

## The Epidemiology of SARS-CoV-2 Delta Variant in Kurdistan Region/Iraq

**Received:** 10 February 2023, **Revised:** 14 March 2023, **Accepted:** 16 April 2023

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### Keywords:

COVID-19 epidemiology, Iraq, Surveillance, hospitalization, clinical characteristics,

### Abstract

The epidemiological characteristics of patients who infected with delta SARS-CoV-2 variant was studied in Kurdistan Region of Iraq. A cross-sectional study has been carried out among positive patients of SARS-CoV-2 to compare Alpha, Delta and Omicron variants. The Alpha group included 1050 positive subjects diagnosed between June 10 and July 21, 2021, and 9505 patients diagnosed with delta variant enrolled to this study between July 20 August and December 10, 2021, Omicron variant enrolled 1418 cases between 20th December of 2021 to 30th of 2022. A descriptive statistics of the three groups' included the clinical and demographic feature of participants. Delta group had a significantly higher percent of patients with severe and moderate symptoms in comparison to the Alpha group (P value <0.05). Among vaccinated individuals, the percentage of symptomatic patients was higher in Delta group compared to Alpha and Omicron group. Odds ratios of symptomatic patients infected with delta variant was 3.08 (95% CI, 2.55–3.72) and it was 1.10 (95% CI, 0.80–1.41) for hospitalization. Vaccination rate improvement of COVID-19 is considered as main concern to reduce the impacts of the virus on patients' outcome. Additional strategies, such as social distancing, outdoor masking could be crucial in limiting the spread covid-19 infection.

## 1. Introduction

Since the beginning of SARS-CoV-2 pandemic, the virus has been widely circulated, it continually mutates, a new variant emerges. The genetic mutation gives advantage to the virus in emerging several variants of concern (VOC). The variants have higher level of transmissibility, pathogenicity and virulence<sup>1</sup>. VOCs have linked to reduced efficiency of public health measures including diagnostics, vaccines, and treatment, as well as epidemiological changes<sup>1</sup>. Continuous observing and timely assessment of genetic alterations are essential for identifying the spread of these variants<sup>2</sup>. Surveillance improvements and enhanced concern regarding the identification of new variants, the international travels among countries, and local transmission have raised awareness regarding spreading of VOC.

Multiple epidemiological researches showed that the COVID-19 was noted on December 2019 in Wuhan province, China<sup>3-5</sup>. This virus later spread throughout the world, including Asian and European countries and it was identified as pandemic on March 2020<sup>5</sup>. The first case of this disease was discovered in Iraq at 24<sup>th</sup> February 2020<sup>6</sup>. COVID-19 is highly infectious, and it transmits from person to person<sup>7</sup>. According to data reported by the Government of Iraq (<https://moh.gov.iq>) in June 2022, the total COVID-19 cases in Iraq were 2,345,893, the total deaths were 25,239 and the total recovered cases were 2,311,299.

After the first wave of the pandemic, epidemiological surveillance focused on testing patients who were symptomatic patients with critical condition that required hospitalization and intensive medical care<sup>8-9</sup>.

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While efforts to ensure that everyone has access to molecular testing, the vast virus spread has effectively confined COVID-19 diagnosis to just those infected persons who have exhibited severe symptoms<sup>10</sup>. This constraint, combined with an absence of guidelines in the identification and diagnosis of asymptomatic patients, greatly affected the impact of testing procedures and tracing contacts, jeopardizing the community's ability to control SARS-CoV-2 spread. Lack access of population data, variations in official statistics across countries has made challenge in comparison the cases globally.

In response to the pandemic large number of people who had symptoms in the public who lived in Iraq during the first lockdown were enrolled to the ministry of health dashboard. Researchers were able to understand the association of symptoms, the vaccination role to prevent diseases and to define aspects of the population in the context of the pandemic.

This provides epidemiological data on Delta variant infections. The aim of this study was to investigate the epidemiological and demographic characteristics, hospitalization mortality of the Delta variant outbreak in Kurdistan Region/Iraq. We were able to investigate the impact of vaccination on virus shedding and transmission.

