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Epidemiological Approach of SARS-CoV2 in the First Month of Appearance in the Kurdistan Region of Iraq

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Abstract: The new emerging coronavirus SARS-CoV2 is an alerting pandemic worldwide. Understanding the epidemiology, viral behavior in the host, and the severity of the disease in an infected patient is a demanding approach for the healthcare system which lead to plan and contemplate the response for further waves of the same virus and even other related viruses. The evaluation of the protection measurements along with analyzing the recorded data of epidemiology and spread provides thorough insights toward the new Coronavirus modes of transmission, infection, and severity. Kurdistan Region of Iraq was hit by the SARS-CoV2 on March 2020 when first confirmed case recorded. The present paper analyzed a full month data of confirmed hospitalized and quarantined cases with regard to age, sex, geographical distribution. The highest risks were shown to be males of their young ages of 30-39 years old in Sulaimani province due to the social structure of the Kurdish population and the geographical position of Sulaimani. Social integration played a significant role in the spreading the virus in all cities of Kurdistan first onset of the virus in the community. Diagnosed hospitalized cases were mostly suffered from high fever, dry cough and breathing difficulties. The mortality rate was shown to be reasonable, and the majority of the cases were recovered after hospitalization and receive supportive treatment. Social distancing and total lockdown played a significant role in viral spread containment. The health authorities prevented devastating outbreak through tracing all the cases and their contacts, isolating the suspicious contacts, quarantining the neighborhoods were the virus found. Further investigation is needed in a larger scale of data in order to be armed with adequate knowledge for any other waves of COVID-19 in the region.

Keywords: SARS-COV-2, COVID-19, Epidemiology, Kurdistan Region of Iraq.

1. INTRODUCTION

Coronaviruses cause contagious respiratory infections in humans. Pneumonia and progressive respiratory failure are common symptoms of the new coronavirus outbreak (REF). A sever public health threat emerged during the previous Coronaviruses infections including severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS) in many countries (Graham *et al*., 2013). In late December 2019, a series of pneumonia cases were admitted to the hospitals with clinical presentations much resembling viral pneumonia. These patients were epidemiologically linked to seafood and wet animal wholesale market in Wuhan, Hubei Province, China (Bogoch *et al*., 2020).

Detailed sequencing analysis of samples from the lower respiratory tract of the symptomatic patients indicated a novel Coronavirus, which was named the 2019 novel Coronavirus (2019-nCoV) and later was publicized by WHO on February 11th, 2020 as COVID-19) causing severe acute respiratory syndrome disease (SARS-CoV2) (Sohrabi *et al*., 2020:Zhou *et al*., 2020). The origin of SARS-COV2 is from an animal source especially wild bats and pangolins (Figure 1), because the genetic sequencing of this virus is significantly similar to those detected in these animals (Cagliani *et al*., 2020).

The etiological agent of the new disease is a member of the Coronavirus family that includes at least six other types of human infectious Coronaviruses, such as (SARS-CoV) and (MERS-CoV) (Zhang *et al*., 2020). Coronavirus is a genus of *Coronaviridae* family, which are enveloped and contain a large positive-sense single-stranded RNA genome. The genomic RNA is 27–32 kb in size, capped and polyadenylated. Three serologically distinct groups of Coronaviruses have been described. Within each group, viruses are characterized by their host range and genome sequence (Cui *et al*., 2019). Coronaviruses have been identified in mice, rats, chickens, turkeys, swine, dogs, cats, rabbits, horses, cattle and humans, which can cause a variety of severe diseases including gastroenteritis and respiratory tract diseases (van der Hoek *et al*., 2004).

The new coronavirus outbreak originated from Wuhan city, Hubei province, China late last year, and it was the start of the fast-spreading novel infection around the world (Ayittey *et al*., 2020). The spread of the new virus caused an elevated mortality rate worldwide compared with the mortality rates of common conditions such as seasonal flu (Meo *et al*., 2020; Koh *et al*., 2015).

