Letters

RESEARCH LETTER

Characteristics and Outcomes of Hospitalized Patients in South Africa During the COVID-19 Omicron Wave Compared With Previous Waves

On November 24, 2021, a SARS-CoV-2 variant of concern, Omicron (B.1.1.529), was identified in South Africa as responsible for a fourth wave of COVID-19.[1,2] The high number of spike mutations has raised concerns about its ability to evade vaccine and spread.[3,4] We assessed hospitalized patients with a positive SARS-CoV-2 test result during the fourth wave compared with previous waves.

Methods | Netcare is a private health care group consisting of 49 acute care hospitals (>10 000 beds) across South Africa. South Africa has experienced 3 COVID-19 waves: (1) June to August 2020 (ancestral variant), (2) November 2020 to January 2021 (Beta), and (3) May to September 2021 (Delta). Cases again started to increase beginning November 15, 2021, coinciding with the identification of Omicron; as of December 7, 26% community positivity rates were reached. We identified the period when 26% positivity rates were reached in the previous waves (wave 1: June 14 to July 6, 2020; wave 2: December 1-23, 2020; wave 3: June 1-23, 2021) and compared them with the fourth wave (November 15 to December 7, 2021).

For triage purposes, Netcare's policy is to test all admitted patients for COVID-19 with reverse transcriptase-polymerase chain reaction or, from wave 2 onward, a rapid antigen test obtained from a nasopharyngeal swab. All patients hospitalized with a positive COVID-19 result were included. Patient characteristics, need for oxygen supply and mechanical ventilation, admission to intensive care, length of stay (LOS), and mortality rates were extracted from the electronic administration system. Follow-up was through December 20, 2021.

Categorical variables were compared between waves using a χ^2 test and continuous variables using 1-way analysis of variance (ANOVA). A 5% significance level (2-sided) was used. Analysis was performed using SAS version 9.4 for Windows (SAS Institute Inc).

This study was approved by Pharma-ethics. All patients provided written informed consent.

Results | The number of patients treated in the hospitals during the same early period of each wave differed (2351 in wave 4 vs maximum 6342 in wave 3); however, 68% to 69% of patients presenting to the emergency department with a positive COVID-19 result were admitted to the hospital in the first 3 waves vs 41.3% in wave 4 (**Table 1**). Patients hospitalized during wave 4 were younger (median age, 36 years vs maximum 59 years in wave 3; $P < .001$) with a higher proportion of females. Significantly fewer patients with comorbidities were admitted in wave 4, and the proportion presenting with an acute respiratory condition was lower (31.6% in wave 4 vs maximum 91.2% in wave 3, $P < .001$). Of 971 patients admitted in wave 4, 24.2% were vaccinated, 66.4% were unvaccinated, and vaccination status was unknown for 9.4%.

The proportion of patients requiring oxygen therapy significantly decreased (17.6% in wave 4 vs 74% in wave 3, $P < .001$) as did the percentage receiving mechanical ventilation (**Table 2**). Admission to intensive care was 18.5% in wave 4 vs 29.9% in wave 3 ($P < .001$).

The median LOS (between 7 and 8 days in previous waves) decreased to 3 days in wave 4. The death rate was between 19.7% in wave 1 and 29.1% in wave 3 and decreased to 2.7% in wave 4.

Discussion | A different pattern of characteristics and outcomes in patients hospitalized with COVID-19 was observed in the early phase of the fourth wave compared with earlier waves in South Africa, with younger patients having fewer comorbidities, fewer hospitalizations and respiratory diagnoses, and a decrease in severity and mortality.

The study has several limitations. First, patients' virus genotyping was not available. The Omicron variant was esti-

Table 1. Characteristics of Patients Admitted With a Positive COVID-19 Result in the 4 Waves[a]

	No. (%) of patients				
	Wave 1[a]	Wave 2	Wave 3	Wave 4	*P* value
COVID-19 patients treated	3875	4632	6342	2351	
COVID-19 patients admitted	2628 (67.8)	3198 (69.0)	4400 (69.3)	971 (41.3)	<.001
Age, median (IQR), y	53 (21.75)	54 (21)	59 (24)	36 (32)	<.001
Sex, female/male	1337/1291	1657/1541	2035/2365	590/381	<.001
Patients with comorbidities[b]	1472 (56.0)	1868 (58.4)	2311 (52.5)	227 (23.3)	<.001
Acute respiratory condition on admission	1909 (72.6)	2783 (87.0)	4013 (91.2)	307 (31.6)	<.001
Vaccination status[c]					
Vaccinated	No vaccine available	No vaccine available	No register available	235 (24.2)	
Not vaccinated				645 (66.4)	
Vaccination status unknown				91 (9.4)	

[a] Wave 1: June 14-July 6, 2020; wave 2: December 1-23, 2020; wave 3: June 1-23, 2021; wave 4: November 15-December 7, 2021.