## 2. Material and Methods

### Study design and setting:

The patients' demographics, epidemiological features, history of chronic disease, and clinical status were collected in a retrospective cross-sectional study. The information was gathered from three provinces with the assistance of healthcare workers, such as doctors, nurses, or pharmacists from the hospitals who provided medical care to the patients. COVID-19 was diagnosed by taking a sample from throat or Real Time-Polymerase Chain Reaction (RT-PCR) test in laboratory, another diagnosis method is checking signs and symptoms of the patient.

### Study population:

The SARS-CoV-2 patients were separated into Alpha, Delta and Omicron variants. The Alpha group included 1050 subjects who were diagnosed between June 10 and July 21, 2021, 9505 cases of Delta variant

enrolled to this stud, which they were diagnosed from July 20 August to December 10, 2021, 1418 Omicron variant cases enrolled between December 20 2021 to March 30 2022.

In this study, virus strains were identified using the sequenced genome and classified using the "Pango lineages" rule<sup>12</sup>. The latent period is the time pattern between infection and becoming contagious, as opposed to the incubation period, which is the time interval between infection and symptom onset.

All patients' demographics, as well as data regarding symptoms, vaccinations, hospitalizations, incubation period, mode of transmission and outcomes for COVID-19, were documented. Patients were classified based on the clinical stage of COVID-19 disease as determined by the health institutions.

### Case definition:

Patients with delta variant, in particular, were labeled as "asymptomatic" if they lacked any COVID-19 symptoms; When symptoms like a fever, cough, sore throat, malaise, headache, muscle pain, nausea, vomiting, diarrhea, or a loss of taste or smell are present but there is no sign of shortness of breath, dyspnea, or abnormal chest imaging, the condition is classified as "mild"; it is classified as "moderate" if there is signs of lower respiratory infection but hospitalization is not necessary; "severe" if respiratory failure, septic shock, and/or multiple organ dysfunction had occurred, requiring the patient's admission to the intensive care unit. "critical" if SpO<sub>2</sub> was low, respiratory rate was less than 30 breaths per min, or if there is evidence of lung infiltration by more than 50%.

### Statistical analysis:

Patients were categorized according to the worst clinical condition they had. Patients were divided into three groups: Alpha, Delta and Omicron group, also they are separated to unvaccinated (those who did not receive COVID-19 vaccine), partially vaccinated (received one dose in two weeks) fully vaccinated). Data presented as percentage and 95% confidence intervals (CI), and Chi-square or Fisher exact test was utilized to compare epidemiology of the variants. The association between clinical state, hospital admission, and infections with the Alpha, Delta or Omicron variant was investigated by using a multivariate

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logistic regression model. The data was analyzed by using SPSS version 25, and a p-value less than 0.05 was considered as statistically significant.

### 3. Results

A total, 11,973 SARS-CoV-2 positive cases from Kurdistan region were enrolled. They were separated into three groups. The group one (n =1050) was labelled "Alpha" variant, while the group two (n = 9505) was labelled "Delta", also the group three (n=1418) labelled "Omicron". The Alpha group had 99.1 percent (n = 1041) unvaccinated patients, moreover, 0.1% percent (n = 1) of the Alpha group incompletely vaccinated, and 0.9 percent (n = 9) were completely vaccinated, while the Delta group had 99.7 percent (n = 9478) unvaccinated patients, 0.1 percent (n = 13) partly vaccinated patients, and 0.28 percent (n = 27) vaccinated patients. Whereas, among Omicron group 98.9 (n=1403) were unvaccinated, and 0.5 percent (n=5) were partially vaccinated, 1.06 percent (15) were fully vaccinated. Clinical and

demographic characteristics were described in (table 1).