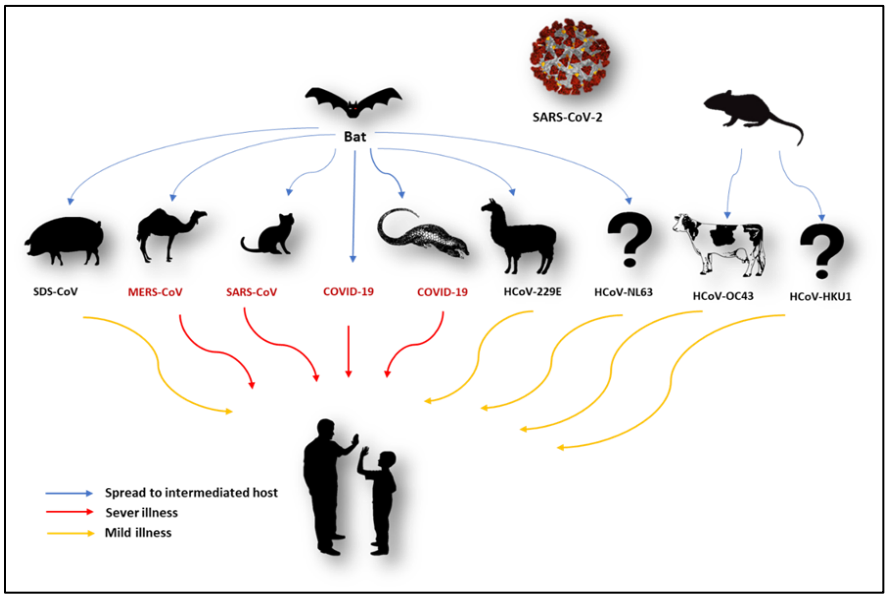


Figure 1 The Role of Animals in the Evolution and Transmission of the Coronavirus

The evolutionary history of SARS-CoV2 was shown by applying the Maximum Likelihood (ML) program based on the Tamura-Nei model. The bootstrap value made up of 1000 replicates is taken to be the evolutionary history of the taxa analyzed (Figure 2). Tree branches corresponding to partitions copied in less than 50% bootstrap reproduces are collapsed. The analysis involved 56 nucleotide sequences. Evolutionary analyses were conducted in MEGA7.

Furthermore, Muscle alignment tool was used to display the nucleotide variation between SARS-CoV-2 sequences. Stars on the top of the sequences and colour represent the conserved nucleotides among the sequences. Non-colour nucleotides between the sequences showed the nucleic acid variations (Kumar et al., 2016).

