

SARS-CoV-2 Omicron variant is spreading in different parts of the world in three different trends

Dear Editor,

The COVID-19 cases in India were 9195 new cases/day on December 28, 2021, after which the number of new cases/day skyrocketed everyday, and on January 13, 2022 it became 264 202 new cases/day (<https://outbreakindia.com/india-dashboard>; accessed January 14, 2022). From December 2, 2021 to January 13, 2022, 5524 Omicron cases were reported in India (<https://outbreakindia.com/india-dashboard>; accessed January 14, 2022). Having come out a bit from the impact of the delta variant, we hope it will help India and other countries to make some predictions on the impact of the Omicron spreading trend. Accordingly, the present study clarifies that the Omicron variant is spreading in different parts of the world in three distinct trends.

So far, apart from the original SARS-CoV-2, five (Alpha, Beta, Gamma, Delta, and Omicron) variants of concern viruses have evolved by mutations (tracking SARS-CoV-2 variants; <https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/>; accessed January 14, 2022). Of these, only the original SARS-CoV-2, Delta, and Omicron spread and caused major outbreaks worldwide (Figures 1A,B and S1A–C) (tracking SARS-CoV-2 variants; <https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/>; accessed January 14, 2022). The Alpha variant was unable to exert much of its dominance in Africa and South America (Figure S1A). It is noteworthy that the Beta variant in Africa and the Gamma variant in South America gained their dominance during the period when the Alpha variant spread throughout Europe (Figure S1B,C). In phylogenetic analysis, the Gamma variant is grouped with the Alpha variant, but the Beta variant is significantly different from the Alpha and Gamma variants (Figure 1C) (<https://www.gisaid.org/phylogenetics/global/nextstrain/>; accessed January 14, 2022). Finally, it appears that the Omicron variant is derived from the group of Alpha and Gamma variants (Figure 1C).

The Omicron variant, discovered in Botswana in November last year, spread rapidly to 149 countries by January 6, 2022.¹ This highlights how fast this variant is spreading. Within these 2 months, the Omicron variant began to spread in South Africa, reaching its peak and then coming under control (Figure 1D) (<https://covariants.org/per-country>; January 10, 2022 accessed January 13, 2022). It is to be hoped that this trend will be reflected in other countries as well. It is noteworthy that the Alpha and Gamma variants were not widely distributed in South Africa and that the Omicron variant began to spread only after the Delta variant came under control (Figures 1D and S1D) (<https://covariants.org/per-country>. January 10, 2022;

accessed January 13, 2022). So it can be assumed that the Omicron variant spread rapidly without prior nearly related antibody restriction and ended spontaneously. But the Omicron variant started to spread in Europe and North America before the delta variant came under control (Figure 1E) (<https://covariants.org/per-country>. January 10, 2022; accessed January 13, 2022). The Omicron variant has dominated America since its inception. In America, the Delta variant decreased from 97 431 cases (from November 15 to 29, 2021), to 2285 (from December 27, 2021 to January 10, 2022) (Figure 1E) (<https://covariants.org/per-country>. January 10, 2022 accessed January 13, 2022). Meanwhile, from December 27, 2021 to January 10, 2022, the Omicron variant has risen to 18 101 cases in America (Figure 1E) (<https://covariants.org/per-country>. January 10, 2022; accessed January 13, 2022). A recent study suggests that an antibody developed with Omicron infection may neutralize the Delta variant, making it less likely for anyone recovering from Omicron to become infected with Delta.² Thus, it can be speculated that Omicron has spread rapidly in the United States and brought the impact of Delta under control.

On the other hand, Omicron's dominance in Europe, which spread like wildfire from November 29, 2021 to January 3, 2022, began to decline slightly from January 4, 2022 to January 10, 2022 (Figure 1B). During the same period (January 4, 2022 to January 10, 2022), the dominance of the Delta variant in Europe began to increase slightly (Figure 1A). It is a mystery why Omicron has not been able to maintain its dominance in Europe alone. The H655Y, N679K, P681H mutations in Omicron's spike protein are believed to increase the cleavage of the spike protein and contribute to Omicron's high-speed transmission (Science Brief: Omicron (B.1.1.529) Variant, <https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/scientific-brief-omicron-variant.html>. accessed January 14, 2022.). Beta and Gamma variants do not contain the P681H mutation, so it is safe to say that these variants became restrictive in Africa and South America, respectively. But it is noteworthy that this P681H mutation is present in the Alpha variant that has spread throughout Europe. The H655Y mutation appeared 4002 times in different lineages worldwide as of January 17, 2022 of which 2577 (64.39%) occurred only in Europe (Data S1) (<http://cov-glue.cvr.gla.ac.uk/#/project/replacement/S:H:655:Y>. accessed January 14, 2022). The N679K mutation appeared 1349 times in different lineages worldwide as of January 17, 2022 of which 684 (50.7%) appeared only in Europe (Data S2) (<http://cov-glue.cvr.gla.ac.uk/#/project/replacement/S:N:679:K>; accessed January 14, 2022). All of this

