COVID-19 is a severe disease, which mainly affects respiratory system and causes lung failure. The disease spread dramatically over the world, including Kazakhstan. Between March 13 and September 30, 2020, a total of 107,979 laboratory confirmed cases of COVID-19 were registered in the republic.

The aim of the study was to describe the epidemiological characteristics of COVID-19 outbreaks in five localities of Beyneu and Karakiya districts of Mangistau region of the Republic of Kazakhstan.

Methods. A descriptive cross-sectional study was carried out in Mangistau region for the period from 31 May 2020 till 06 June 2020 to investigate the epidemiological characteristics of several COVID-19 outbreaks, and to assess the effectiveness of implemented intervention.

Results. In the Mangistau region, in the oil production area, five outbreaks of COVID-19 were registered: two in the Beyneu region (Beyneu settlement and Borankul village), one in the Karakiyan region (Senek village) and two at the Kalamkas and Zhetibay oil fields, where there were foci with the number of cases from two to 100 cases.

Discussion. The main reason for the spread of the disease was overcrowding and cross-contact between oilfield workers, which influenced the registration of outbreaks among workers in field camps. The active movement of workers between camps, the involvement of medical workers with no experience in using PPE to work at checkpoints and local hospitals, as well as the presence of a confirmed case of COVID-19 at funerals where participants did not use respiratory protection also influenced the spread of infection.

Conclusions. This article describes the epidemiologic features of the outbreak series in five settlements located in the oil production zone of Mangistau region of Kazakhstan during May - June of 2020. An exponential increase in numbers of COVID-19 patients in Beyneu district appeared to be caused by exposure among the members of in canteens and dormitories for shift workers in oil-producing areas with the additional community- and hospital-transmission.

Keywords: COVID-19, outbreaks, Kazakhstan.
ркүйекке дейін Республика COVID-19 індетінің 107 979 зертханалық расталған жағдайы тіркелген.

Зерттеудің мақсаты Қазақстанның Маңғыстау облысы Бейнеу ауданының бес елді мекенінде COVID-19 індетінің эпидемиологиялық сипаттамаларын беру болды.

Адістер. 2020 жылының 31 мамыры мен 2020 жылының 6 маусымы аралығында Маңғыстау облысында бірнеше COVID-19 өршу жағдайының эпидемиологиялық сипаттамаларын зерттеу және жұрғызатын іс-шаралардың тұмдылығын бағалау үшін зерттеу жүргізілді.

Алынған нәтижелері. Маңғыстау облысы, мұнай өндіру аумағында COVID-19 бес өршу жағдайы тіркелді: екеуі Бейнеу ауданында (Бейнеу кенті және Боранқұл ауылы), біреуі Қарақия ауданында (Сенек ауылы), екеуі екеуі “Қаламқас” және “Жетібай” мүнай кен орындарында, бұнда екіден 100 жағдайға дейін ауру ошақтары болды.

Талқылауы. Аурудың таралуының негізгі себебі мұнай кен орны қызметкерлерінің көптеп әрі тығыз жиналуы болған, бұл кен орнының вахталық қалашықтарының қызметкерлері арасында өршу жағдайының тіркелуіне әсер етті. Сондай-ақ, инфекцияның таралуына вахталық кенттер арасында қызметкерлердің белсенді қозғалысы, блок-бекеттерде және жергілікті гость спитальдарда жұмыс істеу үшін ЖҚҚ пайдалану тәжірибесі жоқ медицина қызметкерлерін тарту, сондай-ақ қатысушылар тыныс алу органдарын қорғау құралдарын пайдаланбасын, сондай-ақ COVID-19 расталған жағдайының болуы әсер етті.

Қорытынды. Осы мақалада 2020 жылының мамыр-маусым аралығындағы кезеңде Қазақстан- ның Маңғыстау облысының мұнай өндіру аймағында орналасқан бес елді мекенде өршу сіріясының эпидемиологиялық ерекшеліктері сипатталды. Бейнеу ауданындағы COVID-19 науқастарының экспоненциалды артуы мұнай өндіретін аудандардың асханалары мен жатақ-ханаларда вахтамен істейтіндердің науқастануы және қосымша түрде инфекцияның жергілікті тұрғындар мен ауруханаларда таралуы әсер еткен сөзді деген. 

