

Comparison of Clinical Characteristics and Outcome of COVID-19 Patients Between the 4th and 5th Wave in a Tertiary Care Hospital in Karachi, Pakistan

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ABSTRACT

Objective: To compare the clinical parameters of 4th and 5th COVID waves in Karachi, Pakistan.

Study Design: Descriptive study.

Place and Duration of the Study: PNS Shifa Hospital, Karachi, from July 2021 to February 2022.

Methodology: All patients with COVID-19 in PNS Shifa Hospital were included in the study. The patients were divided into two groups, those who had COVID-19 during the 4th wave, and others who had it during the 5th wave. The patients' demographic details, comorbidities, vaccination status, initial presentation, the severity of disease, clinical progress, and final disposal from the hospital were noted. A comparison of severity, length of hospital stays, and mortality was made between the groups.

Results: There were 747 patients admitted during the Delta variant-dominated 4th wave of COVID-19, and 490 patients during the 5th wave, dominated by the Omicron variant. A vast majority of fifth-wave patients had the mild disease (87.35% vs. 49.39%), with significantly lower critical patients (2.04% vs. 7.09%). Vaccination was effective against both the Delta and the Omicron variant of the SARS-CoV-2 virus. The mean length of stay in the hospital for patients was significantly lesser ($p < 0.001$) during the 5th wave as compared to the 4th wave (6.43 ± 3.37 vs. 9.56 ± 5.45 days). The mortality rate was 7.09% among patients admitted in the 4th wave and 2.04% in the 5th wave. This difference was statistically significant ($p < 0.001$).

Conclusion: The severity of disease, length of hospital stays, and mortality were higher in the Delta variant-dominated 4th wave of COVID-19 as compared to the Omicron variant-dominated 5th wave in Pakistan. The vaccination was effective against both the Delta and the Omicron variant of COVID 19, as the mortality rate among the vaccinated patients during the two waves was not significantly different.

Key Words: COVID 19, Vaccination, Disease outcome, Mortality.

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INTRODUCTION

Numerous countries across the globe have encountered outbreaks of COVID-19 since 2020. The overall pattern of the coronavirus pandemic so far has been a series of COVID-19 waves, surges in new cases, with different characteristics, followed by declines. Several factors have had an impact on whether new COVID-19 cases are increasing or declining in different geographical locations.

These factors include the effectiveness of vaccines over time, human behaviour, infection prevention policies, changes to the coronavirus itself, and the number of people who are vulnerable because they have not developed some immunity, whether from natural infection or through vaccination.

The SARS-CoV-2 virus is prone to mutations.¹ As a result, numerous variants of the SARS-CoV-2 virus have emerged. In Pakistan the 4th wave of COVID-19, dominated by its Delta variant, started in July 2021 and lasted till October 2021.² At the start of the fourth wave, only around 7% of the Pakistani population had received at least one dose of COVID-19 vaccine.³

The fifth wave of COVID-19 in Pakistan was predominantly caused by the Omicron variant of the SARS-CoV-2 virus.⁴ The first case of Omicron was reported in Pakistan on 13th December 2021.⁵ The fifth wave reached its peak on 27th January 2022, in

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Pakistan with 8133 new cases reported by National Command and Operation Center (NCOC).⁶ At that time, almost 36% of the Pakistani population was fully vaccinated while a further 10% had received at least one dose of COVID-19 vaccine.³ Pakistan government had also started booster dose administration to all those who were fully vaccinated for over 6 months from December 2021.

Both the Delta and the Omicron variants of SARS-CoV-2 virus were infectious. However, the Omicron variant was considered to spread even more rapidly than the Delta variant.⁷ In addition, there were concerns about the efficacy of vaccination against the Omicron variant of the virus.⁸

This study aimed to analyse and compare the 4th and the 5th wave of SARS-CoV-2 in terms of the severity of the disease, hospitalisations, and mortality.

METHODOLOGY

The study was a descriptive study conducted in Pakistan Naval Ship (PNS) Shifa Hospital, Karachi, from July 2021 to February 2022. All patients who were diagnosed with COVID-19 (COVID-19 Polymerase Chain Reaction test positive) in PNS Shifa Hospital were included in the study. These patients comprised of those who were admitted through the COVID-19 Clinic, emergency room, or in the wards.