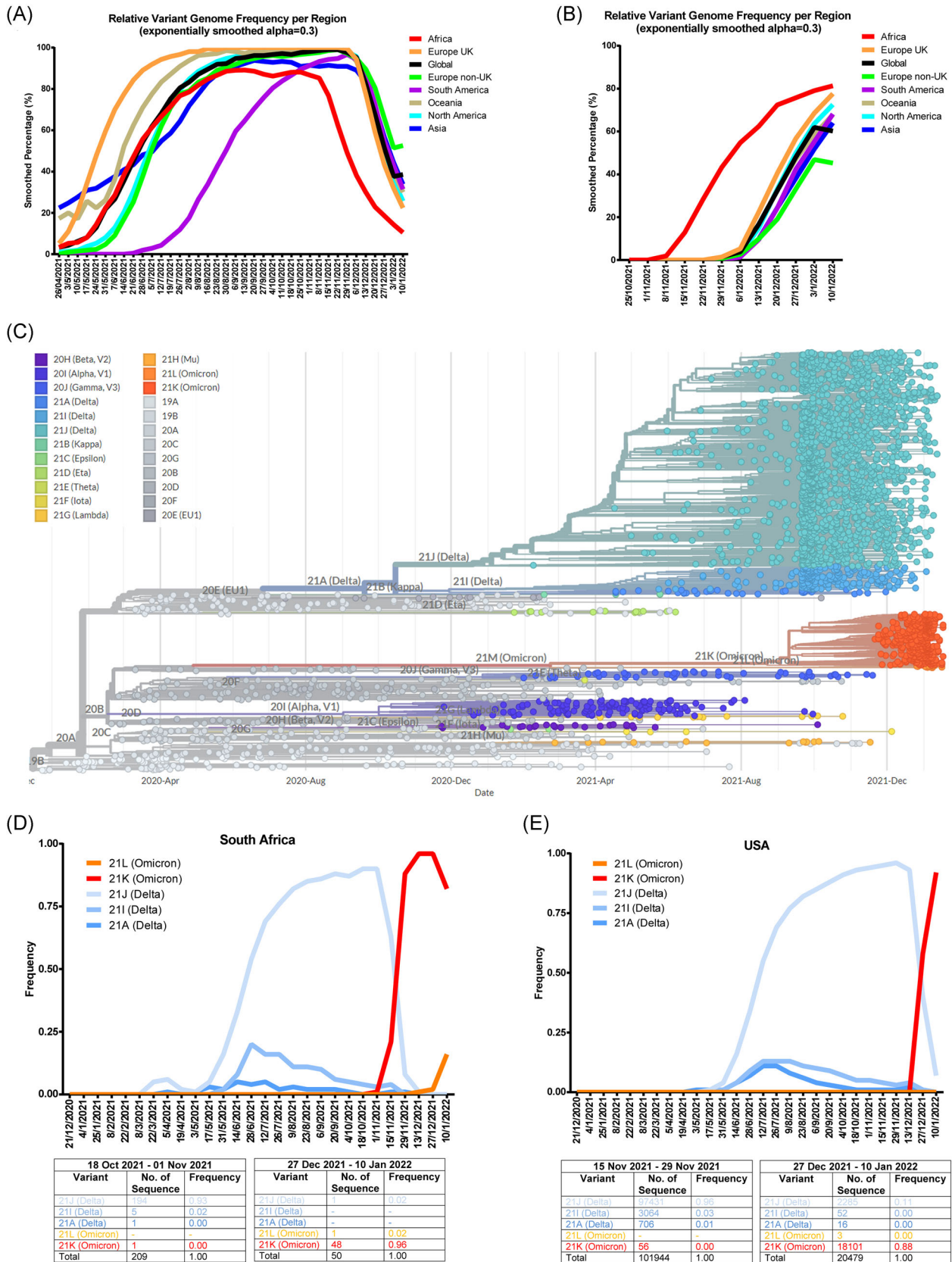


FIGURE 1 Omicron variant spreading trend. (A) Relative Delta variant frequency per region globally (exponentially smoothed alpha = 0.3) (<https://www.gisaid.org/hcov19-variants/>). (B) Relative Omicron variant frequency per region in the world (exponentially smoothed alpha = 0.3) (<https://www.gisaid.org/hcov19-variants/>). (C) The phylogenetic tree displays the phylogenetic relationship of different variants (<https://nextstrain.org/ncov/gisaid/global>). (D) Frequency of Delta and Omicron variants in South Africa (<https://covariants.org/per-country>). (E) Frequency of Delta and Omicron variants in USA (<https://covariants.org/per-country>).

information is derived from the sequences submitted to GISAID, but the percent case sequence is lower in Europe (Data S3) (<https://www.gisaid.org/submission-tracker-global/>, accessed January 14, 2022). This H655Y, N679K, P681H mutation may be more prevalent in non-sequenced cases in Europe, and the European population may have antibodies to it, thus speculating that Omicron may not be able to dominate in Europe.

The Omicron variant has begun to spread in India after the Delta variant came under control and has been pushed to the point where it can withstand the third wave of COVID-19. Alpha and Gamma variants associated with the Omicron variant are not as widespread in India (Figure S1E) as in South Africa. Therefore, like South Africa, we can expect the Omicron variant to spread quickly in India and end soon. However, in South Africa, the Omicron variant was found to cause mild disease.³ It is noteworthy that the Delta variant and 30 lineages were first detected in India and named as Indian lineages (https://cov-lineages.org/lineage_list.html; accessed January 13, 2022). Therefore, the Omicron variant is likely to mutate and become a severe disease-causing variant. We believe, it is mandatory for every country to adopt strict COVID-19 protocol and sequence monitoring to be safe from the effects of the Omicron variant.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

All the authors contributed significantly to this manuscript. Perumal A. Desingu analyzed and wrote the first draft, K. Nagarajan reviewed

the manuscript. All the authors reviewed and approved the final submission.

DATA AVAILABILITY STATEMENT

Not applicable.

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