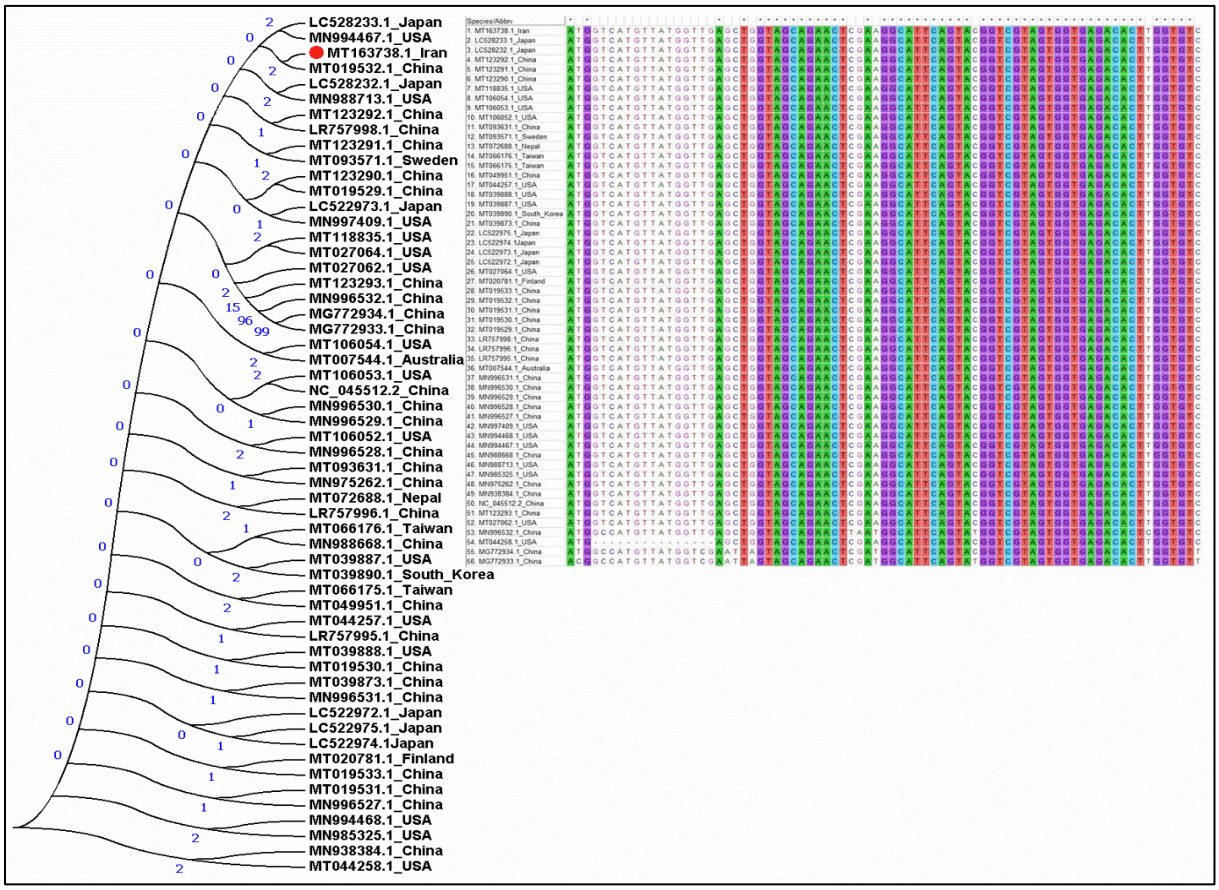


Figure 2 Diagonal Plots to Graphically Compare Biological Sequences and Identify Regions of Close Similarity.

A newly emerging infectious disease such as this virus contributes to a severe public health risk. The unprecedented rate of death has been recorded daily first in China, then Iran and Italy early this year (Raoofi *et al*., 2020). The fast spread of COVID-19 in the world causes different ranges of illnesses and deaths. The dramatically increase of positive cases of the new virus has driven many countries around the world to go through lockdown processes and social distancing. Therefore, the world governments have taken a severe step to fight against this new disease (Sjödin *et al*., 2020). In most countries' lockdown measures have been taken, to contain the spread of the novel Coronavirus. This includes lockdown of schools, universities, public transports, airlines, small and large companies and businesses (Gudi and Tiwari, 2020).

Here, in Kurdistan region of Iraq with around five million in population, at the beginning of the COVID-2019 outbreak, the Kurdistan regional government (abbreviated KRG) quarantined those travelers who came back for 14 to 30 days. Then the government closed the schools, universities, religious locations, markets and public areas for preventing the spread of the new disease. Transport systems between cities are postponed or cancelled. As a result, the first case of the virus was detected during March, which is much later than many western countries.

The patients who were first infected with COVID-19 experienced symptoms such as fever, cough and fatigue. Nasal congestion, sore throat, runny nose, and diarrhoea have also been detected in some cases. However, most of the cases in the Kurdistan Region have been mild cases with little to no symptoms, with most recovering without taking any particular medicine

which accounts to 80% of the cases whereas almost 20% of the patients have suffered severe symptoms. (Ai *et al*., 2020; Jiang *et al*., 2020).
This study aims to describe the epidemiological distribution, clinical characteristics, treatment, and outcomes of patients confirmed to have the 2019-nCoV infection in Iraqi Kurdistan region and to compare the clinical features of the diagnostic patients with other countries who have been infected with this disease. The study findings will inform the global community of the emergence of this novel Coronavirus and its clinical features.

2. METHODS

Study Design and Data Collection

All 214 patients with COVID-19 positive test results confirmed from the hospitals of the Kurdistan region from March 1st to April 4thwere questioned in this study. Written or oral informed consent was obtained from the patients. A standard questionnaire was adopted to gather information on sociodemographic and clinical characteristics.

Questionnaire and Data Analysis

The following information was taken from each patient, and the questionnaire was divided into two different parts. The first part included demographic data of the patients (sex, age, and work experience), whereas the second part of the questionnaire, included the knowledge patients had on how the virus was transmitted from one person to another. Besides, the gathered data contained the medical history of the patients under the study. Statistical analysis of all data was performed with GraphPad Prism (version 8.0.1.244, GraphPad Software, La Jolla, CA, USA).

Assemble and Align Nucleotide Databases

For the showing and finding evolutionary relationships among SARS-COV-2 sequences in distinct countries, molecular phylogenetic dendrogram will be generated. Firstly, because the Iranian sequences of SARS-CoV2were available on the genomic sequences of National Center for Biotechnology Information (NCBI), the sequence was used as Blast query sequences to search for the original dataset. All sequences ($\geq$ 50%) of sequence identity, were collected and downloaded. Analysis of each of the Multiple Sequence Alignment (MSA) and phylogenetic tree was taken using molecular evolutionary genetic analysis, version 7 (MEGA7) software (Kumar *et al*., 2016). The MSA was built and aligned using muscle tool, and Phylogenetic dendrogram was constructed using the Maximum likelihood tool (ML).

