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Original Article

COMPARATIVE ANALYSIS OF COVID-19 PATIENTS DURING DELTA AND OMICRON WAVES OF COVID-19 PANDEMIC: AN EXPERIENCE FROM RURAL TERTIARY CARE HOSPITAL IN NORTH INDIA

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ABSTRACT

Objective: In this study, an effort has been made to find out possible clinical parameters that may have played role in differences in the disease outcome in the delta and omicron waves.

Methods: This is a retrospective observational study conducted at a rural tertiary care center of North India. We recorded sociodemographic and clinicopathological parameters of the admitted patients during delta and omicron waves in India. The outcome measures were demographic, baseline clinical, disease severity, ICU admissions and hospital mortality.

Results: In our study, 1731 patients were tested positive for SARS-CoV-2, out of which 16 patients were admitted during the omicron wave and 878 admissions during the delta wave. In delta wave, the ratio of male to female was 1:2 and in omicron wave, it was 1:3. There were 271 deaths in delta wave and 2 deaths in omicron wave. A significantly lower number of admissions were noted during omicron wave ($p<0.001$). Patients without previous history of COVID-19 and unvaccinated status had significantly higher admission ($p<0.001$). The admission rate among comorbid patients was also significantly low in the omicron wave ($p<0.001$). 251 patients had one or more comorbidities and were mostly in severe (13.4%) or critical (88.4%) conditions in delta wave while among 13 comorbid patients in omicron wave, 7.7% were in severe and 15.4% were in critical condition.

Conclusion: The hospital admissions were very low in comparison to delta wave. During delta wave, the degree of severity and number of deaths were also very high.

Keywords: Clinical, COVID-19, Delta variant, Omicron variant, Outcome, Rural India

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INTRODUCTION

The wild strain of SARS CoV-2 i. e. Wuhan variant had now emerged into a variety of variants. Based on the impacts of mutations in SARS-CoV-2 on the effectiveness of the medical countermeasure, severity of disease and ability to spread from person to person, WHO has divided them into three parts: variants of concern (VOCs), variants of interest (VOIs), and variants under monitoring (VUMs). The VOCs designated previously by WHO are Alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1), and Delta (B.1.617.2) due to which many people around the world have been infected and have died [1]. For the first time, the Delta variant (B.1.617.2) was detected in India in the month of March 2021 which was the result of 13 different mutations in SARS-CoV-2 [2]. More than 80 countries around the world were soon affected due to the high transmission rate of the Delta variant. The morbidity and mortality were also very high around the globe [3].

Another SARS-CoV-2 variant B.1.1.529, which is now referred to as the Omicron variant by WHO, is the fifth Variant of Concern (VOC), and was first identified in South Africa in November 2021 [4]. The Omicron variant has been reported to be the result of around 50 mutations in the genome of SARS-CoV-2 of which 30 are present in spike protein [5]. In India, the first Omicron variant was identified in Karnataka on 25 November 2021 and within 20 days; India had reported approximately 200 cases of Omicron. The current concern is that Omicron can evade immunity induced by the currently used vaccines and drugs [3].

Outlining the transmission of the Omicron at this time is scanty and an evaluation is required for the effectual control of this variant worldwide. Specifically, it is important to explore whether the transmission rate and symptoms of the Omicron variant can be attributed to immune evasiveness i. e., the proportion of vaccinated or previously infected individuals being receptive to infection for this variant or both. Some studies have shown that infection with the Omicron variant has been seen even in people who have received two doses of COVID vaccines [6]. According to a study on the BNT162b2 vaccine (Pfizer-BioNTech), it is analyzed that this vaccine is also capable to counteract the Omicron variant during both delta wave and omicron waves. It has been found that the chances of infections have decreased in people who have taken all doses of vaccination and even if there is an infection in them, then most of them have been cured by home isolation or with a shorter duration of hospitalization [7, 8].

The focus of this study is to explore the factors that played role in admission and patient outcomes during the delta and omicron waves.

MATERIALS AND METHODS

This retrospective observational study was conducted at our rural tertiary care hospital situated in Eastern Uttar Pradesh, India. In this study, patients of all age group who were admitted between 1st March, 2021 and 20th March, 2022 were recruited. Ethical clearance from Institutional Ethics Committee was obtained for this study dated 07.04.2022.

The main objective of this study was to compare age group, gender, setting area, past history of COVID-19, comorbidities, vaccination details, ICU admissions, disease severity and outcomes.