The patients who had COVID-19 clinically but the diagnosis could not be confirmed by PCR test for COVID-19 were excluded. The Ethical Review Committee approved the study vide letter number ERC/2022/MEDICINE/04. The patients were divided into two groups, those who had COVID-19 during the 4th wave, and others who had it during the 5th wave. The 4th wave of COVID-19 was considered to have lasted from 1st July 2021 to 30th September 2021, as that was the time when a surge of the Delta variant-infected COVID-19 patients was seen. The 5th wave of COVID-19 was considered to have started from 1st January 2022 up till 15 February 2022, as the number of Omicron variant-infected COVID-19 patients had dominated during that period. The hospital record of COVID-19 patients was accessed. The patients' demographic details, comorbidities, vaccination status, initial presentation, the severity of disease, clinical progress, and final disposal from the hospital were noted.

Data were analysed using IBM SPSS v 25. Numerical variables were expressed as mean and SD values after applying descriptive statistics. Categorical variables were expressed as percentages and frequencies. The two groups (the patients treated during the 4th and 5th wave of COVID-19) were compared for their age, gender distribution, and comorbidities. A comparison of severity, length of hospital stays, and mortality was made between the patients admitted during the 4th and the 5th COVID-19 waves. Chi-square test was used to find out if there was a significant difference in the severity of the disease between the 4th and the 5th wave. The t-test was done to find out any significant difference in the duration of hospital stays

during the 4th and the 5th wave. The same analyses were done to compare the vaccinated and the non-vaccinated patients. The p-value of less than 0.05 was considered significant.

RESULTS

There were 747 patients admitted during the Delta variant dominated 4th wave of COVID-19, 370 of them having been vaccinated against COVID-19 while 377 were non-vaccinated.

During the 5th wave, dominated by the Omicron variant, 490 patients were admitted, 486 of whom had been vaccinated against COVID-19.

The comparison of demographic distribution and comorbidities between the Delta variant-dominated fourth wave and Omicron variant-dominated fifth wave is given in Table I.

The severity of the disease also varied between the fourth and the fifth wave. A vast majority of the fifth-wave patients had mild disease. The number of critical patients was also significantly lower in the fifth wave. The comparison of disease severity between the fourth and the fifth wave is given in Figure 1.

Table I: Comparison of demographic distribution and comorbidities between patients of the fourth and fifth wave of COVID-19.

Characteristics	Fourth Wave n (%)	Fifth Wave n (%)
Gender		
Male	521 (69.75)	425 (86.73)
Female	208 (27.85)	65 (13.27)
Age (years)		
1-20	54 (7.23)	46 (9.39)
21-40	362 (48.46)	312 (63.67)
41-60	210 (28.11)	90 (18.37)
61-80	101 (13.52)	35 (7.14)
81-100	20 (2.68)	7 (1.43)
Comorbidities		
Hypertension	24 (3.21)	53 (10.82)
Diabetes	20 (2.68)	30 (6.12)
Ischemic heart disease	5 (0.67)	15 (3.06)
Bronchial asthma	3 (0.4)	9 (1.84)
Cerebrovascular accident	3 (0.4)	2 (0.41)
Malignancy	2 (0.27)	2 (0.41)
Chronic kidney disease	2 (0.27)	1 (0.20)
Hyperthyroidism	1 (0.13)	2 (0.41)
Hepatitis C	1 (0.13)	0 (0)
Acute demyelinating polyneuropathy	0 (0)	1 (0.20)

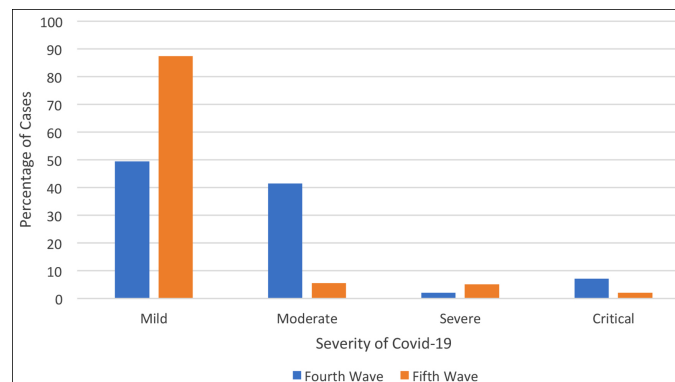


Figure 1: Comparison of disease severity between the 4th and the 5th wave of COVID-19.

The mortality rate of patients admitted in the 4th wave was 7.09% whereas it was 2.04% in the 5th wave. This difference was statistically significant ($p < 0.001$).

There were 370 vaccinated patients treated during the 4th wave, 15 (4.05%) of whom died. During the 5th wave, 486 vaccinated patients were treated, 10 (2.06%) of whom died. The difference in mortality rate was not significant ($p = 0.102$).

Amongst the non-vaccinated patients, the mortality rate was higher during the 4th wave, as 38 (10.08%) non-vaccinated patients died due to their illness. In the 5th wave, only 4 non-vaccinated patients were admitted, all of whom survived.