3. RESULTS AND DISCUSSION

Impact of Age on Coronavirus Infection

A new infectious disease, caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV2), was detected in Wuhan, China, in December 2019. The COVID-19 spread rapidly, reaching epidemic proportions in China. The disease was detected in 189 other countries. As of April 9, 2020, over 1,536,094 cases of COVID-19 were reported, with > 89,877 deaths. No specific therapeutics is available, and current management includes travel restrictions, patient isolation, and supportive medical care. The results of this study revealed that two age groups range from (30-39) and (40-49) years were infected (Figure 3), in

contrast, to the recorded data from other countries, in which older age (≥65 years) were associated with higher severity and mortality in patients with COVID-19 (Onder *et al*., 2020).The percentages of older age were much higher in the deceased group than in the survived group of patients with COVID-19, especially in the Italian population. This may be due to the demographic characteristics of the Italian population that differ from other countries. In 2019, approximately 23% of the Italian population was aged 65years or older. Ultimately, COVID-19 is more serious in older patients, so the older age distribution in Italy may explain, in part, Italy's higher case-fatality rate compared with that of other countries (Tuite *et al*., 2020: Yang *et al*., 2020).

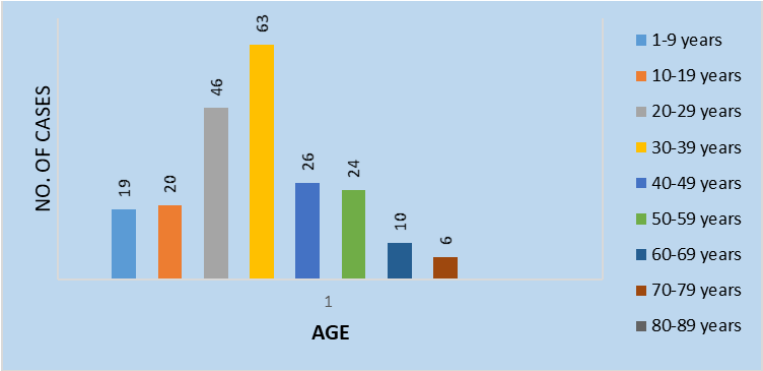


Figure 3 The COVID-19 Patients' Age-specific Infection rate in the Iraqi Kurdistan Region During March 2020.

Gender and its Relation to COVID-19

The gender factor was also observed in COVID-19 patients. The obtained data analysis showed that men had a significantly higher susceptibility rate than women. Despite a similar proportion of male and female patients of COVID-19, the incidence of the disease in male was higher than females which agreed with (Jin et al., 2020) (Figure 4). Although, for the available data of some of the countries, there is not any clear pattern in terms of whether women or men are more likely to be diagnosed with COVID-19. In some of these countries, there is a higher proportion of confirmed cases among women (over 50%), and in some other countries, it is higher among men (Wei *et al*., 2020). Iran is one of the most epidemic countries for COVID-19, and there is no information regarding the proportion infection rate between male and female to this infectious disease (Jinet *et al*., 2020; Rahimzadeh *et al*., 2020).

Older ages and male gender are risk factors for the worst outcome in patients with COVID-19. Because the severity and mortality of COVID-19 do not depend on age susceptibility (Rahimzadeh *et al*., 2020: Wu and Mc Googan, 2020), it is habitual to think women are less likely to be affected by many infectious bacteria and viruses than men, partly because of their more robust innate and adaptive immune responses (REF). However, this may be related to the occupational risk factors for men in exposure to the virus. They may be more prone to have higher severity and mortality independent of age and susceptibility. Thus, the new disease could be seen that the elderly male patients with certain chronic diseases were a more challenge to treat, resulting in an extended hospital stay and slow recovery.

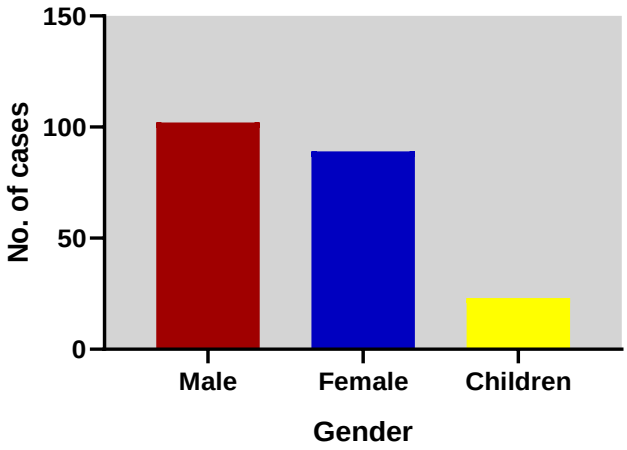


Figure 4 The Gender Proportional Rate within COVID-19 Infected Patient during March 2020.

