

Predominance of SARS-CoV-2 Variants of Concern, 501Y.V1 and 501Y.V2 at the Kenyan Coast

Key Points

- We sequenced 102 SARS-CoV-2 PCR positive samples collected between 23rd March-9th April 2021 from 5 counties in the coast region (Kilifi (n=71), Mombasa (n=14), Taita Taveta (n=13), Kwale (n=2) and Lamu (n=2)).
- A total of 94 (92.2%) out of the 102 samples were classified as variants of concern (VOC); 501Y.V1 (n=66) and 501Y.V2 (n=28).
- A total of 96 PCR positive samples were obtained from individuals who had no confirmed history of recent international travel and of these 89 (92.7%) were classified as VOC.

Background

Between 12th March and 27th March 2021, we reported genome sequences of two variants of concern (VOC); 501Y.V1 (n=49) and 501Y.V2 (n=37) from SARS-CoV-2 PCR positive samples collected from the Kenya coast. The majority of these were isolated from individuals presenting at points of entry (PoE), but some were isolated from individuals without a history of recent travel (policy brief #14). Here we report sequences from more recent samples, to investigate the possible spread of the two VOCs in the region.

Findings from sequence data obtained on 16th April 2021

We sequenced a total of 102 SARS-CoV-2 positive samples from across five coastal counties (Kilifi (n=71), Mombasa (n=14), Taita Taveta (n=13), Kwale (n=2) and Lamu (n=2)) collected between 23rd March and 9th April 2021 (**Figure**). We used the two main classifications systems for SARS-CoV-2 genomes (i.e. the Pango and the NextStrain clade classification). We classified the genome sequences into 6 Pango lineages and 5 NextStrain clades; B.1.1.7 (NextStrain clade 501Y.V1; n=66), B.1.351 (NextStrain clade 501Y.V2; n=26), A.23.1 (n=4), B.1 (n=2), B.1.525 (n=2) and B.1.1 (n=2) (**Figure**).

The samples were dominated by VOCs comprising 92.2% (n=94) of the 102 sequenced samples. 501Y.V1 occurred in 64.7% (n=66) samples while 501Y.V2 occurred in 27.5% (n=28) of the samples. There were 96 PCR positive samples from individuals without history of recent travel and of these 62 (64.6%) were VOC 501Y.V1 and 27 (28.1%) were VOC 501Y.V2. Hence, our genomic surveillance provides evidence that local spread of SARS-CoV-2 is dominated by VOCs 501Y.V1 (B.1.1.7) and 501Y.V2 (B.1.351) across the coastal region (**Table**).

Two sequences that were classified as lineage B.1 contained 5 amino acid changes in the spike protein i.e D80A, K417N, N501Y, D614G, A701V. In addition, we report detection of a variant of interest (VOI), B.1.525 (n=2) which has the E484K amino acid change, also present in the B.1.351 VOC and known to aid immune evasion. Four sequences (2 from Taita Taveta, 1 from Lamu and 1 from Mombasa) were assigned lineage A.23.1, a dominant lineage in Kampala Uganda based on a recent report which has also been assigned VOI status [1]. A detailed breakdown of mutations is shown in the **Appendix**.

Table: Basic epidemiological characteristics of SARS-CoV-2 Rt-PCR positive samples collected from at the coast.

	501Y.V1 (n=66)	501Y.V2 (n=28)	Variants of Interest (i.e. uncertain significance) #(n=6)	Variants of no Concern* (n=2)
County				
Kilifi	50	19	2	0
Mombasa	6	6	1	1
Taita Taveta	9	2	2	0
Kwale	1	0	0	1
Lamu	0	1	1	0
Travel History				
With history of travel	4	1	0	1
Local	62	27	6	1
*Variants of no Concern: B.1.1				
#Variants of interest: A.23.1 and B.1.525				

