Iranian Journal of Microbiology
Volume 12 Number 6 (December 2020) 657-660

LETTER TO THE EDITOR

Altered severity of the current SARS-CoV-2 in the Kurdistan region of Iraq

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Received: June 2020**, Accepted:** October 2020

A novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is behind the recent pneumonia outbreak that started in December 2019 in Wuhan city, Hubei province, People's Republic of China (1). On 30 January 2020, the World Health Organization (WHO) announced a Public Health Emergency of International Concern (PHEIC) for the Coronavirus Disease 2019 (COVID-19) outbreak. Later, on 11 February, WHO named the new coronavirus SARS-CoV-2. Afterward, the transmission of SARS-CoV-2 from human to human was confirmed (2). On 7 March, COVID-19 was officially recognized as a pandemic disease by WHO (3). SARS-CoV-2 has rapidly spread across many countries in the world; as of 7 September 2020, there are nearly 27 million confirmed cases with 900,000 deaths worldwide (4). COVID-19 has different morbidity and mortality in different regions of the world (5). The incurable COVID-19 is a progressive pneumonia-like disease characterized by fever, dry cough, fatigue and headache at its early stage. Respiratory insufficiency, coughing and chest pain are experienced as the disease progresses (6). In advanced stages, breathing difficulties may develop (7). It is expected that more people globally will be affected by this disease. Here, the current status of COVID-19 in Kurdistan region of Iraq will be evaluated.

Kurdistan of Iraq, with a population size of more than five million (8), is geographically neighbor to two highly infected countries, Iran and Turkey (Fig. 1A). By 7th of September 2020, Iran recorded 22,154 mortality whereas, the morbidity was 384,666. Also, in Turkey, both mortality and morbidity were 6,620 and 278,228, respectively. On the other hand, the COVID-19 mortality and morbidity of Iraq itself was 7,422 and 256,719, respectively (4). Therefore, it was expected that a great number of people in the Kurdistan Region will acquire the disease, and spread it. Authorities in Kurdistan are exercising huge efforts in controlling the spread of the disease in a number of ways such as raising awareness and closing schools and universities from February 26 up until September 8, 2020. Additionally, curfew was imposed on March 13 to June 6, 2020 with partial curfew afterwards until August 13. Moreover, travelers arriving from an infected area are quarantined for 14 days and tested for the new coronavirus before release. Currently, travelers are required to be tested for COVD-19 in the last 48 hours before they travel. Social distancing and disinfection principles were practiced by most of the residents of the area. A total of 354,797 real-time PCR tests has been performed for COVID-19 by the ministry of health of the Kurdistan Regional Government (KRG) (9). RT-PCR is the gold standard for diagnosis of the current COVID-19 (10). On 1st of March 2020, the first case was reported in the Kurdistan region. Up to September 8, the region's total confirmed cases of SARS-CoV-2 are 33,685, of which 21,244 have recovered and 1,246 have passed away (Fig. 1B).

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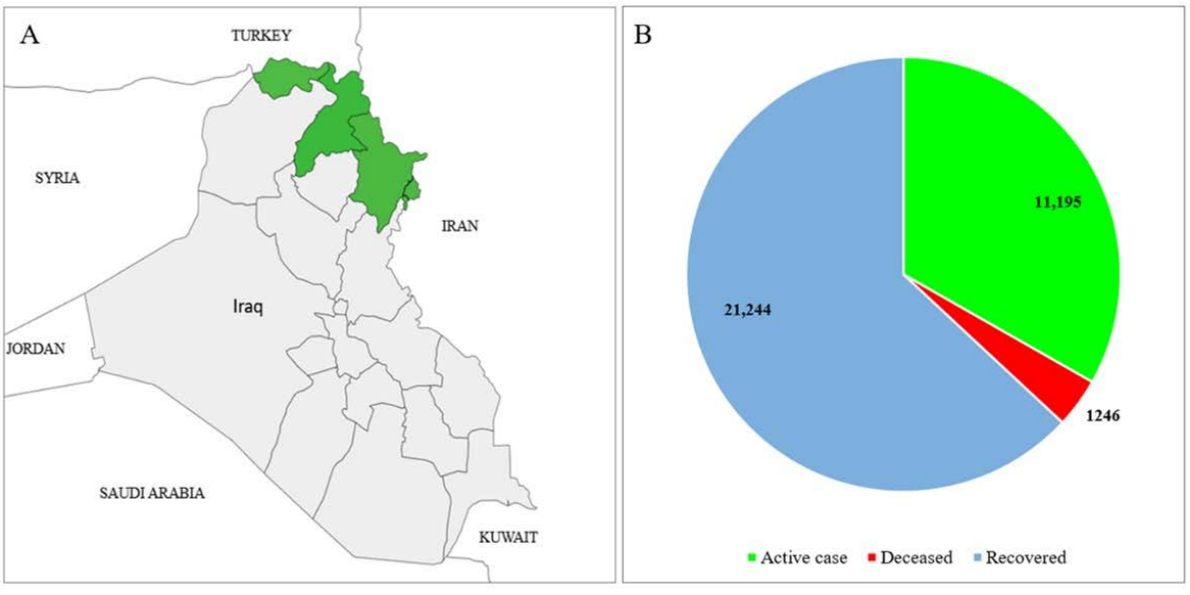