Geographical Distribution of Coronavirus in Kurdistan of Iraq

Global epidemic curves reflect that COVID-19 rapidly spread from a single city to the entire country in just a few days. In parallel, the collected data revealed that within 214 positive cases 105, 66, 14 and 29 patients from Sulaimani, Erbil, Duhok and Halabja cities, respectively, were estimated with COVID-19 (Figure 5). The highest incidence from Sulaimani may be due to the geographical expansion with the border of Iran because the economic activity in this area is bustling. Travelling of the residents was at a high rate during the crisis in comparison with other cities through the border.

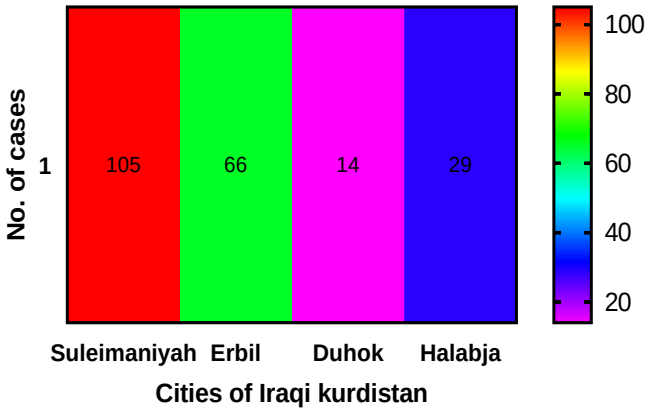


Figure 5 Distribution of COVID-19 in Iraqi Kurdistan Region Cities during March 2020.

Number of Infected Peoples by Coronavirus and their Occupation

Although the KRG focused on the controlling of public health outbreak tactics like isolation, quarantine, social distancing, and community containment, the diagnosed cases of COVID-19 were immediately isolated. Nevertheless, in March, the number of cases increased in the region. The collected data showed that the most diagnosed cases in all cities of Iraqi Kurdistan region were about 214 cases, of that 84 cases, were from travelers, mostly from

countries where COVID-19 was epidemic (Figure 6A). The other 130 cases were from residents who have had contacts with the returnees or secondary contact to those who contacted them. This is maybe due to the fact of using public transport, airplanes, crowd rides, and close contact during travel. Nevertheless, most of the returnees have also contact with their families and relatives before being tested for the virus. The government later warned all the returnees to reach out testing centers to confirm clarity of the virus in their bodies. Freely moving carriers caused a dramatic increase in cases due to their contact (Figure 6B). This is related to the context of the social structure of the Kurdish people and social relations. It has been indicated from the tracking and tracing data that the source of infection in the Kurdistan Region of Iraq was from patients or carriers that have returned from endemic COVID-19 countries (Chinazzi *et al.*, 2020: Lai *et al.*, 2020).

