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# Impact of Preventive Measures Against Covid-19 on the Prevalence of Infectious Diseases Among the Population of The Republic of Kazakhstan

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## ABSTRACT

**Aim:** To study the impact of COVID-19 preventive measures on airborne and fecal-oral infectious diseases in Kazakhstan

**Materials and Research Methods:** We used comparative data from the Study of Sanitary and Epidemiological Control of Infectious Morbidity in the Population of the Kazakhstan for 2019-2020. In this case, there are infectious diseases transmitted mainly by airborne droplets among the entire population (children, adolescents and adults) and diseases with fecal-oral transmission.

**Results:** The total number of cases detected was 1,239,635. Thus, the percentage change in the total number of cases from 2019 to 2020 was - (+) 5.6%. In 2019, 596,216 cases of infectious diseases transmitted by airborne droplets were detected, and in 2020 - 631,407, i.e. 35,191 more were revealed (+5.9%). ARVI and influenza account for the largest proportion in this group, and the incidence has increased in these groups. At the same time, exacerbations of diseases transmitted by the fecal-oral route: from 2019 to 2020, diseases occurred in 1,716 (-38.8%) cases.

**Conclusion:** This study demonstrated a useful effective COVID-19 prevention measure for several other infectious diseases in Kazakhstan during the pandemic. However, special attention should be paid to the increase in the incidence of ARVI and influenza in Kazakhstan. Possible exceptions, according to the authors, are ignoring the high incidence of influenza and ARVI in 2020 compared to 2019, since special attention was focused on COVID-19. The next hypothesis is the impact of COVID-19 on influenza immunization in the country - restrictive measures have reduced the number of influenza vaccinated.

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## Introduction

Since the start of the COVID-19 outbreak in the Wuhan Province of the People's Republic of China, measures have been taken around the world to prevent the spread of the virus. This list of preventive measures included: regular washing and disinfection of hands, the use of protective masks, remote work and study, as well as a ban on gathering people in enclosed spaces (public events). The main strategy to reduce the frequency and duration of contact among possibly infected people was to limit contact [1-5].

Scientists at the beginning of the pandemic assumed the effectiveness of these preventive measures in relation to COVID-19 and other infectious diseases. These diseases include seasonal influenza, pneumonia, scarlet fever, measles and chickenpox. For example, the incidence of influenza has decreased by 79 times in New Zealand according to the results of recent studies. Pakistan also saw a decline in incidence among twelve infectious and five non-infectious diseases from 192,000 in 2019 to 91,000 in 2020 [6]. And also there was an 80% decrease among infectious and non-infectious diseases [7]. According to the results of scientists from Taiwan, the incidence of respiratory viral diseases decreased by 28.2% in 2020 compared to 2019 [8-10]. There was also a decrease in the number of severe influenza and tuberculosis among the country's population during the COVID-19 pandemic [10,11]. The issue of the impact of the COVID-19 pandemic on all healthcare structures is also relevant for the Republic of Kazakhstan. In Kazakhstan, as of December 3, 2021, the number of confirmed cases of SARS-COV-2 reached 1.06 million, including 17,871 deaths after its first laboratory confirmation on March 13, 2020 [11]. In this regard, we conducted a study to study the impact of preventive measures against COVID-19 on infectious diseases transmitted by airborne and fecal-oral routes in the Republic of Kazakhstan.

## Materials and Methods of Investigation

### Study Design

**Retrospective Study:** Impact of an Incident (COVID-19) on the Prevalence of Certain Infectious Diseases.

### Data Sources

We used the comparative data of the Committee for Sanitary and Epidemiological Control on the infectious morbidity of the population of the Republic of Kazakhstan for 2019-2020. To assess the potential impact of COVID-19 on the occurrence of notifiable airborne infectious diseases in Kazakhstan, we estimated the number of cases between January 1 and December 31, 2019 and 2020 for comparison. In this study, infectious diseases transmitted mainly by airborne droplets were studied: whooping cough, purulent (unspecified etiology) and serous (unspecified etiology) meningitis, chicken pox, measles, acute respiratory viral infection (ARVI) and influenza; and diseases with fecal-oral transmission: salmonella infections, bacterial and viral intestinal infections of unspecified etiology, rotavirus enteritis and bacillary dysentery. There are 11 diseases analyzed in total.

