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Outbreak of SARS-CoV-2 Cases during Omicron Variant Infections

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Abstract:

Despite the development of vaccines and a decrease in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infections cases, there is a constant concern about the occurrence of new waves during the coming winter, according to the World Health Organization. This study aimed to investigate the outbreak of the SARS-CoV-2 in patients with severe acute respiratory infections and influenza-like illnesses during Omicron variant infections in Iraq between January 2022 and August 2022. The real-time reverse transcription polymerase chain reaction (rRT-PCR), as the standard diagnostic protocol, was performed to analyze the nasopharyngeal swabs of 1879 people with acute respiratory and influenza-like illnesses. Of a total of 1879 participants, 520 (27.7%) showed confirmed infection with SARS-CoV-2 and the peak of infection was during winter season in January and February, and June during the summer season with a statistically significant difference. Males showed an 8% higher infection rate than females but without statistically significant differences. Among the positive cases 31-40, 21-30 and 41-50 age groups were the most affected with a highly statistically significant difference. The positive rate of infection was higher in Baghdad Governorate/Al-Rusafa district and Erbil Governorate with a highly statistically significant difference. The results of this study could help in monitoring the spread of the virus to put health professionals and officials in the Ministry of Health and the government to take precautionary measures to avoid the emergence of a new wave of disease in Iraq.

Keywords: ***SARS-CoV-2, Omicron variant, rRT-PCR, Respiratory Infection, TaqPath™.***

تفشي حالات SARS-CoV-2 خلال عدوى متغير Omicron

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الخلاصة

على الرغم من تطور اللقاحات وانخفاض حالات الإصابة بفيروس كورونا 2 (SARS−CoV−2) ، إلا أن هناك قلقًا دائمًا من حدوث موجات جديدة خلال فصل الشتاء المقبل ، وفقًا لمنظمة الصحة العالمية.هدفت هذه الدراسة إلى التحقيق في تفشي فيروس SARS−CoV−2 في المرضى الذين يعانون من التهابات الجهاز التنفسي الحادة الشديدة والأمراض الشبيهة بالإنفلونزا أثناء عدوى متغير Omicron في العراق بين كانون الثاني (يناير) 2022 وأغسطس (آب) 2022.تم إجراء تفاعل البوليميراز المتسلسل للنسخ العكسي في الوقت الفعلي (rRT−PCR) باعتباره بروتوكول التشخيص القياسي لتحليل مسحات البلعوم الأنفي لـ 1879 شخصًا يعانون من أمراض تنفسية حادة وأمراض تشبه الإنفلونزا.من إجمالي 1879 مشاركًا ، أظهر 520 (27.7٪) إصابة مؤكدة بـ SARS−CoV−2 وكانت ذروة الإصابة خلال شهري يناير وفبراير خلال فصل الشتاء ويونيو خلال موسم الصيف مع وجود فرق معتد به إحصائيًا . أظهر الذكور معدل إصابة أعلى بنسبة 8٪ من الإناث ولكن دون فروق ذات دلالة إحصائية. من بين الحالات الإيجابية كانت الفئات العمرية 31−40 و 21−30 و 41−50 هي الفئات الأكثر تضرراً مع وجود فارق كبير إحصائياً. فيما يتعلق بالمعدل الإيجابي للاصابة كان أعلى في محافظة بغداد / مدينة الرصافة ومحافظة أربيل مع وجود فرق ذو دلالة إحصائية عالية.يمكن تساعد نتائج هذه الدراسة في رصد انتشار الفيروس من أجل وضع المهنيين الصحيين والمسؤولين في وزارة الصحة والحكومة لاتخاذ الإجراءات الاحترازية لتلافي ظهور موجة جديدة من المرض في العراق.