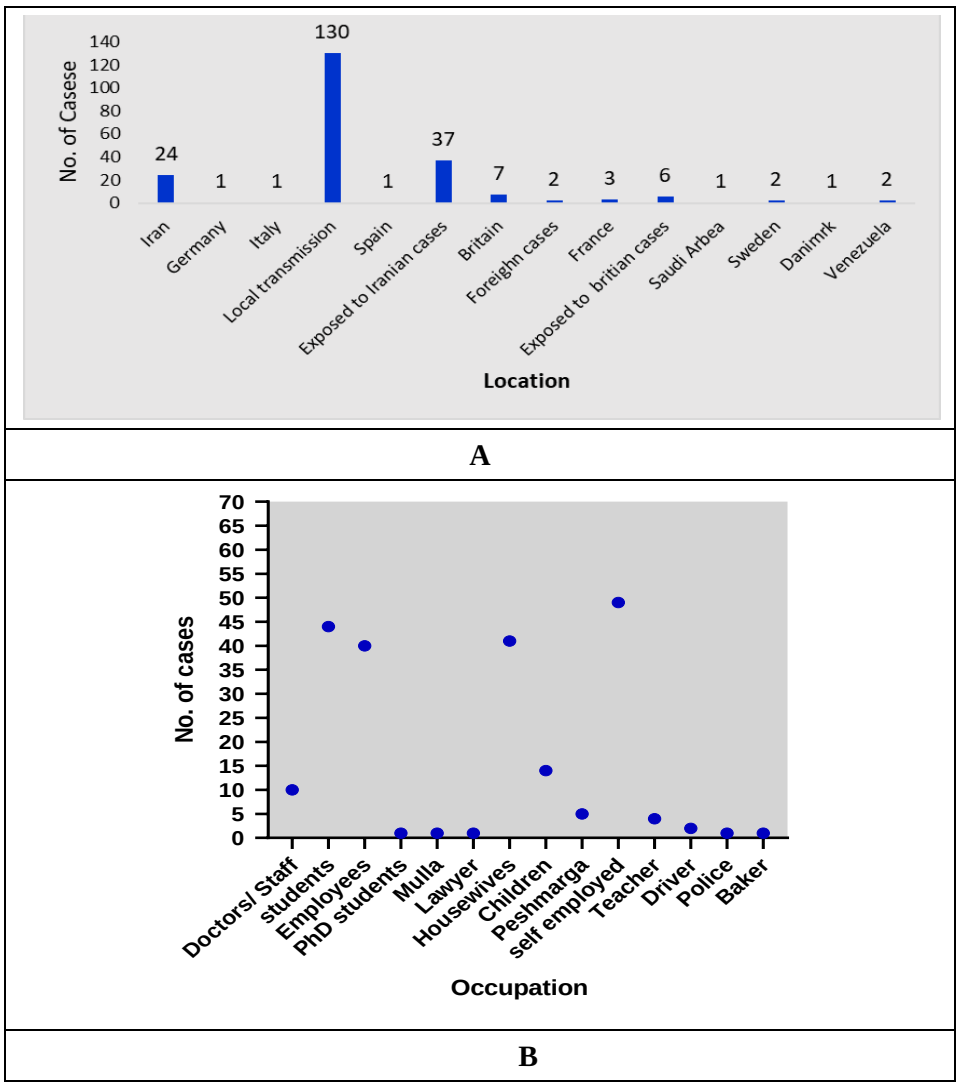


Figure 6 A) Route of Infection within an Infected Person with COVID-19. B) Occupation of the Infected Person with COVID-19. The Blue Dots Represent the Number of Cases.

Signs and Symptoms of Infected Peoples by SARS-CoV2

The signs and symptoms of COVID-19 were ranged from a mild fever and fatigue to the most severe difficulty of breath. Death also occurred due to the severity of the disease in some cases. According to the data, the most common symptoms documented in almost 79% of the cases were patients suffering from a dry cough (Figure 7A). Other symptoms such as

fever,fatigue, the difficulty of breathing were also recorded frequently. The same signs and symptoms wereobserved in all patheints in all of the world (Huang et al., 2020). In COVID-19 patients, fever, cough and myalgia were the most common symptoms, followed by chest distress and shortness of breath. However, upper respiratory tract symptoms (e.g. nasal congestion, nasal discharge and sore throat) and gastrointestinal symptoms (e.g. abdominal pain and diarrhoea) were relatively rare (Huang *et al.*, 2020). It is noteworthy that if the fever was used to trigger screening/testing for COVID-19, a substantial number of patients without fever might be missed (Figure 7B).

