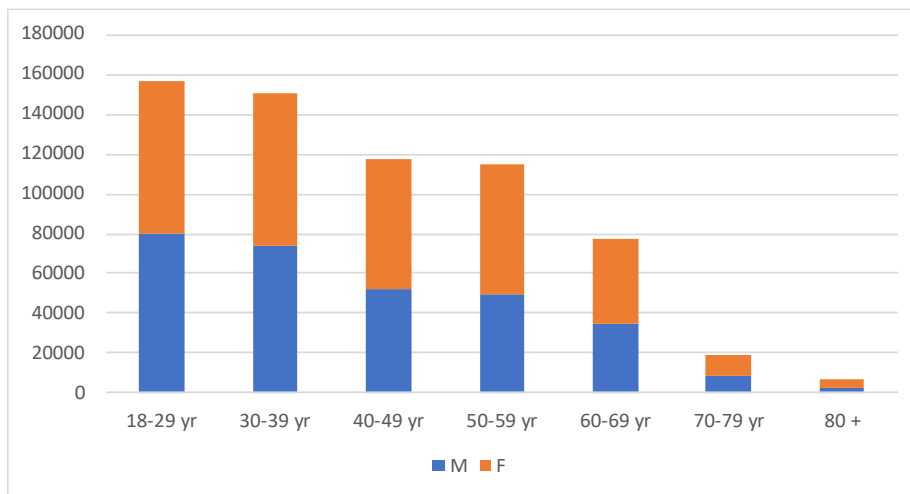
Name of regions and cities	ICD -10 U07.2					
	Received N=5979		Discharged N=5650		Number of death N=199	
	n	%	n	%	n	%
Alai r	330	5,6	315	5,6	15	7,5
Aravan r	713	11,9	676	11,9	16	8,1
Kara-Suu r	1093	18,2	1061	18,7	26	13,1
Kara-Kuldja r	306	5,2	302	5,4	17	8,5
Uzgen r	1537	25,7	1501	16,5	48	24,1
Nookat r	1297	21,6	1241	21,9	28	14,1
Chon-Alai r	203	3,4	199	3,6	4	2,1
Osh city	500	8,4	355	6,3	45	22,5
Total	5979	100	5650	100	199	100



**Figure 1: The proportion of vaccinated persons against COVID-19 Osh, in the Osh region 2022**

Active immunization is underway in all districts of the Osh region, with the aim of acquiring collective immunization. Immunization saves millions of lives and

is one of the most effective public health interventions that protects individuals and the general population from deadly vaccine-controlled infections.

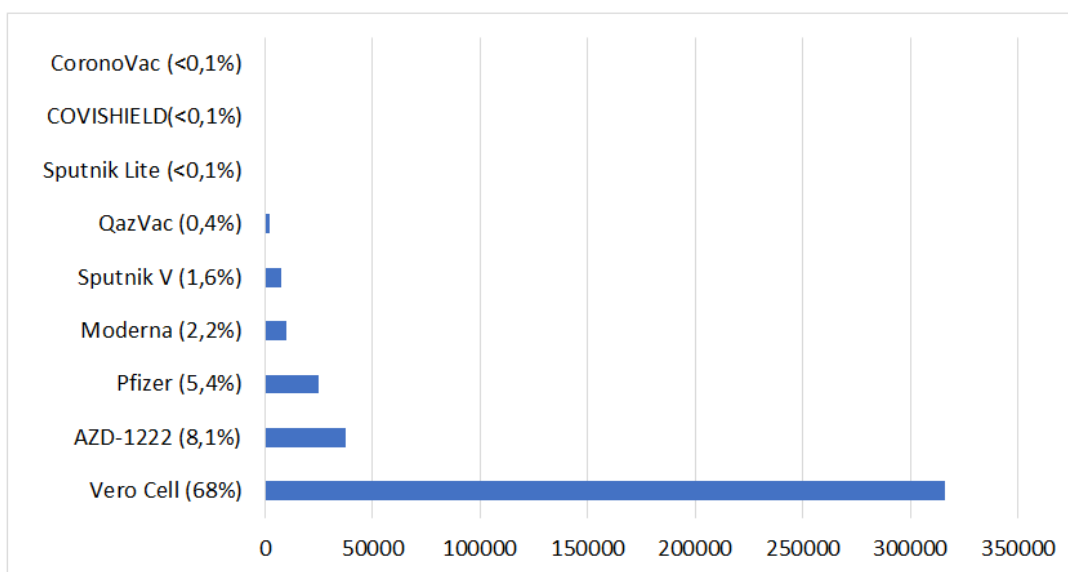


**Figure 2: Number of vaccinated persons by gender and age groups**

The number of vaccinated is shown in Figure 2 and shows that the bulk of vaccinated are young people from 18 to 29 years old, which amounted to 157,041 (24.4%) percent of the total number of vaccinated, the age category of persons from 30 to 39 years old, which amounted to 150,361 people or (23.4%), the remaining categories of vaccinated were below 20%.

Vaccination in the Osh region was carried out with different types of vaccine. In Figure 3 we see that Vero Cell had the largest number of vaccines (68%), followed by AZD-1222 (8.1%), followed by the Moderna vaccine (2.2%), Sputnik V (1.6%) the remaining vaccines were below 1% of all vaccines used in the Osh region of the Kyrgyz Republic.