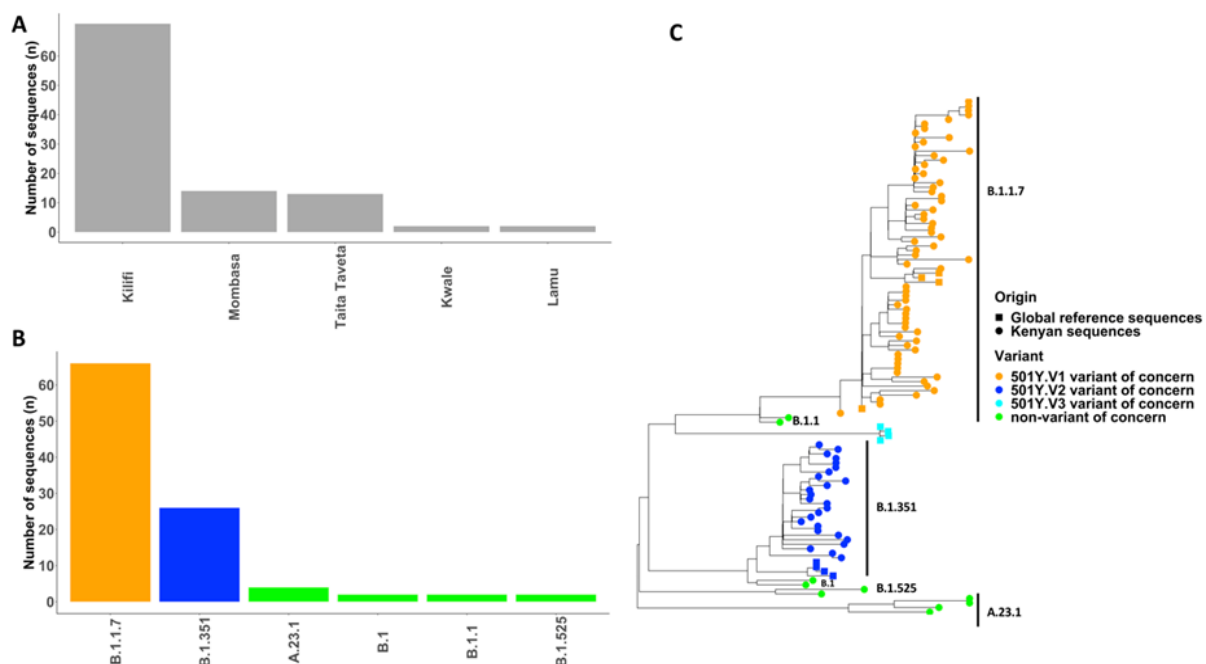


Figure: Analysis of 102 SARS-CoV-2 sequences from samples collected between 23rd March and 9th April 2021. (A) A bar plot showing the geographical distribution of the 102 sequenced samples by county (x-axis). (B) A bar plot showing the frequency of lineages (x-axis) circulating in five counties in coastal Kenya based on the 102 sequences. (C) A phylogenetic tree of 102 SARS-CoV-2 sequences from samples collected between 23rd March-9th April 2021 from six coastal counties together with 12 reference sequences. The tree diagram shows the relationship between the sequenced genomes (circular tip-points) and the global variants of concern (square tip-points).

Implications

These data suggest that two of the three major SARS-CoV-2 variants of concern (i.e. 501Y.V1 and 501Y.V2) have become the predominant strains in circulation in the coast region of Kenya, with 501Y.V1 most common of the two. Both these two VOC reported are documented to have considerably higher transmissibility compared to the original SARS-CoV-2 Wuhan strain and have been reported to have potential to either more efficiently evade pre-existing natural or vaccine immunity [2] or cause more severe disease [3].

Recommendations

- Continued genomic surveillance of SARS-CoV-2 surveillance across the coastal region.
- Emphasize to the rapid response team (RRT) to collect complete epidemiological information during sample collection, for example recent travel histories.
- There is need to revise the case investigation forms to capture details such as previous testing history and vaccination history to put the VOC infections in proper context.

Data availability

Whole-genome sequence data will be available from the GISAID database to allow access to the global scientific community.