Fig. 1. COVID-19 in the Kurdistan Region of Iraq. A. Kurdistan Region of Iraq map (green). B. Number of total cases.

At the first wave of the disease in the Kurdistan region (from 1st of March to 5th of May 2020), there were 391 confirmed cases. The majority of cases had a known epidemiological link to a chain of human transmission within the region (84.4%), whereas 12.53% of cases were those who visited countries infected with SARS-CoV-2. A Percent of 1.28% of cases were confirmed post-mortem. However, most of the cases that the regional government announced were asymptomatic; only a few (1.79%) infected patients had symptoms at the time of diagnosis (Fig. 2A). Deceased patients were over 55 years of age with either hypertension, diabetes, or were immunocompromised. Overall, 96.93% of infected individual had a known source of SARS CoV-2 infection; either travelled to epidemic areas or had direct contact with confirmed local cases. The remaining 3.07% had no clear source of infection and were identified through the government's regulation of random diagnosis. These data are announced and updated on a daily-basis by the KRG official website (9).

In the Kurdistan region, the low COVID-19 morbidity and mortality rates in the first wave might be due to the existence of a mild strain of SARS-CoV-2. Whole genome sequencing of SARS-CoV-2 has not been done in Iraq and Kurdistan region yet. However, after several days (from 6th to 13th of May, 2020) of no confirmed case in the Kurdistan region, a second wave of COVID-19 emerged on 14th of May 2020. The new cases reported by the KRG Ministry of Health tend to be more symptomatic than the first wave of infections. There were 33,294 new confirmed cases from 14th of May to 8th of September. Surprisingly, patients showing obvious symptoms at the time of diagnosis raised to 79.12%, while only 15.28% had a known linked source of infection. Furthermore, 1.87% came back from epidemic areas (Fig. 2B). In other words, 17.15% of confirmed cases diagnosed through authority's regulations were asymptomatic. Nevertheless, 1241 patients (3.73%) passed away in the current wave. Unexpectedly, there are young patients with no chronic or metabolic diseases who died of the disease.

In comparison, a greater number of second wave patients require mechanical ventilation and intensive care units than the first wave patients. Furthermore, the death rate is about thrice of the first wave. A T-test has been performed to compare percentages of the two infection waves in regard to patients who have shown symptoms of the disease at the time of diagnosis. The difference is strongly significant with a p-value of 0.00. In addition to severity, the disease is spreading faster in the second wave. A T-test has been used to compare the speed of the disease spread between the two waves. With the p-value of 0.00, the difference turned out to be significant at 95% significance level.

There are several possibilities of why the disease is more severe in the recent wave of COVID-19. SARS-CoV-2 is an enveloped single stranded RNA