### Compilation of the Database

A summary table was compiled from the data received from the Committee for Sanitary and Epidemiological Control on the infectious morbidity of the population of the Republic of Kazakhstan for 2019-2020. All tables are made in the Microsoft Office Excel spreadsheet program.

### Statistical Method

This study used the statistical method described in the article by Stuart J Pocock "The simplest statistical test: how to check for a difference between treatments" [12]. The Z score calculation was used to compare the results of 2019 and 2020.

### Results

The total number of patients in the study was 1,239,635. A total of 11 diseases were analyzed in this study. Of these, 7 are infectious diseases transmitted mainly by airborne droplets, and 4 are transmitted by the fecal-oral route. The number of cases of all diseases was 602,848 in 2019 and 636,787 in 2020. Thus, the percentage change in the total number of cases from 2019 to 2020 was - (+) 5.6%. Diseases that attract attention with an increase in the number of infected people are ARVI and influenza. 93.1% of the total number of studied patients for all types of diseases were patients with acute respiratory viral infections and influenza (n=1,154,571). Epidemiological data for the studied groups of infectious diseases are shown in Table 1.

**Table 1: Epidemiology of infectious diseases, January to December 2019 and 2020**

| № | Disease | Number of cases | | Deviation in absolute numbers | Deviation in percent | z-score | p-value |
|---|---|---|---|---|---|---|---|
| | | 2019 | 2020 | | | | |
| **(A) Diseases transmitted by airborne droplets:** | | | | | | | |
| 1 | Whooping cough | 147 | 54 | -93 | -63,3 | 6,55 | p<0,001 |
| 2 | Purulent meningitis | 247 | 48 | -199 | -80,6 | 11,5 | p<0,001 |
| 3 | Serous meningitis | 1429 | 62 | -1367 | -95,7 | 35,4 | p<0,001 |
| 4 | Chicken pox | 41841 | 17520 | -24321 | -58,1 | 99,8 | p<0,001 |
| 5 | Measles | 13326 | 3270 | -10056 | -75,5 | 78,1 | p<0,001 |
| 6 | ARVI | 539 226 | 610 453 | +71 227 | +13,2 | -66,4 | p<0,001 |
| 7 | Inflluenza | 2214 | 2678 | 464 | +21,0 | -6,6 | p<0,001 |
| **(B) Diseases transmitted by the fecal-oral route:** | | | | | | | |
| 8 | Salmonella infections | 1099 | 504 | -595 | -54,1 | 14,9 | p<0,001 |
| 9 | Bacterial dysentery | 656 | 184 | -472 | -72,0 | 16,3 | p<0,001 |
| 10 | Bacterial and viral intestinal infections, unspecified | 1 397 | 1 150 | -247 | -17,7 | 4,9 | p<0,001 |
| 11 | Rotavirus enteritis | 1 266 | 864 | -402 | -31,8 | 8,7 | p<0,001 |
| | Total | 602 848 | 636 787 | +33939 | +5,6 | -30,5 | p<0,001 |

### Airborne Diseases

Among 7 diseases transmitted mainly by airborne droplets (Figure 1), the number of cases of serous meningitis of unspecified etiology decreased by 95.7% compared to 2019. If 1429 cases were registered in 2019, then in 2020 there were 62. The next group with a decrease in registered cases of diseases are purulent meningitis of unspecified etiology - the level decreased by 80.6%, i. from 247 cases in 2019 to 48 cases in 2020. In 2020, measles infection among the population of Kazakhstan decreased by 75.5%. In 2019, there were 13326 cases of measles, and in 2020 this figure dropped to 3270 cases.