The patients who were having symptoms and signs of the COVID-19 but were negative for COVID-19 RT-PCR test were excluded from the study. Data of all patients admitted during both waves i. e. delta (between 1st March, 2021 and 30th June, 2021) and omicron

(between 26th December 2021 and 20th March, 2022), on epidemiology, demographics, clinical and laboratories parameters, with the microbiological diagnosis of COVID-19, was extracted from patient files. The data collected were age, gender, and rural/urban setting. History related to COVID-19 vaccination and previous history of COVID-19 was taken. Clinical profiles of patients like body temperature, degree of severity and underlying co-morbidities were recorded at the time of admission. Duration of hospital stay and outcome of patients was also noted.

RT-PCR test was done as per the manufacturer's instructions. Qualitative RT-PCR testing targeting the Envelope (E), Open reading frame 1b (ORF-1b), and RNA-dependent RNA polymerase (RdRp2) genes of beta coronavirus and SARS-CoV-2 virus was utilized for diagnosis. If the RT-PCR test was positive (Ct<35), the samples were stored and sent to the Central Drug Research Institute, Lucknow, for whole-genome sequencing to know the SARS-CoV-2 variants.

In the delta wave, the State Government from different districts of Uttar Pradesh conducted clustered sampling. The majority of isolates were found to be delta variant. [9] In Omicron wave, all samples of admitted patients were sent to Central Drug Research Institute, Lucknow for identification of variants. In delta wave, the state government at King George's Medical University (KGMU), Lucknow, for gene sequencing, conducted cluster sampling. In our region the identified variant were delta (71%), beta (7%), and others (21%) during 2nd wave [9]. The most common observed mutation was found in the spike protein of SARS-CoV-2 virus, which is Spike_D796Y, Spike_D614G, Spike_N969K, Spike_N764K, Spike_Q954Y, whereas in our region, in the Delta variants, two mutations of Spike_K417N and Spike_W258L were observed in the spike protein [9].

Statistical analysis

Categorical variables were presented as frequency and percentages (n; %). Comparability of groups was analyzed by Chi-square test and p-value<0.05 as appropriate. IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA) software was used for statistical analyses.

Ethical consideration

Ethical clearance from Institutional Ethics Committee was obtained for this study dated 07 April 2022.

RESULTS

In our study, 1731 patients were tested positive for SARS-CoV-2, out of which 1153 and 536 cases were registered during Delta and Omicron waves, respectively. There were 65% and 74% males in delta and omicron waves, respectively, without any significant difference.

All 16 samples from admitted patients were identified as omicron variant in the omicron wave.

In this study, we compared the 16 patients admitted during the omicron wave with 878 admissions during the delta wave in our tertiary care hospital [fig. 1].

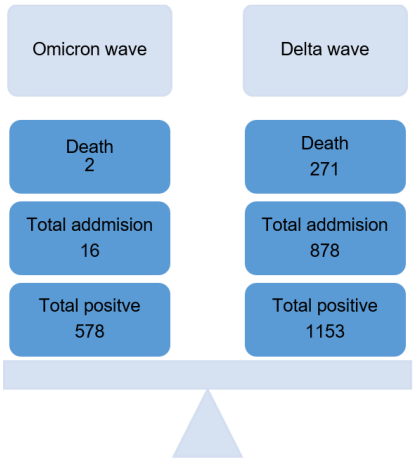

Fig. 1: Comparison of COVID-19 cases in our region during delta and omicron waves

Table 1: Comparison of demography of COVID-19 patients during delta and omicron waves

Indicators	Delta (2nd) wave n (%) or mean (SD)	Omicron (3rd) wave n (%) or mean (SD)	p-value
COVID-19 cases			
Total	1153	536	<0.001*
Admitted	878 (76.1%)	16 (3.0%)	
mean age	46.8	49.25	
Age group			
0-20	51(6.3)	1 (0.06%)	<0.001*
21-40	290 (33%)	4 (30.8%)	
41-60	352 (39%)	4 (30.8%)	
>60	185 (21%)	4(30.8%)	
Sex			
Male	607 (69%)	12(75%)	0.787
Female	271 (30.8%)	4 (25%)	
Sitting			
Rural	695(79.15)	11(68.7)	0.350
Urban	183(20.8)	5(33.3)	
Past history of COVID-19			
Yes	15(1.7%)	5(31.2%)	<0.001*
No	863(98.2%)	11(68.7)	
Co-morbidities			
No-comorbidities	627(71.4%)	3(18.75%)	<0.001*
1 comorbidities	164(18.6%)	4(25%)	
>1 comorbidities	87(9.9%)	9(56%)	
Covid Vaccination detail			
Vaccinated	9(1%)	8(50%)	<0.001*
Unvaccinated	869(99%)	8(50%)	
ICU admission			
Yes	285(32.4)	3(18.7)	0.293
No	593 (67.5)	13 (81.3)	
Outcome			
Death	271(30.8%)	2(12.5%)	0.169
Recovered	607(69.1)	14(87.5%)	

*p value statistically significant at 0.05.