1. Introduction:

COVID-19 is the most recent pandemic that has appeared on the continental level that the world witnessed during the years 2020, 2021 and until this moment is raising serious health concerns around the globe.This new unknown causative agent of a new pneumonia group appeared in December, 2019 in Wuhan, Hubei Province, China. Laboratory diagnosis concerning the virus and subsequent studies indicated that it is a new type of coronavirus that differs from other viruses that cause pneumonia [1]. Specialists have identified the newly emerged virus as the viral pathogenic agent. Due to its high transmissibility it has infected millions of people worldwide. WHO termed it as *2019-nCoV* on 12th January, 2020. Later on the International Committee on Taxonomy of Viruses (*abbr.* ICTV) retermed it as Severe Acute Respiratory Syndrome Coronoavirus -2 (*abbr.* SARS-CoV-2) on 11th February, 2020 and the disease as coronavirus 19 (COVID-19) [2, 3]. The ability of the virus to remain viable from hours to a few days depended on the surrounding environment (temperature and humidity of the place) and surfaces, especially in hospitals that provided treatment for COVID-19 patients that are contaminated with high concentrations of the virus. On the other hand, the appearance of the virus in the blood and faeces raised many questions about other possible modes of transmission [4, 5, 6]. The disease symptoms appear from 2 to 14 days after exposing to the virus and are similar to those of MERS-CoV. These symptoms can be mild like fever, fatigue, and dry cough and sometimes the patients have pain, runny nose, diarrhoea, sore throat plus losing smell and taste senses with frequent chills in some cases. On the other hand, in some people (asymptomatic) the infection passes without any symptoms. While some severe symptoms that lead to tissue damage have also been recorded [7]. According to WHO report issued on 16th October, 2022, there were 621 million certained cases and about 6.5 million deaths due to infection have been recorded worldly [8]. After the appearance of the first case of SARS-CoV-2 infection in Najaf Governorate, Iraq, the health authorities in the country took it upon themselves to manage the policy of controlling the pandemic after the spread of the different strains of the virus as well as managing the vaccine file [12]. The rapid transmission of the virus and its replication between different hosts has led to frequent mutations appearing in the viral genomes and the emergence of new viral variants. Among these variants that appeared over the world, the most common is alpha (B.1.1.7), beta (B.1.351), delta (B.1.617.2), gamma (P.1), epsilon (B.1.427 and B.1.429), eta (B.1.525) and iota (B.1.526). Other detected variants to be monitored (VBM) are kappa variant (B.1.617.1),

mu variant (B.1.621 and B.1.621.1), and zeta (P.2)] and the two most important recent variables of concern (VOC) are delta lineages B.1.617.2 and AY and omicron B.1.1.529 and BA which are now found in more than 150 countries [9, 10, 11]. This study aimed to investigate the outbreak of the SARS-CoV-2 virus among patients during variable omicron infections in Iraq between January 2022 and August 2022.

2. Methods:

2.1. Study Populations

A total of 1879 patients who suffered from severe acute respiratory and influenza-like diseases were enrolled in this study from January 2022 to August 2022. The study covered north, middle and south of Iraq areas: Baghdad Governorate/ Karkh and Al-Rusafa districts, Basra and Erbil governorates. Nasopharyngeal swabs were collected from each patient according to WHO guidelines and diagnosed by RT-PCR technique. Molecular Assays were conducted in the COVID-19 diagnostic laboratories of those governorates. Demographic and clinical data was collected by using a questionnaire specially designed for this purpose. .

2.2. Molecular Detection

Follwoing the manufacturer's instructions, RNA was extracted by ZybioViralDNA/RNA B200-32 kit (China) using EXM3000 molecular automation instrument (Zybio, China) which is characterized by rapidity, sample purity and high yield of extraction utilizing magnetic beads method that binds nucleic acids [13]. SARS-Cov2 was identified by TaqPath™ COVID-19 RT-PCR diagnostic kit (Thermo Fisher Scientific) using Applied Biosystems™ 7500 fast real-time PCR machine (Germany). The kit included probes and specific primers that targeted three genes (ORF1ab, N Gene and S Genes) as well as positive and negative controls. Data was analyzed by Applied Biosystems™ COVID-19 computing interpretive software. Infection was considered as “SGTF (S gene target failure assay)” when the TaqPath COVID-19 PCR test of the patients was positive, and the N gene or ORF1ab gene had a cycle threshold of 36 or less. The S gene, however, was not detectable [14, 15] .

2.3. Statistical Analysis

For analyzing the data, the reasearchers used SPSS-version 25 and GraphPad prism version 8. Both the Pearson coefficient test and Chi-square test. *P*-value less than 0.05 was considered statistically significant.

3. Results:

3.1. Molecular Detection of SARS-CoV-2

Overall, 520 (27.7%) out of 1879 patients were positively dignostized for SARS-Cov-2, while 1359 (72.3%) patients were negatively dignostized, with a significant statistical difference (Chi-square = 19.36; $p < 0.001$). Although the inflectional prevalence was identified as higher (54%) in males than in female (46%) but statistically no significant differences ($p< 0.07$) was found according to gender (Table 1).