References

1. D. Lule Bugembe, M. VTPhan, I. Ssewanyana, et al., A SARS-CoV-2 lineage A variant (A.23.1) with altered spike has emerged and is dominating the current Uganda epidemic, *MedRxiv*. (2021) 2021.02.08.21251393. <https://doi.org/10.1101/2021.02.08.21251393>.
2. D. Zhou, W. Dejnirattisai, P. Supasa, C. Liu, A.J. et al., Evidence of escape of SARS-CoV-2 variant B.1.351 from natural and vaccine-induced sera, *Cell*. (2021) 1–14. <https://doi.org/10.1016/j.cell.2021.02.037>.
3. N.G. Davies, C.I. Jarvis, K. van Zandvoort, et al., Increased mortality in community-tested cases of SARS-CoV-2 lineage B.1.1.7, *Nature*. (2021). <https://doi.org/10.1038/s41586-021-03426-1>.

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Appendix: A summary of epidemiological characteristics of SARS-CoV-2 RT-PCR positive samples collected between 23rd March and 09th April 2021 from five counties in the coastal regions of Kenya. The entries are sorted chronologically from the earliest sample based on the date of sample collection.

Serial	NextStrain Clade	Pango Lineage	date_collected	County	Gender	Age (Years)	Mutations of interest in the spike region
1	20I/501Y.V1	B.1.1.7	23/03/2021	Taita Taveta	Male	53	N501Y, A570D, D614G, P681H
2	20I/501Y.V1	B.1.1.7	23/03/2021	Taita Taveta	Male	50	N501Y, A570D, D614G, P681H
3	20I/501Y.V1	B.1.1.7	23/03/2021	Kwale	Female	30	N501Y, A570D, D614G, P681H
4	19B	A.23.1	24/03/2021	Taita Taveta	Male	2	None
5	20I/501Y.V1	B.1.1.7	24/03/2021	Taita Taveta	Female	22	N501Y, A570D, D614G, P681H
6	20I/501Y.V1	B.1.1.7	25/03/2021	Kilifi	Male	22	N501Y, A570D, D614G, P681H
7	19B	A.23.1	25/03/2021	Lamu	Male	29	None
8	20H/501Y.V2	B.1.351	26/03/2021	Mombasa	Male	18	D80A, K417N, N501Y, D614G, A701V
9	20H/501Y.V2	B.1.351	26/03/2021	Mombasa	Male	22	D80A, K417N, N501Y, D614G, A701V
10	20I/501Y.V1	B.1.1.7	28/03/2021	Mombasa	Male	51	N501Y, A570D, D614G, P681H
11	20I/501Y.V1	B.1.1.7	28/03/2021	Mombasa	Female	51	N501Y, A570D, D614G, P681H
12	20H/501Y.V2	B.1	28/03/2021	Mombasa	Male	15	D80A, K417N, N501Y, D614G, A701V
13	20H/501Y.V2	B.1.351	28/03/2021	Mombasa	Female	40	D80A, K417N, N501Y, D614G, A701V
14	20I/501Y.V1	B.1.1.7	28/03/2021	Mombasa	Male	25	N501Y, A570D, D614G, P681H
15	19B	A.23.1	28/03/2021	Taita Taveta	Male	57	E484K
16	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Female	32	D80A, K417N, E484K, N501Y, D614G, A701V
17	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	7	D80A, K417N, E484K, N501Y, D614G, A701V
18	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Male	66	N501Y, A570D, D614G, P681H
19	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	37	D80A, K417N, E484K, N501Y, D614G, A701V
20	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	36	D80A, K417N, E484K, N501Y, D614G, A701V
21	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	37	D80A, K417N, E484K, N501Y, D614G, A701V
22	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Male	40	N501Y, A570D, D614G, P681H
23	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Female	27	N501Y, D614G, P681H
24	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Male	36	N501Y, A570D, D614G, P681H