[b] Comorbidities included diabetes, heart conditions and hypertension, chronic kidney failure, chronic pulmonary conditions, and cancer.

[c] Vaccinated individuals are defined as having 1 dose of Ad26.COV2.S (Johnson & Johnson/Janssen) or 2 doses of BNT162b2 (Pfizer-BioNTech).

Table 2. Outcomes of Patients Admitted With a Positive COVID-19 Result in the 4 Waves[a]

	No. (%) of patients				
	Wave 1 (n = 2628)	Wave 2 (n = 3198)	Wave 3 (n = 4400)	Wave 4[b] (n = 971)	*P* value
Receiving oxygen therapy	2119 (80.3)	2624 (82.0)	3260 (74.0)	171 (17.6)	<.001
Receiving mechanical ventilation	431 (16.4)	259 (8.0)	548 (12.4)	16 (1.6)	<.001
Admission to intensive care	1104 (42)	1172 (36.6)	1318 (29.9)	180 (18.5)	<.001
Length of stay, median (IQR), d	8.0 (9)	7.8 (8)	7 (9)	3 (3)	<.001
Deaths	520 (19.7)	790 (25.5)	1284 (29.1)	27 (2.7)	<.001

[a] Wave 1: June 14-July 6, 2020; wave 2: December 1-23, 2020; wave 3: June 1-23, 2021; wave 4: November 15-December 7, 2021.

[b] Seventy-two patients (7%) still admitted.

mated to be 81% of the variants isolated by November and 95% isolated by December 2021.[4] Second, 7% of the patients were still hospitalized as of December 20. Third, patients' behavior and the profile of admissions could have differed between waves as different national restrictions and lockdowns were implemented. These factors should not have affected urgent admissions. Fourth, patients admitted for COVID-19 could not be differentiated from asymptomatic patients admitted for other diagnoses with an incidental positive test result, and this likely differed between waves, suggested by the lower proportion admitted with respiratory diagnoses in wave 4.

Further research is needed to determine if the differences between waves are affected by preexisting acquired or natural immunity (44.3% of the adult South African population was vaccinated as of December 2021[5] and >50% of the population has had previous exposure to SARS-CoV-2[6]) or if Omicron may be less pathogenic than previous variants.

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1. New COVID-19 variant detected in South Africa. National Institute for Communicable Diseases (NICD). Accessed December 20, 2021. https://www.nicd.ac.za/new-covid-19-variant-detected-in-south-africa/

2. Classification of Omicron (B.1.1.529) SARS-CoV-2 variant of concern. Accessed December 20, 2021. https://www.who.int/news/item/26-11-2021-classification-of-omicron-(b.1.1.529)-sars-cov-2-variant-of-concern

3. Update on Omicron. Accessed December 20, 2021. https://www.who.int/news/item/28-11-2021-update-on-omicron

4. Network for Genomic Surveillance in South Africa (NGS-SA). SARS-CoV-2 sequencing update. December 17, 2021. Accessed December 20, 2021. https://www.nicd.ac.za/wp-content/uploads/2021/12/Update-of-SA-sequencing-data-from-GISAID-17-Dec-21_Final.pdf

5. Latest vaccine statistics. Department of Health, Republic of South Africa. Accessed December 20, 2021. https://sacoronavirus.co.za/latest-vaccine-statistics/

6. Kleynhans J, Tempia S, Wolter N, et al; PHIRST-C Group. SARS-CoV-2 seroprevalence in a rural and urban household cohort during first and second waves of infections, South Africa, July 2020-March 2021. *Emerg Infect Dis*. 2021;27(12):3020-3029. doi:10.3201/eid2712.211465