A significantly lower number of admissions were noted during omicron wave (p<0.001). The majority of admitted patients during the delta wave were in the age groups of 21 to 40 and 41 to 60, whose rates were 33% and 39%, respectively, with significantly less admission of age group less than 20 y in omicron wave. The admission was significantly lower during the omicron wave [3.0% v/s 76% (p<0.001)]. Patients without previous history of COVID-19 and unvaccinated status had significantly higher admission (p<0.001). 71.4% and 18.75% of the patients had no comorbidities in the delta and the omicron waves, respectively whereas in the remaining patients, one or more comorbidities were found but the numbers were again very low in the omicron wave. The admission rate among comorbid patients was also significantly low in the omicron wave (p<0.001) [table 1].

Clinical profiles of admitted patients was distributed based on the degree of severity and outcome. Severity of COVID-19 and age showed positive correlation with significantly higher severity among age of more than 40 y. Most of COVID-19 admissions seen in this wave were in the age group of 41 to 60 yrs., out of which 47%of the patients of this age group died and 36.9% people got discharge (p<0.001). In all the categories male were significantly more affected than females (p<0.005), while no significance was found between their outcomes (p 0.013). Most of the patients who did not have any comorbidities remained in non-severe conditions, whereas the patients with one or more comorbidities were mostly in severe or critical conditions, and the significance between them (p<0.001) and their outcomes was significant (p<0.001). There was no significant correlation of the past COVID-19 history of patients with disease severity (p 0.098), while its outcome was significant (p 0.008) [table 2].

Total 16 COVID positive patients were admitted to our tertiary care center during the Omicron wave, out of which 13 patients were in non-severe condition while one patient was severely ill and two patients were in critical condition. No variation was found in the age group in the non-severe condition, whereas the age group of 41–60 y was found in both severe and critical condition (p 0.751), and no significant difference was found among their outcome (p-0.712). During this wave, no significance was found even between genders (p 0.559) and its outcome (p 0.383). All patients with past COVID-19 history were in non-severe condition in this wave and all got discharged from hospital soon. During this wave, no significance was found in any group, one reason for this may be the admission of very less number of patients during this wave [table 3].

Table 2: Clinical profile of admitted patients during delta wave

Indicator	Disease severity during the course of treatment			p-value	Outcome		p-value
	Non severe	Severe	Critical		Discharged	deceased	
Age group							
0-20	48(6.9%)	0(20%)	3(1.5%)	<0.001*	47(7.7%)	4(1.47%)	<0.001*
21-40	252(37.6%)	6(60%)	32(16.32%)		237(44.9%)	53(19.5%)	
41-60	205(37.9%)	32(20%)	115(47.9%)		224(36.9%)	128(47.2%)	
>60	82(17.4%)	22(0%)	81(34.1%)		99(16.3)	86(31.73%)	
Sex							
Male	424(71.9%)	36(60%)	147(59.6%)	0.005*	436(71.8%)	171(63%)	0.013*
female	153(28%)	24(40%)	94(40.3%)		171(28.2%)	100(36.9%)	
Comorbidities							
No comorbidities	482(83.5%)	26(43.3%)	18(7.4%)	0.001*	502(82.7%)	24(8.8%)	0.001*
1 comorbidities	84(14.5%)	23(38.3%)	159(65.9)		92(15.1%)	174(64.2%)	
>1 comorbidities	11(1.9%)	11(18.3)	64(26.5%)		13(2.1%)	73(26.9%)	
Past COVID history							
Yes	13(1.9%)	1(20%)	1(0.5%)	0.098	15(2.4%)	0(0%)	0.008*
No	564(98%)	59(80%)	240(99.5%)		592(97.5%)	271(100%)	
Vaccination detail							
Vaccinated	8(1.3%)	0(0)	1(0.3%)	0.078*	8(1.3%)	1(0.3%)#	0.288
Unvaccinated	569(98.6%)	60(100)	240(99.6%)		599(98.6%)	270(99.6%)	