Table 1: Results of RT-PCR for SARS-Cov-2 based on gender.

Gender	**SARS-CoV-2 Positive Cases**		**Chi-square 3.39 *p*-value 0.07**
	Frequency (n)	**Percentage (%)**	
Male	281	54.0	
Female	239	46.0	
Total	520	100	

Regarding the distribution of infection with months, the highest rate of infection was in both February and January which were 24.8% and 24.6% respectively, while the lowest rate of infection was 17.7% in June with significant differences (P =0.001) (Figure 1). It is pbvious from Figure 1 that the lowest rate of infection was not in June but July.

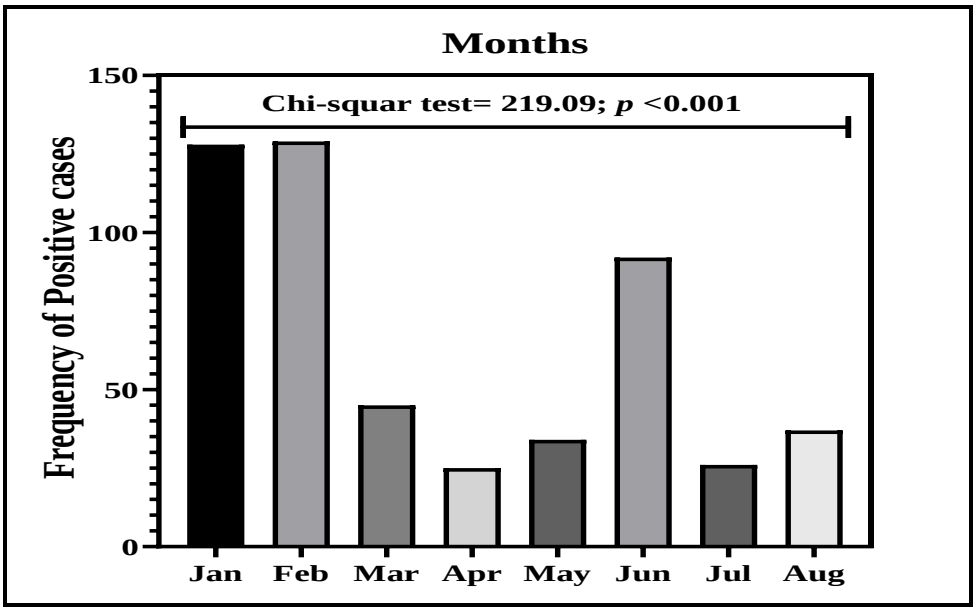

Figure 1: Positivity rate of SARS-CoV-2-infection by months of year.

The higher prevalence of SARS-CoV-2 positive cases among the age groups of individuals who tested positive for the presence of viral DNA diagnosed at the Central Diagnostic laboratories for COVID-19 in the governorates of Iraq included in the study, was 26.2% (n = 136), 20.8% (n = 108) and 19.4%(n = 101) in 31-40 years old, 21-30 years old and 41-50 years age groups respectively, with a high statistic significant difference (p <0.001). The mean age and the standard deviation of infected individuals were 42.38±16.776 (Table 2, Figure 2).

Table 2: Results of RT-PCR for SARS-Cov-2 based on age.

Age Groups	**SARS-CoV-2 Positive Cases**		
	Frequency (n)	**Percentage (%)**	
1-20	30	5.8	**Chi-square = 78.69** ***P*-value < 0.001**
21-30	108	20.8	
31-40	136	26.2	
41-50	101	19.4	
15-60	65	12.5	
>60	80	15.4	
Total	520	100	
mean	42.38	***Std. Deviation***	16.776