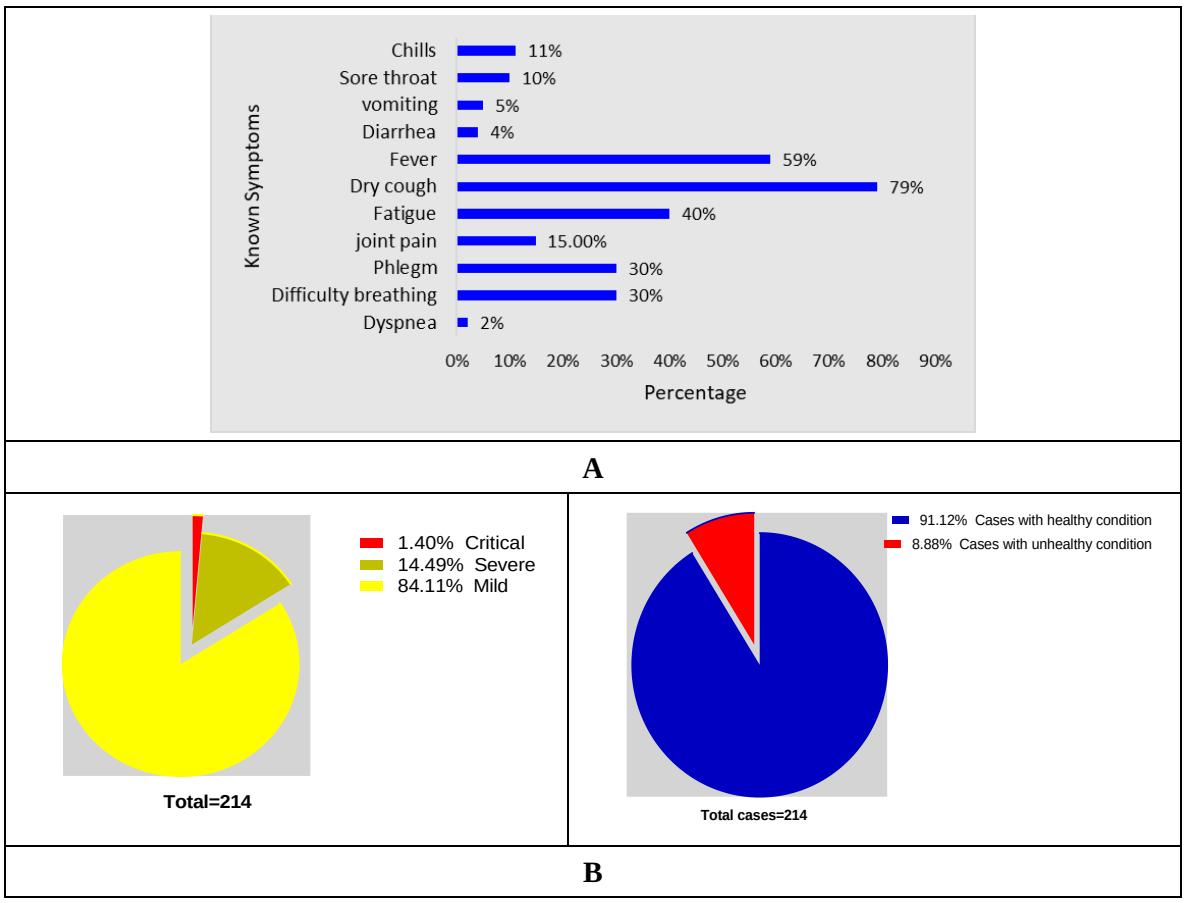


Figure 7 Signs and Symptoms of Infected Peoples by SARS-CoV2 (A) and their Condition (B).

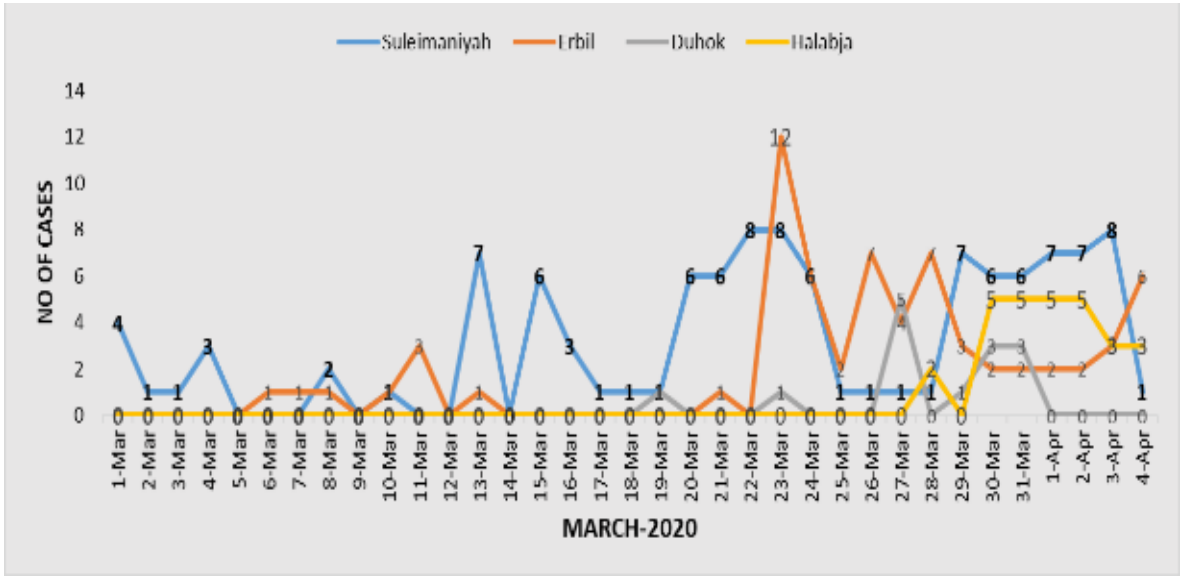
Prevalence of COVID-19 Infection

The symptoms which were started from (10-14) days, as mentioned in other studies (Huang et al., 2020) either mild, severe or critical, which lead to death. Fortunately, in Iraqi Kurdistan region Most cases were classified as mild (84.11%). However, 14.49% were severe, and 1.40% were critical (i.e., respiratory failure, septic shock, and/or multiple organ dysfunction or failure). The death cases were rare in compared with other places which suffer from infection (De Natale *et al.*, 2020: Lauer *et al.*, 2020) (Figure 8A). The efforts of symptom relief and total treatment of the virus is an ongoing challenge; however, to date, there is no robust data suggests any specific treatment for COVID-19 (Onder et al., 2020). Medications used mostly for the alleviation of symptoms and not an eradication of the virus. Additionally, antiviruses and anti-inflammatory were used commonly to fight the virus (Lauer *et al.*, 2020).