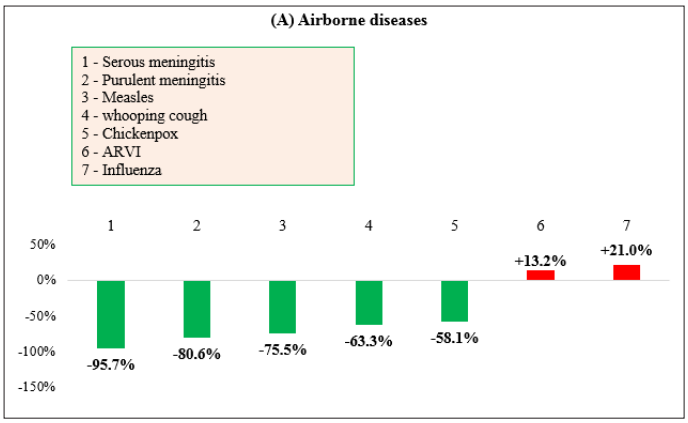


**Figure 1:** Reducing the number of airborne diseases (p<0,001)

The incidence of whooping cough, one of the main symptoms of which is a dry spasmodic cough, decreased by 63.3%. In 2019, 147 cases of this disease were noted, the next year the number of cases decreased to 54. Compared to 2019, the incidence of chickenpox decreased by 58.1% (in 2019 - 41841, in 2020 - 17520).

A significant group of infectious diseases in the Republic of Kazakhstan, the registration of which has not decreased, but rather increased, is ARVI and influenza (Figure 1). In 2019, 539,226 sick people were recorded. In 2020, the Covid-19 pandemic began around the world, engulfing Kazakhstan. The symptoms of Covid-19 and ARVI are largely similar, and PCR analysis is used for the etiological identification of the disease. In 2020, the number of patients diagnosed with acute respiratory viral infections increased to 610,453. The difference was 71,227 people, i.e. the number increased by 13.2%.

The number of people with influenza also increased by 21.0% (n=464). In 2019, there were 2214 patients with influenza, and in 2020 there were 2678.

**Diseases Transmitted by the Fecal-Oral Route**

The study included 4 groups of diseases transmitted by the fecal-oral route. These are salmonella infections, rotavirus enteritis, bacterial and viral intestinal infections of unspecified etiology, bacillary dysentery (Figure 2). It was revealed that the number of cases of intestinal infections, regardless of the type of infection, decreased from 4,418 in 2019 to 2,702 cases in 2020. The reduction in the number of cases over the studied periods was 38.8% (-1,716) cases. The incidence of bacillary dysentery in 2020 decreased by 72% compared to 2019. In 2019, the number of cases with confirmed bacteriological culture was 656 people, and in 2020 - 184. If the diagnosis of Salmonella infections in 2019 was made to 1099 patients, then in the next 2020 504 patients were registered (a decrease of 54.1%). In 2019, rotavirus enteritis was detected in 1,266 patients who applied to city polyclinics for medical help. In 2020, the number decreased by 31.8%, and amounted to 864 cases. The incidence of bacterial and viral intestinal infections with unspecified etiology decreased by 17.7% (from 1,397 to 1,150 cases) (Figure 2).