Негізгі сөздер: COVID-19, өршу, Қазақстан.
COVID-19 is a severe disease, which mainly affects the respiratory system and causes lung failure [1]. The etiological agent of COVID-19 has been confirmed as a novel coronavirus, now known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is most likely originated from zoonotic coronaviruses, like SARS-CoV, which emerged in 2002 [2]. The virus belongs to the order Nidovirales, family Coronaviridae, subfamily Orthocoronavirinae, the subgenus Sarbecovirus of the genus Betacoronavirus [3]. The global incidence of COVID-19 has increased dramatically: by April 2020 it has affected 85,403 patients in 57 countries/territories and has caused 2,924 deaths in 9 countries [4]. So, national healthcare systems are facing the contagion with the need of immediate emergency response.

The first cases of COVID-19 in Kazakhstan were registered on March 13, 2020 in the cities of Almaty and Nur-Sultan. These cases were imported from Germany and Italy [5]. From March 20, confirmed cases of COVID-2019 began to be registered in other regions of the country [5]. The vast majority of symptomatic patients had mild disease, and the proportion of patients with moderate disease was about 10% [6]. Between March 13 and September 30, 2020, a total of 107,979 laboratory confirmed cases of COVID-19 were registered in Kazakhstan. Of them, 8,518 (7.8%) cases occurred in healthcare workers (own data).

This study aims to describe epidemiological characteristics of the COVID-19 outbreaks in five settlements of Beyneu and Karakiya districts of Mangistau region of the Republic of Kazakhstan.

A descriptive cross-sectional study was carried out in Mangistau region for the period from 31 May 2020 till 06 June 2020 to investigate the epidemiological characteristics of several COVID-19 outbreaks, and to assess the effectiveness of intervention implemented.

Case definition and case-finding
Case-finding and field epidemiological investigation was conducted among all households in the target area; we used diagnostic criteria and case definitions for COVID-19 from the National Clinical Protocol, 7th edition, that corresponds to the WHO case definitions of 27 February 2020.

STUDY SITE
Mangistau region (province) is located in the south-west of Kazakhstan, to the east of the Caspian Sea on the Mangyshlak plateau (Mangistau). The administrative center is the city of Aktau, an international seaport. Mangistau region is an industrial region, 25% of Kazakhstan’s oil is produced here. There are seven administrative territories in the oblast: two cities, five rayons (districts). The population of Mangistau region as of 01 January 2020 is 707,329 people, including 247,446 children under 14 years old.

RESULTS
As of June 4, 343 cases of COVID-19 were recorded in Mangistau region (cumulative incidence was 48.5 per 100,000 population). In two rayons of the region, a high incidence level of COVID-19 was observed: in Karakiyansky districts it was 138.0, and in Beyneusky districts it was 190.3, which exceeds the regional level by 2.8 - 4.0 times, respectively (Figure 1).
The mean age of cases was 49.0 ± 19.2 SD. The main risk groups for COVID-19 were non-working people (16.9 %), workers of Tenigizchevroil Company (TCO; 10.2 %), including catering staff (2.3 %), medical workers (10.5 %) and retirees (7.3 %). All identified catering workers were employees of the Caspian Food Company and were located at the TCO Company’s Kalamkas oil field at the time the COVID-19 outbreak began (Table 1).

Analysis of a COVID-19 daily timeline in Mangistau region shown that there were two incidence increases: from April 29 to May 17, 2020 and from May 28 to June 4, 2020 (Figure 2).

The COVID-19 incidence increase in the period from April 29 to May 17, 2020 was due to residents of the village of Senek and the town of Zhanaozen had contact with a previously identified COVID-19 patient in the village of Senek, Karakiyanskiy districts, during the funeral with the Muslim ritual of Sadaqah that led to mass people contamination.

The incidence increase in the period from May 28 to June 4, 2020 was associated with the identification of COVID-19 cases at the Kalamkas and Zhetybai oil fields. In the same period there were COVID-19 outbreaks in the villages of Beyneu and Borankul.

Thus, from April to June, five outbreaks were detected in Mangistau region: in Beineuskiy rayon (villages of Beineu and Borankul), in Karakiyanskiy rayon (village of Senek) and in the oil fields Kalamkas and Zhetybai.

Description of the outbreaks is given below.