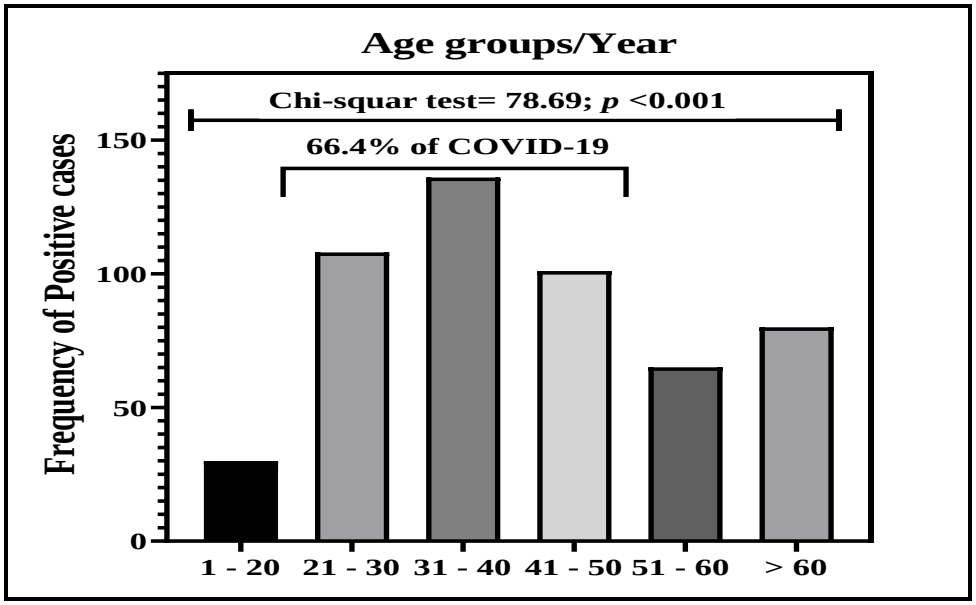

Figure 2: Positivity rate of SARS-CoV-2 infection according to age groups.

Regarding the Department of Health (DOH) in Baghdad Governorate, Karkh district, Baghdad Governorate, Al-Rusafa district, Basra, Erbil and Karbala governorates, the results of the present study showed that the prevalence of the disease was higher in Baghdad Governorate, AL-Rusafa, with a positive rate of 40. 6% (n = 211) and Erbil Governorate 26.5% (n = 138) with a high statistic significant difference (p <0.001) (Figure 3). Around 32.8 % study participants diagnosed with SARS-CoV-2 infections who were from the health departments of Baghdad, Karkh district, Basra and Karbala, were suffering from severe acute respiratory infections. While 67.2 % of study groups diagnosed with SARS-CoV-2 infections for each of Baghdad governorate, Al-Rusafa and Erbil were suffering from influenza-like illnesses, with a high statistic significant difference (p <0.01).

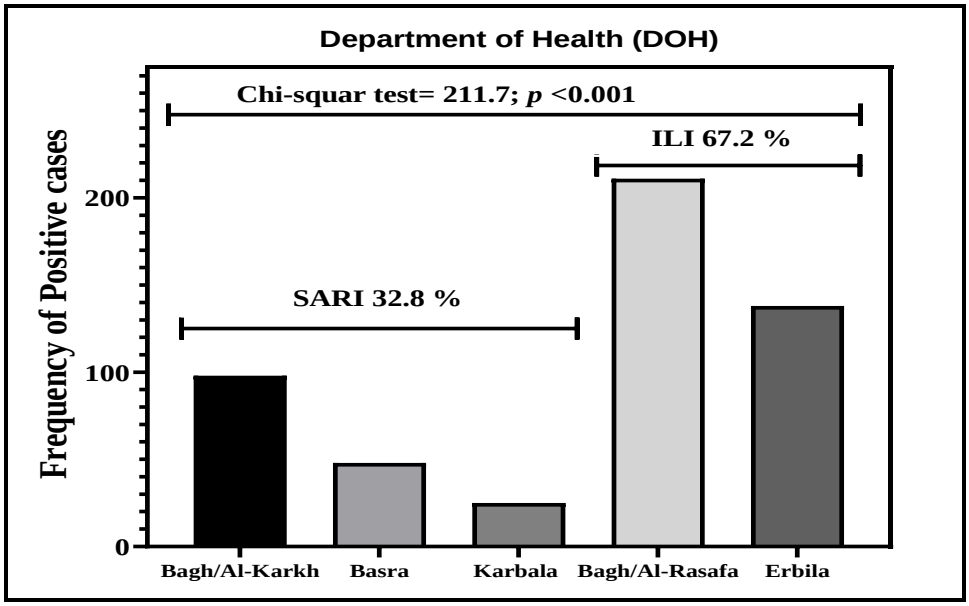

Figure 3: Positivity rate of SARS-CoV-2infection according to the Department of Health (DOH).