*p value statistically significant at 0.05; #Post COVID sequelae

Table 3: Clinical profile of admitted patients during omicron wave

Indicator	Disease severity during the course of treatment			p-value	Outcome		p-value
	Non severe	Severe	Critical		Discharged	deceased	
Age group							
0-20	1(7.6)	0	0	0.751	1(7.1)	0	0.712
21-40	4(30.8)	0	1(50)		5(35.7)	1(50)	
41-60	4(30.8)	1(100)	1(50)		5(35.7)	1(50)	
>60	4(30.8)	0	0		3(21.4)	0	
Setting							
Rural	10(76.9)	0	1(50)	0.231	10(71.4)	1(50)	0.541
Urban	3(23)	1(100)	1(50)		4(28.5)	1(50)	
Sex							
Male	8(61.5)	1(100)	1(50)	0.599	11(84.6)	1(50)	0.383
female	5(38.4)	0	1(50)		3(21.4)	1(50)	
Past COVID history							
Yes	5(38.4)	0	0	0.330	5 (35.7)	0	0.242
No	8 (61.5)	1 (100)	2 (100)		9 (64.2)	2 (100)	
Comorbidities							
No-comorbidities	3 (23)	1(100)	2 (100)	0.449	3 (21.4)	2 (100)	0.319
1 comorbidities	4 (30.7)				4 (28.5)		
>1 comorbidities	6 (46.1)				7 (50)		
Vaccination detail							
Vaccinated	6 (46.1)	1 (100)	1(50)	0.584	8(57.1%)	0(0)	0.893
Unvaccinated	7 (53.8)	0	1 (50)		6(42.8)	2(100)	

DISCUSSION

The main objective of this research paper is to understand the factors that played role in differences of morbidity and mortality between delta and omicron waves in India in both the variants of SARS-CoV-2 through clinical profile of admitted COVID positive patients.

In a previous study, it has been observed that during the Omicron wave the admitted patients had less severe illness than during the previous waves, this wave fatality ratio is also less as compared to the previous waves [10].

The first case of omicron wave in our region was detected on 26 December 2021, then the cases started to rise rapidly and the peak was observed after four weeks of the first case, and then the third COVID wave declined to almost zero within 10 w. In comparison to delta wave, in omicron wave lesser number of admissions (3% vs 76%) and deaths (12.5% vs 30.8%) were recorded, similar admission pattern as well as death (0%-10.7%) was observed in many studies around the globe during omicron wave [10-15].

In our study, the mean age of patients during delta wave was 46.8 y while during Omicron wave it was 49.25 y. Our data is in accordance with national Indian data where mean age of most of the patients during delta wave were more than 40 y [16] and in omicron wave most of the cases were in large closely distributed age of 10-60 y [17]. There was an increase in patient proportion of age group from 20-60 in The mean age of admitted patients as recorded in a study from Western world was lower in both waves (36.4 and 39.1 y) [12].

During the study period, it has been observed that the rate of female and male admission during delta wave was 31% and 69% respectively whereas during the Omicron wave it was 25% and 75% respectively. The Indian data showed similar trend in Delta wave with 1:2 ratio for female and males whereas the omicron data had ratio of 1:1.2 [16, 17]. While according to a study the admission of female and male during the Delta wave was 54.1% and 45% respectively and during the Omicron wave was 56.7% and 43% respectively [12].

In our study, we have observed that there was 33% ICU admission during delta wave while 18% during omicron wave. The mortality rate was 30% during the delta wave, while it was 12% during the omicron wave. National data showed 10.8% mortality during delta wave [16] and Sharma *et al.* found 0.3% mortality during omicron wave [17]. Our finding of similar mortality rate in omicron is supported by study from Imperial college of London [18]. Mortality in rural areas were high and lack of systemic studies might undermine this fact. This could be attributed to highly populated rural areas, which were never ready to face a pandemic just like rest of the world.

According to our study in Eastern Uttar Pradesh, 99% of admitted patients were unvaccinated at the time of delta wave, but during the omicron wave 50% of the admitted patients had been vaccinated with 2 doses of the COVID-19 vaccine. Data from our region showed that most of the patients who contracted SARS-CoV2 infection during Omicron wave were in home isolation with 65% having complete vaccination [9]. The reason for lower number of admissions during the omicron wave may be attributed to predominantly asymptomatic or mild nature of cases, vaccination and possible immunity due to previous COVID-19 [11]. In another study, it was also found that there was a decrease in infection rate in people who had taken one or two doses of the vaccine [15]. The sero-surveillance data of India in mid-2021 showed more than two third population having antibodies against SARS-CoV2 and it is expected to be expand till omicron wave throughout the country.

CONCLUSION

By comparing both the waves, we have come to the conclusion that the severity of the disease during the delta wave was much higher than the omicron wave. After analyzing all the facts carefully, we conclude that the difference between delta wave and omicron wave is because more than 50% of the population were vaccinated with the background of previous infection in Eastern Uttar Pradesh before the emergence of the omicron wave. Mild and asymptomatic nature of the cases added to low admission and testing. Lack of awareness along with resource limited settings among the people living in rural areas maybe one of the reasons of higher infection and transmission in both the waves.

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Nil

AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

Declared none

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