The mean length of stay in the hospital for COVID-19 patients during the 4th wave was 9.56 ± 5.45 days. During the 5th wave, the mean hospital stay was 6.43 ± 3.37 days. The difference between the two was significant ($p < 0.001$).

The vaccinated patients stayed in the hospital for an average 9.89 ± 4.79 days during the 4th wave and 6.42 ± 3.37 days during the 5th wave. The difference was statistically significant ($p < 0.001$). The non-vaccinated patients had mean hospital stay of 9.25 ± 6.02 days during the 4th wave, and 8.75 ± 2.5 days during the 5th wave. The difference was not significant ($p = 0.723$).

DISCUSSION

To the best of the authors' knowledge, this is the first reported study in Pakistan on comparison of Delta and Omicron COVID-19 waves in terms of severity of disease, hospitalisation, and mortality. Early in July 2021, Pakistan witnessed the start of 4th wave dominated by Delta variant.⁹ The wave lasted for about 4 months. The Omicron variant was first detected in South Africa and it was declared as "variant of concern" by WHO.¹⁰ The Omicron variant has demonstrated a higher transmissibility but lower severity.¹¹ In Pakistan, the surge of the 5th wave dominated by Omicron variant,¹² started in mid-December 2021 and lasted for about two months.

In this study, majority of the patients (69% in 4th wave and 86% in 5th wave) were males. More male population was affected by 5th wave as compared to 4th wave. This was in contrast to a study done by Bouzid, *et al.* in which the Omicron wave was more common in females (53%).¹³ This could be due to the fact that the hospital predominantly receives the young male military population. Similarly, young population (21-40 years) was predominantly affected (48% in 4th wave and 63% in 5th wave).

This study demonstrated that hypertension (3% and 10%, respectively) was a predominant associated risk factor in both waves followed by diabetes (2% and 6%, respectively). The present findings were consistent with another study in which hypertension was the predominant associated comorbid condition followed by diabetes.¹³

Number of studies have demonstrated that infection caused by the Omicron variant is usually mild and has reduced severity as

compared to the Delta variant.¹⁴⁻¹⁷ In this study, 87.3% patients admitted during 5th wave, and 49.3% admitted during 4th wave, had mild disease. Similarly, there was a significant difference in mortality between Delta and Omicron variant, mortality was 7.09% in the 4th wave and 2.04% in 5th wave. These results are consistent with results of study by Bouzid, *et al.*¹³ In their study, the mortality rate was 9.5% in Delta variant and 4.0% in the Omicron wave.

In the present study, mortality among vaccinated persons was 4.05% during the 4th wave while it was 2.06% in 5th wave. These findings suggest that vaccination was equally effective against Delta and Omicron variants. However, mortality among non-vaccinated patient was significantly high (10.08%) in the Delta wave. All four non-vaccinated patients in Omicron wave survived. Another observation was that during the 4th wave, almost half of the patients (50.4%) were not vaccinated; while in 5th wave dominated by Omicron variant, almost all (99.1%) patients were fully vaccinated. These findings also suggest that reduced severity and mortality in 5th wave could be due to complete vaccination of all the patients admitted.

The average length of study during 4th wave was longer (9.56 days) as compared to 5th wave (6.43 days). The possible explanation for this fact is that majority of the patients (87.3%) had mild disease in Omicron wave thus less stay in hospital while 41.4% patients had moderate disease in 4th wave. These findings were in accordance with findings of the study by Maslo, *et al.* which found a shorter length of hospital stay and reduced mortality during the Omicron wave.¹⁵

This study has one main limitation. The authors did not perform genomic analysis to confirm the variant (Omicron or Delta) on majority of the samples due to resource constraints. However, data on various samples across the country suggest 4th wave and 5th wave as the predominant Delta and Omicron variants, respectively.^{9,12}

CONCLUSION

The severity of disease, length of hospital stays, and mortality were higher in the Delta variant-dominated 4th wave of COVID-19 as compared to the Omicron variant-dominated 5th wave in Pakistan. The vaccination was effective against both the Delta and the Omicron variant of COVID 19, as the mortality rate among the vaccinated patients during the two waves was not significantly different.

ETHICAL APPROVAL:

The Ethical Review Committee approved the study vide letter No. ERC/2022/MEDICINE/04.

PATIENTS' CONSENT:

Patients' informed consent for inclusion in this study and using their data in publishing the study was obtained before commencing this study.

COMPETING INTEREST:

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTION:

JAK: Study design and planning.

IK: Data collection and data analysis.

LS: PCR (COVID) and microbiological consultant.

MB: Ward incharge and primary physician of COVID cases.

NAA: Literature review and write-up.

RA: Data analysis and critical revision.

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