To determine the role of vaccination in reducing morbidity and mortality, an analysis of the status of morbidity was carried out. Of the vaccinated individuals, 75,261 had COVID-19 - 5.3% of cases, and it was revealed (Table 4) that the disease rate of fully vaccinated was less than 0.1%, partially vaccinated 21% and not vaccinated 46%. This suggests that the risk of getting sick with this species increases in those who are not vaccinated. Of these, 99% of all deaths occurred in unvaccinated people, while fully and partially vaccinated deaths were less than 1%. Each dose of vaccination affects the level of morbidity and mortality, with a large proportion of deaths in partially vaccinated - 2.43% compared to vaccinated - 0.8%.



**Figure 3: Distribution of vaccines in the Osh region of the Kyrgyz Republic 2021**

When analyzing cases of deaths, it was revealed that out of 7 patients were not vaccinated according to the true status of vaccines (Table 4).

**Table 4: Effects of vaccination on morbidity and mortality**

Name	Vaccinated N = 75,261	Partially vaccinated N = 37,758	P-value <sup>2</sup>
Severe stage COVID-19			<0,001
No	60,612 (95%)	32,094 (85%)	
Yes	3,411 (5,3%)	5,663 (14,9%)	
Fully vaccinated (<0,1%)	30 <0,1%	398,104 (100%)	
Fatal outcome			<0,001
No	75,254 (99%)	35,986(97,8%)	
Yes	7 (0,8%)	120(2,43%)	

The vaccines used in the national immunization program are safe [15] and effective. However, no vaccine, like any drug, is absolutely safe, and after immunization, some individuals may experience side effects.

The system of epidemiological surveillance of adverse and undesirable manifestations was evaluated by observing selected medical organizations in Osh and Osh

region, analyzing all reports, regulatory documents, clinical protocols, and electronic tracking of cases of adverse and undesirable manifestations after immunization.

In the city of Osh, a total of 204 cases of side effects after vaccination were registered, of which the average time of appeals was 5-6 days, the standard

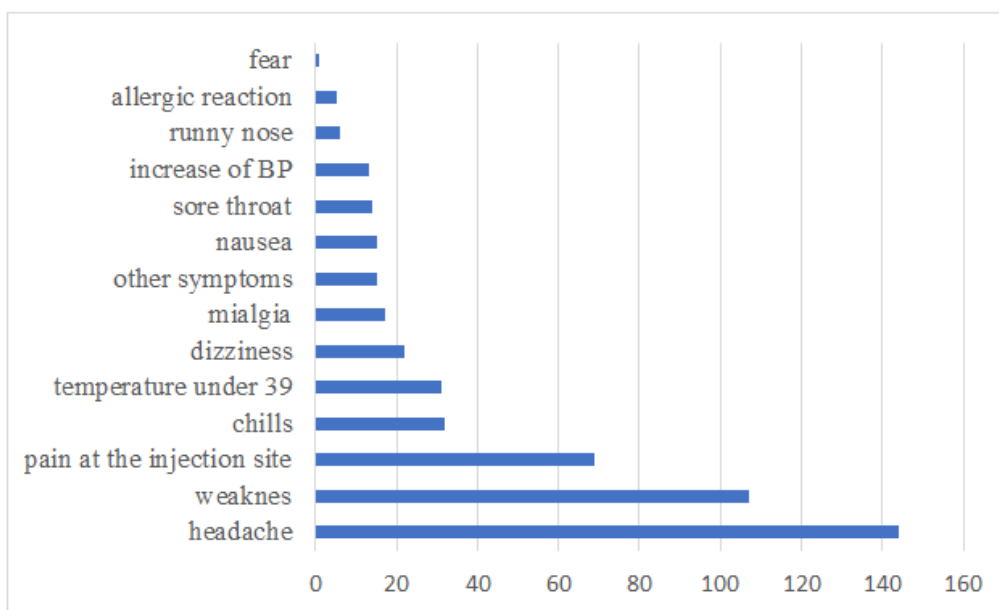
deviation of 19.2, the median of appeals was 1 day after receiving the vaccine.

In the Osh region, a total of 245 cases of side effects after vaccination were registered, of which the average time of appeals was 4-5 days, the median was 1 day, the standard deviation was 12.22 days.

The maximum day of appeals for the city of Osh was 154 days, for the Osh region 151 days. This is due to the fact that even late treatment is recorded, there is

constant monitoring, monitoring of the vaccination system.

The figure shows that the most contingents reported fear 1, allergic reaction - 5, runny nose - 6, increased blood pressure - 13, sore throat - 14, muscle pain - 17, with the least symptoms headaches. In order to identify all possible side effects after vaccination, against COVID-19, there is a constant registration of any changes in the state of health.



**Figure 4: The number of requests for the severity of symptoms after vaccination**

The effectiveness of vaccines also remained relatively stable during the period, despite a slight decrease observed in the months when the delta variant of SARS-CoV-2 became the predominant circulating strain worldwide. Although COVID-19 vaccines used worldwide are very effective, people who are fully vaccinated may have a breakthrough of SARS-CoV-2 infection, especially when the incidence is high and the proportion of vaccinated in the population is low. However, out of every 100 people fully vaccinated in the Osh region of the Kyrgyz Republic during the period of our study had breakthrough infections. The low proportion of people making a COVID-19 breakthrough in our study is within the range recorded in other conditions (from <1 to 8%).

## CONCLUSION

Thus, currently the epidemiological situation is stable throughout the districts of the Osh region. As a result of the organization of vaccination, COVID-19 disease is regressing for all types of vaccines, the proportion of people who have had coronavirus infection is very small, which was revealed by the analysis of the vaccination status of people vaccinated and not vaccinated.

Our results coincide with the recommendation of the Kyrgyz Republic to offer booster vaccination for the elderly, as well as with the recommendations of the CDC and WHO on booster doses for all vaccinated adults.

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