25	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Female	28	N501Y, A570D, D614G, P681H
26	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Male	40	N501Y, A570D, D614G, P681H
27	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Female	43	N501Y, A570D, D614G, P681H
28	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	47	D80A, K417N, E484K, N501Y, D614G, A701V
29	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	38	D80A, K417N, E484K, N501Y, D614G, A701V
30	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Female	47	N501Y, A570D, D614G, P681H
31	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Male	32	N501Y, A570D, D614G, P681H
32	20I/501Y.V1	B.1.1.7	29/03/2021	Kilifi	Female	33	N501Y, A570D, D614G, P681H
33	20H/501Y.V2	B.1.351	29/03/2021	Kilifi	Male	56	D80A, K417N, E484K, N501Y, D614G, A701V
34	20I/501Y.V1	B.1.1.7	29/03/2021	Taita Taveta	Male	1	N501Y, A570D, D614G, P681H
35	20I/501Y.V1	B.1.1.7	29/03/2021	Taita Taveta	Male	63	N501Y, A570D, D614G, P681H
36	20I/501Y.V1	B.1.1.7	29/03/2021	Taita Taveta	Female	32	N501Y, A570D, D614G, P681H
37	20H/501Y.V2	B.1.351	30/03/2021	Kilifi	Female	54	D80A, K417N, E484K, N501Y, D614G, A701V
38	20H/501Y.V2	B.1.351	30/03/2021	Kilifi	Female	49	D80A, K417N, E484K, N501Y, D614G, A701V
39	19B	A.23.1	30/03/2021	Mombasa	Male	40	None
40	20I/501Y.V1	B.1.1.7	30/03/2021	Mombasa	Male	25	N501Y, A570D, D614G, P681H
41	20I/501Y.V1	B.1.1.7	30/03/2021	Kilifi	Male	54	N501Y, A570D, D614G, P681H
42	20I/501Y.V1	B.1.1.7	30/03/2021	Kilifi	Male	43	N501Y, A570D, D614G, P681H
43	20I/501Y.V1	B.1.1.7	30/03/2021	Kilifi	Male	51	N501Y, A570D, D614G, P681H
44	20I/501Y.V1	B.1.1.7	30/03/2021	Kilifi	Male	32	N501Y, A570D, D614G, P681H
45	20I/501Y.V1	B.1.1.7	30/03/2021	Kilifi	Male	50	N501Y, A570D, D614G, P681H
46	20I/501Y.V1	B.1.1.7	30/03/2021	Kilifi	Male	56	N501Y, A570D, D614G, P681H
47	20I/501Y.V1	B.1.1.7	30/03/2021	Taita Taveta	Female	48	N501Y, A570D, D614G, P681H
48	20I/501Y.V1	B.1.1.7	30/03/2021	Taita Taveta	Male	52	N501Y, A570D, D614G, P681H
49	20H/501Y.V2	B.1.351	30/03/2021	Taita Taveta	Male	40	D80A, K417N, E484K, N501Y, D614G, A701V
50	20H/501Y.V2	B.1.351	30/03/2021	Taita Taveta	Male	24	D80A, K417N, E484K, N501Y, D614G, A701V
51	20H/501Y.V2	B.1	30/03/2021	Lamu	Female	NA	D80A, K417N, N501Y, D614G, A701V
52	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Male	42	N501Y, A570D, D614G, P681H

53	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Male	67	N501Y, A570D, D614G, P681H
54	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Female	87	N501Y, A570D, D614G, P681H
55	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Female	33	N501Y, A570D, D614G, P681H
56	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Male	38	N501Y, A570D, D614G, P681H
57	20H/501Y.V2	B.1.351	31/03/2021	Kilifi	Female	51	D80A, K417N, E484K, N501Y, D614G, A701V
58	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Male	25	N501Y, A570D, D614G, P681H
59	20H/501Y.V2	B.1.351	31/03/2021	Kilifi	Male	57	D80A, K417N, E484K, N501Y, D614G, A701V
60	20H/501Y.V2	B.1.351	31/03/2021	Kilifi	Male	29	D80A, K417N, E484K, N501Y, D614G, A701V
61	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Female	19	N501Y, A570D, D614G, P681H
62	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Female	43	N501Y, A570D, D614G, P681H
63	20I/501Y.V1	B.1.1.7	31/03/2021	Kilifi	Male	40	N501Y, A570D, D614G, P681H
64	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	56	N501Y, A570D, D614G, P681H
65	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Female	35	N501Y, A570D, D614G, P681H
66	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Female	66	N501Y, A570D, D614G, P681H
67	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	71	N501Y, A570D, D614G, P681H
68	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	4	N501Y, A570D, D614G, P681H
69	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Female	38	N501Y, A570D, D614G, P681H
70	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	34	N501Y, A570D, D614G, P681H
71	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	36	N501Y, A570D, D614G, P681H
72	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	38	N501Y, A570D, D614G, P681H
73	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	43	N501Y, A570D, D614G, P681H
74	20I/501Y.V1	B.1.1.7	01/04/2021	Kilifi	Male	28	N501Y, A570D, D614G, P681H
75	20I/501Y.V1	B.1.1.7	01/04/2021	Mombasa	Male	33	N501Y, A570D, D614G, P681H
76	20B	B.1.1	01/04/2021	Mombasa	Na	43	N501Y, D614G
77	20I/501Y.V1	B.1.1.7	02/04/2021	Kilifi	Na	49	N501Y, A570D, D614G, P681H
78	20H/501Y.V2	B.1.351	02/04/2021	Kilifi	Male	29	D80A, K417N, N501Y, D614G, A701V
79	20H/501Y.V2	B.1.351	02/04/2021	Kilifi	Male	36	D80A, K417N, E484K, N501Y, D614G, A701V
80	20B	B.1.1	02/04/2021	Kwale	Male	41	N501Y, A570D, D614G
81	20I/501Y.V1	B.1.1.7	05/04/2021	Kilifi	Female	27	N501Y, A570D, D614G, P681H