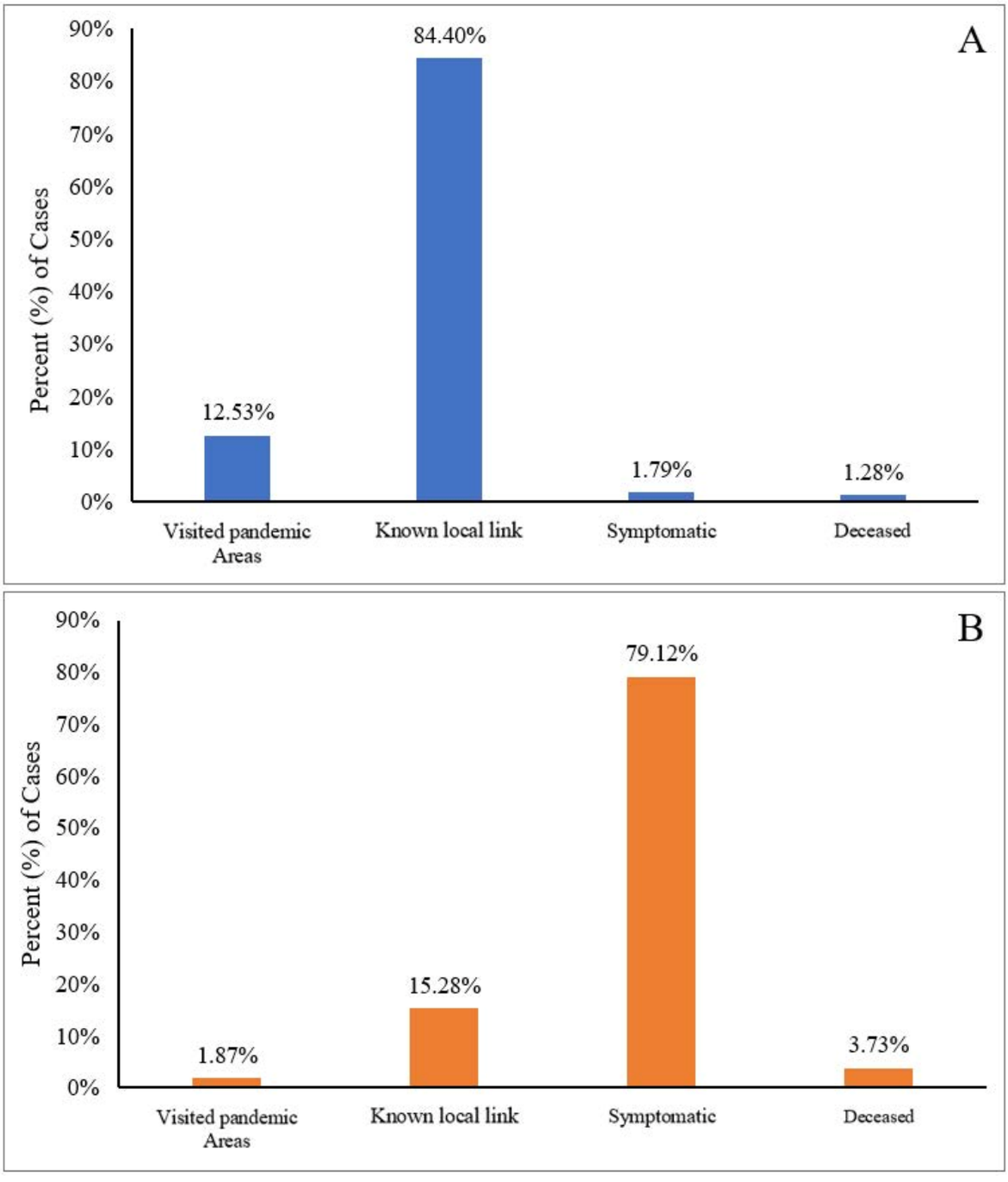

Fig. 2. KRG COVID-19 waves: A. First wave. B. Second wave of SARS-CoV-2

viruses that are characterized by a high mutation rate (11). Previous results showed that the SARS-CoV-2 genome emerged new mutation hotspots (12, 13). A mutation might have occurred and changed the virus into a more virulent strain. Therefore, the strain that is responsible for the second wave of infection is more likely to be different from the previous strain. Another hypothesis is that the severe strain has come from travelers who recently returned from countries that have the severe strain such as Italy and Spain. Data collected from 166 countries has been shown that the increase in temperature and humidity could decrease the mortality and morbidity of COVID-19 (11). At this second wave, with the same local au-

thority regulations, the spread of SARS-CoV-2 is faster even though the temperature is higher. One possibility is that the weather is drier which is more favorable to the virus. It is highly recommended to use the whole genome sequencing approach to unveil the strain responsible for the existing infection in this region.

In conclusion, without an effective vaccine, SARS-CoV-2 continues to infect more people in the world. New, and vague strains are still emerging, that might be the cause of the second wave of the disease in Kurdistan region. Although KRG attempts to make the COVID-19 data as precise as possible, there are still a few limitations that exclude some patients in this data. There are patients who acquired the virus without visiting hospitals. Moreover, data from laboratories other than official government laboratories who perform the test, is not recorded in the KRG website.

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