**Outbreak 1. Senek village (April 27-29, Karakiyanskiy districts)**

The first two cases of coronavirus infection were reported on April 27, 2020. As mentioned above, we established that on April 12, 2020, the village residents participated in the funeral and had contact with the confirmed case of COVID-19. During the epidemiological investigation, we identified 143 contacts, including 36 close contacts. Between April 28 and 29, 13 of the

| Characteristics | Cases (n = 343) | Percent (%) |
|-----------------|----------------|-------------|
| Age group       |                |             |
| < 14            | 49             | 14.3%       |
| 15-19           | 23             | 6.7%        |
| 20-29           | 74             | 21.6%       |
| 30-39           | 69             | 20.1%       |
| 40-49           | 45             | 13.1%       |
| 50-59           | 55             | 16.0%       |
| > 60            | 28             | 8.2%        |
| Occupation      |                |             |
| No occupation   | 58             | 16.9%       |
| TCO workers     | 35             | 10.2%       |
| Workers of other industrial enterprises | 59 | 17.2% |
| Students        | 15             | 4.4%        |
| Medical workers | 36             | 10.5%       |
| Military personnel | 11 | 3.2% |
| School workers  | 9              | 2.6%        |
| Civil servants  | 7              | 2.0%        |
| Catering workers | 8          | 2.3%        |
| Retirees        | 25             | 7.3%        |
| Police officers | 6              | 1.7%        |
| School children | 33             | 9.6%        |
| Other children  | 17             | 5.0%        |
| Others          | 24             | 7.0%        |

![Figure 2 - Daily timeline of the COVID-19 in Mangistau region, March - June, 2020](image-url)
contacts were ill with COVID-19, including two cases in the city of Zhanaozen and 11 cases in the village of Senek.

**Outbreak 2. The village of Beineu (May 4-17, Beineuskyi districts)**

The index case was a local nurse in the village of Beineu. She was registered as a confirmed case on May 6, 2020 and had 49 contacts. Six of them showed positive results on COVID-19. From May 8 to May 11, 2020, when examining 88 people who had contact with these six patients, another 22 cases of COVID-19 were revealed. Subsequently, in the village we identified a total of 40 patients. Of these, 18 (45%) were medical workers, who subsequently became a source of infection for 26 (65%) patients with COVID-19. One woman, a medical worker, had contact with the index case at home, and then, from April 6 to May 4, 2020, she took part in the duty at the checkpoint where employees of the Tengiz oil field arrived, which subsequently became ill with COVID-19.

**Outbreak 3. The village of Borankul (May 6-20, Beineuskyi districts)**

The index case was registered on May 6, 2020. We identified 10 contact persons, of which two were his relatives and two contacts at work. Among the contacts, four had a positive test for COVID-19. On May 7, 2020, another case was registered, which had contact with 23 persons, among whom seven COVID-19 cases were identified. The next patient was identified on May 15, 2020 among workers who arrived from the Tengiz oil field. A total of 24 cases of COVID-19 were identified in the village. It should be noted that 20 of 24 patients were identified during the examination of a provisional hospital. Of the total number of cases, clinical symptoms were present in only 10 patients.

**Outbreak 4 and 5 Kalamkas and Zhethibay oil fields (15 May - 06 June, Mangistau districts)**

Index case, resident of Aqtau. At the Kalamkas field, he worked in the Capital Construction Department. From May 15, 2020, she was in the rotational camp. During work in the period from May 24 to May 25, 2020, the case developed catarrhal manifestations (sore throat, mild cough). Self-medicated, she did not seek medical help. The case was registered as a confirmed case on May 6, 2020 and had 49 contacts. Six of them showed positive results on COVID-19. From May 8 to May 11, 2020, when examining 88 people who had contact with these six patients, another 22 cases of COVID-19 were revealed. Subsequently, in the village we identified a total of 40 patients. Of these, 18 (45%) were medical workers, who subsequently became a source of infection for 26 (65%) patients with COVID-19. One woman, a medical worker, had contact with the index case at home, and then, from April 6 to May 4, 2020, she took part in the duty at the checkpoint where employees of the Tengiz oil field arrived, which subsequently became ill with COVID-19.

**Outbreak 5. The village of Borankul (May 6-20, Beineuskyi districts)**

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