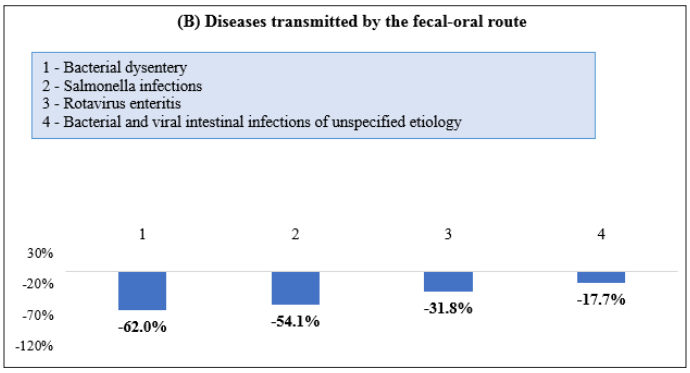


**Figure 2:** Reducing the number of diseases transmitted by the fecal-oral route (p<0,001)

**Discussion**

This study examined changes in the incidence of a range of infections before and during the COVID-19 pandemic in Kazakhstan and produced several important findings. COVID-19 is a respiratory infectious disease and the main route of transmission is person-to-person contact or direct contact with respiratory droplets produced when an infected person coughs or sneezes. Therefore, many public mitigation measures have been developed to prevent transmission, such as wearing a mask, universal hygiene, social distancing, and avoiding crowded places. Preventive measures taken during the Covid-19 pandemic have reduced the incidence of infections with the fecal-oral mechanism (p<0,001) and diseases with the main airborne transmission mechanism (p<0,001), with the exception of ARVI and influenza, the number of which, on the contrary, increased by 13.2%. Of the total number of patients, whose number in the study was 1,239,635 people - 93.1% are patients with acute respiratory viral infections and influenza. Due to the increase in cases of ARVI and influenza in Kazakhstan, the difference in the number of cases of all infectious diseases (included in the study) between 2019 and 2020 was 33,939, with a percentage change of +5.6%. During the analysis by the statistical method, it was also revealed that the null hypothesis about the absence of data changes in 2020 compared to 2019 is rejected (p<0.001), i.e. preventive measures against COVID-19 have affected the change in the incidence of the studied diseases.

We put forward two possible reasons for this situation:

1. The increase in the number of acute respiratory viral infections and influenza may be due to the fact that since March 2020 the main attention of the health care system of Kazakhstan has been paid to COVID-19, and for this reason, the increase in the incidence of acute respiratory viral infections and influenza has remained in the shadows. In our opinion, during the COVID-19 pandemic, the country's population continued to suffer from ARVI and influenza. Perhaps, due to similar symptoms, many patients who sought medical help in medical institutions were not correctly referred for additional examination, i.e. the population in the vast majority of cases was examined for coronavirus infection (PCR tests for SARS-CoV-2), but did not undergo laboratory testing for influenza and other acute respiratory viral infections.
2. Influenza was a clinically and epidemiologically underestimated disease. As a result of restrictive measures in the context of the COVID-19 pandemic, the number of people vaccinated against influenza has decreased.

## Conclusion

The conducted study demonstrated the side positive benefit of COVID-19 prevention measures for several infectious diseases in the Republic of Kazakhstan during the pandemic and showed the threat and risk of spreading other ARVI and influenza ($p<0,001$). These discoveries have once again shown the importance of continuing to implement COVID-19 prevention measures to prevent the spread of SARS-CoV-2, as well as other infections. Therefore, given the impressive inter-annual reduction in the incidence, we recommend maintaining certain public hygiene measures in the future. Also, special attention should be paid to the increase in the incidence of ARVI and influenza in Kazakhstan despite the ongoing preventive measures against Covid-19. Possible reasons, according to the authors, are a decrease in alertness to influenza, ignoring the high incidence of ARVI and influenza in 2020 compared to 2019, since the main attention was focused on the new coronavirus infection COVID-19. Perhaps due to similar symptoms, many patients who applied to medical institutions for medical care with signs of a viral infection were not further examined for influenza and other acute respiratory viral infections. The next research hypothesis is the conclusion about the impact of the COVID-19 pandemic on influenza immunization in the country. Despite the high incidence of ARVI and influenza among the population of Kazakhstan, it is possible that restrictive measures in the context of the COVID-19 pandemic have significantly reduced the number of people vaccinated against influenza.

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