In the Kurdistan Region of Iraq, this approach was supported by oxygenation, fluid management, and mechanical ventilation as needed.

March 2020 considered being the challenge for the Kurdistan Region Government and health sector. This isbecause the first officially confirmed case were at the beginning of that month. The government obliged to issue a sequence of emergency orders to restrain the outbreak. The cases of COVID-19 infection was increasing per days (Figure 8B). However, the dramatic increase was recorded in the middle of March in all cities, especially in Sulemani. In Hawler the records of cases reached its peak on March 22th and the others at the beginning of April 2020. This has been declined with the actions taken by the local governments, including total lockdown of cities as well as more understandings and new information has been released throughout media and published articles. Social distancing played an important role in decreasing the record numbers of new cases. This included the prohibition of all social activities, crowds, and social events. Virtually all transportation was subsequently restricted at a national level. People who had been in contact with COVID-19 cases were quarantined in individual quarantine facilities, where they could be monitored for onset of symptoms.

Fortunately, recovery from the disease were seen in most of the cases, although no specific treatment was available (Figure 8). Supportive treatment and medical care, along with a healthy diet, might be crucial for recovery (Gudi and Tiwari, 2020). Globally, the death rate was recorded to be 2.3 % (Lai et al., 2020). However, as indicated in the present data and others, the mortality rate was higher in older adults, specifically those with underlying diseases. These patients are among those who suffered severe symptoms patients with mild symptoms or asymptomatic were less prone to death. These preexisting comorbid conditions included cardiovascular disease, diabetes, chronic respiratory illnesses, hypertension and malignancy. In the present study, among the 214 positive cases, 3 deaths were recorded, all of them were previously diagnosed with having other chronic illnesses.



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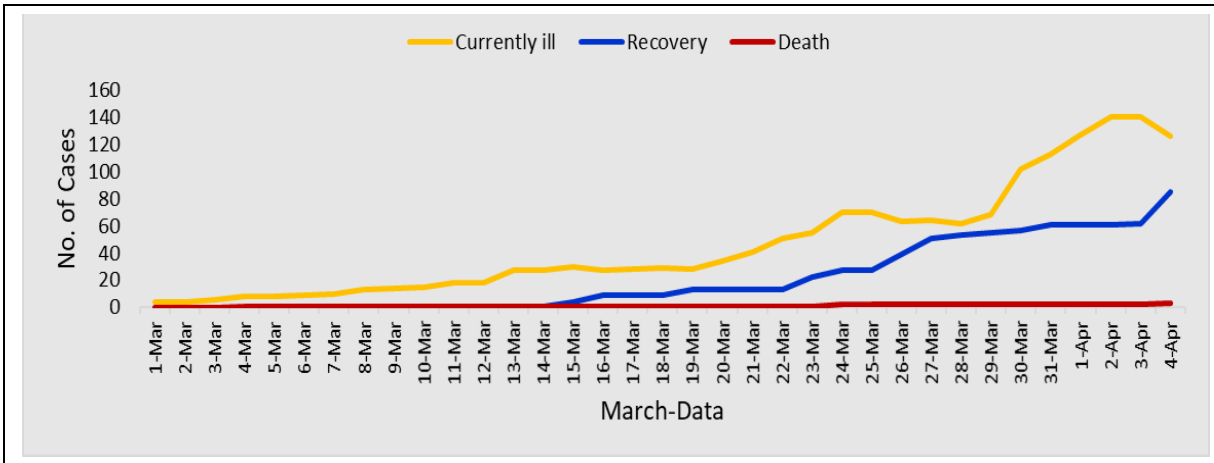

B

Figure 8: Prevalence of COVID-19 Infection Per Days of the Month in different Cities (A) and their Situation (B).

4. CONCLUSION

In conclusion, the status of COVID-19 in the Kurdistan region for the first month of onset is well controlled. This is remarkably related to the immediate response of the authorities to the global alerts, application of extreme protection measurement and protocols of lockdown and social distancing, the containment of the viral spread which eventually weakened the virus mutation in the population. However, the future direction should be well designed to respond to any second waves of the viral spread, especially with the relaxation of the protective measures and reopening the market places were crowd are usually gathered. Further research is mandatory to understand the community behaviors and the viral mutation and aggressiveness in order to be well prepared for any other viral attacks.

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