The proportion of patients SARS-CoV-2 Alpha, Delta and Omicron variant were significantly higher among all age groups except patients aged 5-16 years. Moreover, highest proportion 51.7 (n=4911) of infection patients aged 17-35 years found those who were infected with Delta variant, while greatest percent 60.4 (n=634) and 77.4 (n=1094) of cases aged 36-65 years found among Alpha and Omicron variant group (P = 0.001). Furthermore, the patients infected with Delta variant had a significantly higher percentage of patients with mild and moderate symptoms than the Alpha and Omicron group (p 0.001). Furthermore, the Delta group had a higher percent of patients with severe and critical symptom in comparison to the other variants, though the difference was not statistically significant. Hospital admission and mortality rates were higher for patients infected with Delta variant (p = 0.001) compared to Alpha and Omicron variant (Table 1).

**Table 1:** Demographic and clinical characteristics of patients with Alpha, Delta and Omicron variant

Patients' characteristics	Alpha		Delta		Omicron		P value
	N	%	N	%	N	%	
Age							
0-4	2	0.20%	3	0.00%	10	0.70%	0.001
5-16	27	2.60%	688	7.20%	42	3.00%	0.6
17-35	176	16.80%	4911	51.70%	32	2.30%	0.001
36-65	634	60.40%	3480	36.60%	1098	77.40%	0.001
>65	211	20.10%	423	4.50%	236	16.60%	0.001
Sex							
Female	445	42.40%	4238	44.60%	602	42.50%	0.15
Male	605	57.60%	5267	55.40%	816	57.50%	
Clinical status							
Asymptomatic	84	8.00%	24	0.30%	41	2.90%	0.001
Mild	288	27.40%	2441	25.70%	502	35.40%	0.001
Moderate	635	60.50%	6554	69.00%	821	57.90%	0.001

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Severe	33	3.10%	386	4.10%	42	3.00%	0.15
Critical	10	1.00%	100	1.10%	12	0.80%	0.61
Hospital admission	37	3.50%	808	8.50%	13	0.90%	0.001
Death	24	2.30%	235	2.50%	3	0.20%	0.001

Based on the results, among vaccinated participants, the highest percentage (100) of symptomatic patients aged less than 18 years only found in Omicron group. In addition, 91% of symptomatic patients aged 36-65 years reported in Delta wave (P value <0.05). However, asymptomatic patients only found in Delta variant group by 100% (P value >0.00). Among

unvaccinated groups, the proportion of symptomatic people in all age groups higher in Delta group in comparison to Alpha and Omicron groups. Furthermore, among asymptomatic people highest proportion (100%) found in those aged 18-35 years (P value <0.005) (table 2).

**Table 2:** Clinical status of the COVID-19 variants by age group and vaccination status

vaccinated		COVID Type			P value
		Alpha N (%)	Beta N (%)	Omicron N (%)	
Yes	<b>Symptomatic</b>				0.001
	<18	0	0	1 (100)	
	18-35	8 (22.9)	12 (34.3)	15 (42.9)	
	36-65	0	10 (90.9)	1 (9.1)	
	>65	1 (16.7)	2 (33.3)	3 (50)	
	<b>Asymptomatic</b>				0.8
	<18	0	0	0	
	18-35	0	0	0	
	36-65	0	1 (100)	0	
	>65	0	0	0	
No	<b>Symptomatic</b>				0.001
	<18	29 (3.8)	690 (89.5)	52 (6.7)	
	18-35	168 (3.3)	4892 (96.4)	17 (0.3)	
	36-65	550 (10.9)	3452 (68.2)	1057 (20.9)	
	>65	207 (24)	421 (48.7)	236 (27.3)	

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	Asymptomatic				
	<18	0	0	0	0.001
	18-35	0	7 (100)	0	
	36-65	84 (58.6)	16 (11.3)	41 (29.1)	
	>65	0	0	0	

## 4. Discussion

Since its identification in India, the Delta variant spread very fast throughout the world, causing an increase in infection cases<sup>13</sup>. The Delta variant had a significant impact in India due to its high morbidity rate and massive load on hospitals, leading to medical supply and life-saving equipment shortages. As a result, concerns have been raised about this variant's ability to resist SARS-CoV-2 vaccine-induced immunity<sup>15</sup>.