82	20I/501Y.V1	B.1.1.7	05/04/2021	Kilifi	Female	52	N501Y, A570D, D614G, P681H
83	20A	B.1.525	06/04/2021	Kilifi	Male	10	E484K, D614G
84	20H/501Y.V2	B.1.351	06/04/2021	Kilifi	Female	27	N501Y, A570D, D614G, P681H
85	20I/501Y.V1	B.1.1.7	06/04/2021	Kilifi	Male	NA	N501Y, A570D, D614G, P681H
86	20I/501Y.V1	B.1.1.7	06/04/2021	Kilifi	Female	46	N501Y, A570D, D614G, P681H
87	20I/501Y.V1	B.1.1.7	06/04/2021	Kilifi	Male	16	N501Y, A570D, D614G, P681H
88	20H/501Y.V2	B.1.351	07/04/2021	Kilifi	Female	29	D80A, K417N, E484K, N501Y, D614G, A701V
89	20H/501Y.V2	B.1.351	07/04/2021	Kilifi	Male	39	D80A, K417N, E484K, N501Y, D614G, A701V
90	20I/501Y.V1	B.1.1.7	07/04/2021	Kilifi	Male	48	N501Y, A570D, D614G, P681H
91	20A	B.1.525	07/04/2021	Kilifi	Female	45	E484K, D614G
92	20I/501Y.V1	B.1.1.7	08/04/2021	Kilifi	Male	56	N501Y, A570D, D614G, P681H
93	20I/501Y.V1	B.1.1.7	08/04/2021	Kilifi	Male	58	N501Y, A570D, D614G, P681H
94	20H/501Y.V2	B.1.351	08/04/2021	Kilifi	Female	38	D80A, K417N, E484K, N501Y, D614G, A701V
95	20I/501Y.V1	B.1.1.7	08/04/2021	Kilifi	Male	29	N501Y, A570D, D614G, P681H
96	20I/501Y.V1	B.1.1.7	08/04/2021	Kilifi	Male	39	N501Y, A570D, D614G, P681H
97	20I/501Y.V1	B.1.1.7	08/04/2021	Taita Taveta	Female	45	N501Y, D614G, P681H
98	20I/501Y.V1	B.1.1.7	09/04/2021	Kilifi	Female	32	N501Y, A570D, D614G, P681H
99	20I/501Y.V1	B.1.1.7	09/04/2021	Kilifi	Female	48	N501Y, A570D, D614G, P681H
100	20I/501Y.V1	B.1.1.7	NA	Mombasa	Na	NA	N501Y, A570D, D614G, P681H
101	20H/501Y.V2	B.1.351	NA	Mombasa	Na	NA	D80A, K417N, E484K, N501Y, D614G, A701V
102	20H/501Y.V2	B.1.351	NA	Mombasa	Na	NA	D80A, K417N, E484K, N501Y, D614G, A701V