4. Discussion:

The epidemiological situation of SARS-CoV-2 over the world has improved significantly and the news of "COVID-19" is no longer receiving great attention globally and locally, especially after the development of vaccines which reduced the spread of the disease significantly. Health experts and workers, however, at the World Health Organization still fear that the situation may worsen by next winter because this emerging virus may evolve and mutate at the genetic level and produce new more aggressive variants. Various methods have been used to detect SARS-CoV-2. Due to its high sensitivity and specificity, real-time polymerase chain reaction is the most reliable method for diagnosing it. Other diagnostic methods, such as serological tests, including the ELISA test, are of great importance. No less than molecular tests, in survey research to determine the responses of immunity against SARS-CoV-2 infections, and are widely applied in the studies of seroprevalence in a large number of countries [16]. Al Janabi and Chung [17] indicated that the health system in Iraq is not adequately prepared to face the pandemic of the century optimally in terms of quick treatment of the offensive effects of the spread of the virus. As expected, the rapid increase of cases of COVID-19 in Iraq in February 2021 and beyond and during its successive waves was because of the emergence of new variants of concern [18]. According to WHO reports, from January 3, 2020, to October 26, 2022, Iraq recorded 2,461,107 confirmed cases of the virus and 25,358 deaths [19]. The result of this study indicated that among the 1879 samples, 520 (27.7%) were confirmed positive for SARS-CoV-2 infection. Multiple studies around the world have shown different positive rates of SARS-CoV-2 infection. The prevalence of COVID-19 in Jakarta Indonesia and neighbouring regions, between March,2020 and February 2021, was 10,130 (15.7%) confirmed positive cases [20]. The age groups of the participants in the current study (31-40, 21-30 and 41-50) respectively. were the most age groups dignosized with SARS-CoV-2 with a positive rate of 66.4%, compared to other age groups. This was also indicated by the study conducted in Bangladesh [21]. Mohammed *et al*. [22] indicated that older patients with chronic diseases like diabetes and hypertension are more likely to develop a severe disease compared to other age groups. In addition to infection with seasonal influenza viruses and other respiratory viruses, cases of Covid-19 infection may increase during the winter months and this is what was shown by the current study, as the months of January and February showed the highest rate of confirmed infection with SARS-CoV-2. Changes in environmental conditions caused by the seasonal cycle play an crucial role in virus survival. Aerosol transmission has been confirmed as one of the transmission means of SARS-CoV-2. It has been anticipated that cold, dry conditions were favourable for virus transmission in aerosols during the winter months [23, 24, 25]. In addition, high humidity has an increasing effect on the efficiency of virus transmission. High humidity helps the virus to survive on surfaces which are contaminated with infected respiratory secretions by affecting the evaporation of those virus-carrying droplets [26]. In addition, people gathering and staying indoors during the colder months may contribute to an increase in the rate of infections [27]. COVID-19 infection rates detected during the current study, specifically in May and June, were 162 positive cases which is lower than what appeared in the results of the study conducted in southern Bangladesh during the period from May to June 2020 which was 879 positive [28, 29, 30]. The decrease in the number of infections during those months may be because during this period crowding and gatherings decrease due to the end of the school year in schools and universities, plus the gradual decrease in the virus spread during the current study period compared to 2020, when the pandemic was at its peak. The positive cases of SARS-CoV-2 were higher in Al-Rusafa district, Baghdad Governorate with a positive rate of 40. 6% (n = 211) and Erbil governorate 26.5% (n = 138) with a high statistic significant difference. Since the outbreak of the pandemic in Iraq and according to the reports of the Iraqi Ministry of Health, the city of Al-Rusafa in Baghdad was the area with the highest spread of infections at the time. It still leads in the number of infections s the city is characterized by

overcrowding and the lack of commitment to the precautionary measures that could have been imposed to avid the situation. Erbil Governorate is Iraq's tourist front and the most visited area by people from inside and outside Iraq, making it the most high-incidence area.

5. Conclusion:

Despite the decline of the COVID-19 pandemic, over the world generally and in Iraq particularly, survey studies still show the SARS-CoV-2 spread in the region, and the fear lies in the frequency of infections and transmission of the disease to people with chronic diseases and those who are immunocompromised. The results of this study helped in monitoring the spread of the virus in order to put health professionals and officials in the Ministry of Health and the government to take precautionary measures to avoid the emergence of a new wave of disease in Iraq.

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