This research was carried out to evaluate the epidemiology and effects of Delta variant in Kurdistan region though assessing the rate of hospital admission, symptoms of disease and death. The highest proportion of patients aged 36-65 year infected with Delta and Omicron variant, may be it is related to high coverage vaccine among youth (people aged <35 years) and elderly population. According to recent study, Omicron variant has been increased among adolescents and young people. In August 2021, the incidence of COVID-19 cases among children in the United States was ten times higher compared to June 2021<sup>16</sup>.

Our findings revealed that Delta variant individuals were more likely than Alpha and Omicron variant patients to acquire serious illness, however the difference was not significant. This information could be clarified through the fact that the severity of Omicron variant is less compare to the other variants. Although early findings indicate that Omicron may develop milder symptoms, some persons may still acquire severe disease, require hospitalization, and die as a result of infection with this variety and Iraq's low vaccination coverage. Furthermore, among vaccinated patients, the percentage of asymptomatic patients was greater in the Delta group than Omicron and Alpha variant. This could be linked with neutralizing activity

against the variants in fully vaccinated patients<sup>17-18</sup>. However, it is unknown whether the decline in neutralization activity will impair the effectiveness of COVID-19 vaccinations. Vaccine efficacy against Delta and Omicron variants was found to be higher in completely and partially vaccinated subjects than against infection with the Alpha variant<sup>19</sup>. Recent studies indicated a reduction in vaccine impact against the Delta variant<sup>20</sup>. More research is needed to clarify this critical issue.

Our research reveals that patients with the Delta variation were more likely to be hospitalized, three times higher in comparison those infected with Alpha and Omicron variant. The hospitalization of the cases have been supported with an earlier study, as it has been stated people with the B.1.617.2 were at risk to be hospitalized three times compared to the other variants.<sup>21</sup>.

The hospitalization rate according to vaccination and variants were not compared in our study because of insufficient number of vaccinated cases who had been admitted to the hospital in Alpha group. This could be related to the Delta group's structure, which included COVID-19 patients infected from July 20 August and December 10, 2021, at that time highest number of people infected with the Alpha and vaccination rate was too low.

Though this study found that SARS-CoV-2 Delta variant had effectiveness on the outcomes of the patient, the study had several numbers of limitation, which may affect the accuracy of results. Firstly, the samples were chosen according to the prevalence of the variants rather than sample sequencing, the positive samples were not allocated to whole-genome sequencing (WGS). In fact, the research only compares the variants in three different time periods. whereas, the prevalence of variants were nearly 100%

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during the two times. Secondly, the sample sizes of the three groups were significantly different. These findings reflect SARS-CoV-2 morbidity rates in three time periods. Our study's main strength is that it provides understanding into several initial epidemiological sides of Delta variant infection in Kurdistan Region/Iraq. The results, could serve as the foundation for decision of public health authorities in our states along with epidemiology of SARS-CoV-2 infection. Low vaccine efficiency and high transmissibility of Delta variant could increase in contact rates that may lead to increase transmission of infection<sup>22</sup>.

## 5. Conclusion

Improvement of vaccination rate of COVID-19, is a priority because the Delta variant is linked to an increased risk of COVID-19 infection and hospital admission. Vaccination is the primary approach for infection prevention, severe clinical status, hospitalizations, and mortality related to SARS-CoV-2 illness. Due to of the Delta variant's high transmissibility, additional prevention strategies such as social distancing, mask use regardless of vaccination status, and the use of sanitary passports may be essential for restricting infection spread throughout the fall and winter respiratory virus seasons.

## Acknowledgments

The authors thank healthcare workers, such as doctors, nurses, or pharmacists and ministry of health.

## Disclosure

The authors have no conflict of interest.

**Authors contribution:** The authors participated equally in all stages of this work including, data collection, data coding, analysis, writing and revising.

**Funding:** This study has not received external funding.

## Ethical approval:

This study involved human participation, thus formal paper from the department submitted to the college of medicine at university of Sulaimani. The ethical approval granted by the ethical committee from college of medicine. In addition, informed consent

obtained from the study participants prior to study commencement.

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- [22] **Abbreviations:** VOC: variant of concern, WHO: World Health Organization, CDC: center of disease control.