CORONAVIRUS DISEASE (COVID-19) PANDEMIC

Establishing a surveillance platform to assess the clinical impact of SARS-CoV-2 variants (DATCOV-Gen) in South Africa

Since the introduction of SARS-CoV-2 in the country in March 2020, South Africa has experienced three epidemic waves, with the Beta and Delta variants dominating the second and third waves, respectively. Genomic surveillance of SARS-CoV-2 in South Africa is currently being performed by the Network for Genomic Surveillance in South Africa **(NGS-SA)**, which includes the NICD. NICD has established a prospective surveillance network linking real-time SARS-CoV-2 genomic sequencing data to detailed epidemiologic and clinical data on hospitalised cases to allow rapid assessment of severity and clinical presentation of SARS-CoV-2 variants of concern and future emerging lineages (DATCOV-Gen). Clinical specimens from COVID-19 cases are sent to the NICD from private and public diagnostic laboratories around the country (predominantly from Gauteng, North West, Mpumalanga and Northern Cape provinces), and collected through the pneumonia surveillance programme in five provinces (Western Cape, KwaZulu-Natal, North West, Gauteng and Mpumalanga). SARS-CoV-2 whole genomes are sequenced in real-time from a random selection of specimens, and are linked to epidemiological data through the notifiable medical conditions surveillance system (NMCSS), and clinical and outcome data through the DATCOV national surveillance system. DATCOV is an active surveillance system for COVID-19 hospital admissions with comprehensive coverage of all hospitals in South Africa.[1,2]

From March 2020 through September 2021, 42 369 specimens were received at the NICD. Of these, 10 214 (24.1%) were sequenced and 6 673 (65.3%) yielded high quality sequence data for Global Initiative on Sharing All Influenza Data **(GISAID)** variant assignment (Figure 1). Among the sequenced cases, 1 272 (19.1%) were matched to hospitalised COVID-19 cases (hospital admission within 14 days of specimen collection) on the DATCOV database. The majority of specimens (1 158/1 272, 91%) were from adults aged ≥25 years in Gauteng (36%), Western Cape (17%) and North West (16%) provinces (Table 1). Among the COVID-19 cases admitted to a hospital, presence of co-morbidity, level of hospital care, clinical severity and hospital admission duration differed by variant type. Further analysis of these data will enable us to better understand the epidemiological and clinical characteristics of SARS-CoV-2 variants, and this platform will allow these characteristics to be rapidly assessed as new variants emerge. Public and private testing laboratories are requested to continue to submit COVID-19 respiratory samples weekly to the NICD or their closest NGS-SA sequencing laboratory. For further information on specimen submission please contact Prof Anne von Gottberg (annev@nicd.ac.za), Dr Nicole Wolter (nicolew@nicd.ac.za) or the closest NGS-SA laboratory. Regular **SARS-CoV-2 genomic surveillance** and **DATCOV** reports are available on the NICD website.

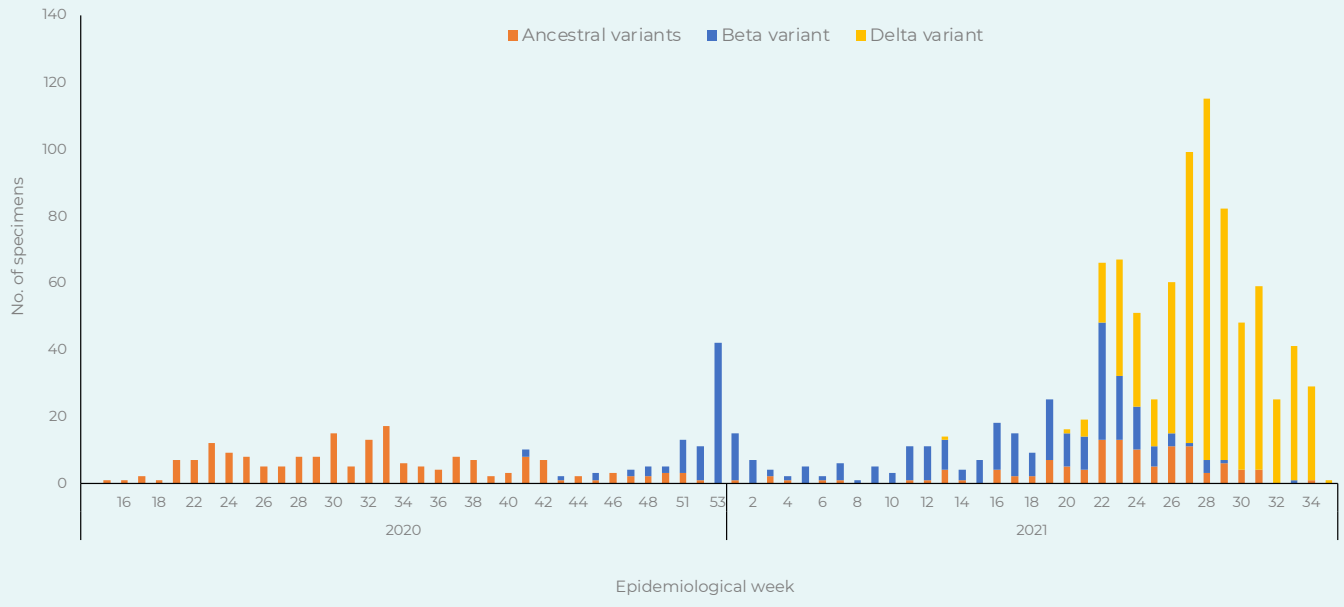

Figure 1. Number of SARS-CoV-2 specimens sequenced for hospitalised COVID-19 cases by epidemiological week and variant type, DATCOV-Gen, March 2020 – September 2021 (N=1 272)

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Table 1: Epidemiological and clinical characteristics of hospitalised COVID-19 cases by SARS-CoV-2 variant type, DATCOV-Gen, March 2020 – September 2021

		Overall n (%)	Ancestral variants n (%)	Beta variant n (%)	Delta variant n (%)	P-value
Demographic characteristics						
Year		**N=1 272**	**N=310**	**N=313**	**N=610**	
	2020	266 (21)	192 (62)	74 (24)	0 (0)	<0.001
	2021	1 006 (79)	118 (38)	239 (76)	610 (100)	
Epidemic wave[a]		**N=1 270**	**N=309**	**N=312**	**N=610**	
	Pre-wave 1	31 (2)	31 (10)	0 (0)	0 (0)	<0.001
	Wave 1	99 (8)	99 (32)	0 (0)	0 (0)	
	Post-wave 1	56 (4)	51 (17)	5 (2)	0 (0)	
	Wave 2	114 (9)	15 (5)	98 (31)	0 (0)	
	Post-wave 2	132 (10)	23 (7)	105 (34)	1 (0)	
	Wave 3	838 (66)	90 (29)	104 (33)	609 (100)	
Age group (years)		**N=1 272**	**N=310**	**N=313**	**N=610**	
	<5	39 (3)	14 (5)	4 (1)	20 (3)	0.364
	5-12	13 (1)	2 (1)	5 (2)	6 (1)	
	13-18	24 (2)	5 (2)	8 (3)	11 (2)	
	19-24	38 (3)	11 (4)	7 (2)	19 (3)	
	25-39	180 (14)	45 (15)	45 (14)	83 (14)	
	40-59	424 (33)	104 (34)	93 (30)	216 (35)	
	≥60	554 (44)	129 (42)	151 (48)	255 (42)	
Sex		**N=1 272**	**N=310**	**N=313**	**N=610**	
	Male	538 (42)	137 (44)	134 (43)	256 (42)	0.727
	Female	734 (58)	173 (56)	179 (57)	357 (59)	
Province		**N=1 272**	**N=310**	**N=313**	**N=610**	
	Eastern Cape	93 (7)	44 (14)	12 (4)	37 (6)	<0.001
	Free State	1 (0)	0 (0)	0 (0)	1 (0)	
	Gauteng	453 (36)	100 (32)	173 (55)	158 (26)	
	KwaZulu-Natal	40 (3)	7 (3)	6 (2)	27 (4)	
	Limpopo	102 (8)	10 (3)	17 (5)	69 (11)	
	Mpumalanga	115 (9)	26 (8)	51 (16)	35 (6)	
	North West	209 (16)	77 (25)	20 (6)	109 (18)	
	Northern Cape	44 (3)	10 (3)	26 (8)	7 (1)	
	Western Cape	215 (17)	36 (12)	8 (3)	167 (27)	
Clinical characteristics						
HIV status		**N=564**	**N=170**	**N=111**	**N=266**	
	Uninfected	438 (78)	134 (79)	83 (75)	207 (78)	0.719
	Infected	126 (22)	36 (21)	28 (25)	59 (22)	
Co-morbidity		**N=1 272**	**N=310**	**N=313**	**N=610**	
	Absent	678 (53)	137 (44)	178 (57)	341 (56)	0.001
	Present	594 (47)	173 (56)	135 (43)	269 (44)	
Highest level of care		**N=1 272**	**N=310**	**N=313**	**N=610**	
	General ward	1 080 (85)	245 (79)	26 (83)	538 (88)	0.007
	High care	63 (5)	22 (7)	18 (6)	22 (4)	
	ICU	129 (10)	43 (14)	35 (11)	50 (8)	

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		Overall n (%)	Ancestral variants n (%)	Beta variant n (%)	Delta variant n (%)	P-value
Severe disease[b]		**N=1 272**	**N=310**	**N=313**	**N=610**	
	No	457 (36)	104 (34)	87 (28)	253 (41)	<0.001
	Yes	815 (64)	206 (66)	226 (72)	357 (59)	
Hospital duration (days)		**N=1 266**	**N=310**	**N=312**	**N=606**	
	<3	261 (21)	58 (19)	54 (17)	136 (22)	0.030
	3-6	410 (32)	100 (32)	90 (29)	209 (34)	
	7-13	408 (32)	103 (33)	107 (34)	188 (31)	
	≥14	187 (15)	49 (16)	61 (20)	73 (12)	
Outcome		**N=1 266**	**N=310**	**N=312**	**N=606**	
	Survived	928 (73)	235 (76)	219 (70)	449 (74)	0.258
	Died	338 (27)	75 (24)	93 (30)	157 (26)	

[a] Epidemic wave periods (weekly incidence risk of ≥5 admissions per 100,000 individuals[1]) defined as: Pre-wave 1 (weeks 10-23 of 2020), Wave 1 (weeks 24-34 of 2020), Post-wave 1 (weeks 35-46 of 2020), Wave 2 (week 47 of 2020 – week 5 of 2021), Post-wave 2 (weeks 6-19 of 2021), Wave 3 (20-38 of 2021).
[b] Severe disease defined as a patient meeting at least one of the following criteria: admitted to ICU, received oxygen treatment, ventilated, received extracorporeal membrane oxygenation (ECMO), experienced acute respiratory distress syndrome (ARDS) and/or died.

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Source: Centre for Respiratory Diseases and Meningitis, NICD-NHLS; cherylc@nicd.ac.za