Review Article

Omicron SARS-CoV-2 Variant: A Short Review

Niharika Vyas[1], Gaurav Mishra[2]

[1]Department of Pedodontics and Preventive Dentistry, Modern Dental College and Research Center, Indore, Madhya Pradesh, India.
[2]Department of Pedodontics and Preventive Dentistry, Index Institute of Dental Sciences, Indore, Madhya Pradesh, India.

Abstract

A new variant of concern (VOC) named the Omicron variant (B.1.1.529) was reported recently. This variant has a large number of mutations in the S protein. To date, there exists a limited information on the Omicron variant. Omicron being detected in more than 27 countries around the world. Given its more than 50 mutations, there is a widespread concern about its public health impact, leading the World Health Organization to designate it a VOC.

Keywords: Omicron, SARS-COV-2, Diagnostics.

Introduction

On November 24, 2021, a new SARS-CoV-2 variant B.1.1.529 has been reported to the WHO by South Africa and was specified as a variant of concern (VOC) on November 26, 2021. Omicron is considered as 3 times more infectious than SARS-CoV-2 and also from delta variant.

B.1.1.529 was first recognized in sample which is collected in Botswana on November 11, 2021 and in South Africa on November 14, 2021.[1,2] Botswana and South Africa were the first countries which diagnosed the Omicron variant in mid-November. At least 27 countries have recognized Omicron variant. The Omicron variant has been observed in travel related cases in various countries such as Brazil, Australia, Sweden, Nigeria, United Kingdom, and many more countries.[1]

Origin

Origin of Omicron is unknown but there are few hypotheses which is mentioned below:

Coinfection

It evolved from coinfection with periodic coronaviruses. In a preprint study, which figure out the mutations recognized that there is an insert (ins 214epe), which is exclusively seen in the Omicron variant.[3-7]

Chronically infected patient

This hypothesis is supported by sequencing which shows changes to virus in patients which is chronically infected.

Natural selection

Selective pressure, which accommodate mutations which reinforce viral infectivity, plays an important role in evolution of SARS-COV-2.

Animal reservoir

According to this hypotheses, Omicron could developed in non-human species, from which it dribble back into the population.

Limited surveillance

Omicron may have been circling and developing in a residents with bit supervision and sequencing. The Omicron variant's genome has a cumulative 53 mutations proportionate to the original reference stain. The spike protein of omicron variant is expressed by at least 30 amino acid substitution, one small insertion, and three small deletions. Out of 30 amino acid substitutions, 15 are in receptor binding domain. There are also a number of deletions and changes in other genomic regions.

Various studies limelight on the receptor binding domain of spike protein. On the other hand, a few studies proposed that the spike n terminal domain may ease the virus entrance through sialic-acid receptor binding.[8,9] The Omicron variant contains two clades, ba.1 and ba.2. Ba.1 clade spreads expeditiously.

Access this article online

Website: www.jrad.co.in

DOI: https://doi.org/10.53064/jrad.2022.13.4.201

Address for correspondence: Dr. Niharika Vyas, Department of Pedodontics and Preventive Dentistry, Modern Dental College and Research Center, Indore, Madhya Pradesh, India.
E-mail: nvyas9750@gmail.com

Received: Apr. 01, 2022; **Accepted:** May. 02, 2022; **Published:** May. 12, 2022

How to cite this article: Vyas N, Mishra G. Omicron SARS-CoV-2 Variant: A Short Review. J Res Adv Dent 2022;13(4):55-56.

Both ba.1 and ba.1 clades bear approximately all the same mutations. ba.2 Omicron clades are not detectable by s-gene target failure because it does not carry spike: 69/70 deletion.[10]

Growth Rate

A study done in United Kingdom observed that there is a bigger possibility of transmission to contacts from Omicron index cases when it is compared to delta index cases.[10] The estimated growth rate of Omicron in united kingdom is around 0.35/day. In South Africa, estimated growth rate is 0.24/day in Gauteng over delta.

Transmission

Transmission: At present, it is unexplained how proficiently the Omicron variant can advanced from person to person. N501y hikes binding to ACE2 receptor, which leads to increase transmission. Furthermore, consolidation of n501y and 1498r may increases binding affinity. Nonetheless, other substitutions in omicron spike proteins are supposed to decreases binding to ace2. H655y increases the spike cleavage, which promote transmission. N679k and p681h also increase spike cleavage.[11]

Symptoms

In a study done on positive cases of Omicron in United Kingdom recognized symptoms. These symptoms are headache, runny nose, sore throat, sneezing, and fatigue. In South Africa, primary care doctor who treated Omicron patients said that they experience body aches, fatigueness, and mild headaches but no loss of taste or smell was observed.[12-14]

Diagnostics

It has been observed that polymerase chain reaction (PCR) and rapid antigen tests are able to recognized Omicron. According to the FDA, there are few molecular test whose conduction may be ingrained by mutations in Omicron variant. However, they have cautioned that these tests will give false negative results.

The tests include:

- Revogene SARS-CoV-2, Meridian Bioscience, Inc.
- DTPM COVID-19 Reverse transcription PCR test, Tide Laboratories
- Linea COVID-19 Assay Kit, Applied DNA Science.

European commission's joint research center has established a new detection technique specialized for Omicron variant. They recognized a target region with distinctive and Omicron specific cluster of nucleic acid sequence. By utilizing this region, scientist originates a variant specific set of primers which is to be used as Omicron PCR detection method.[15,16]

Vaccine Development

Different vaccines makers manufacturers are also developing Omicron specific vaccines or boosters.

References

1. World Health Organization. Classification of Omicron (B.1.1.529): Sarscov-2 Variant of Concern. Geneva: World Health Organization; 2021.
2. Available from: https://www.who.int/news/item/26-11-2021-classification-of-omicron-(b.1.1.529)-sars-cov- 2-variant-of-concern [Last accessed on 2021 Dec 02].
3. Martin D, Lytras S, Lucaci AG, Maier W, Grüning B, Shank SD, *et al*. Selection analysis identifies significant mutational changes in Omicron that are likely to influence both antibody neutralization and Spike function (Part 1 of 2)-SARS-cov-2 coronavirus. Virological 2021. DOI: 10.1101/2021.12.06.471394
4. Venkatakrishnan AJ, Anand P, Lenehan PJ, Suratekar R, Raghunathan B, Niesen MJ, *et al*. Omicron Variant of SARS-cov-2 Harbors a Unique Insertion Mutation of Putative Viral or Human Genomic Origin. United States: OSF HealthCare; 2021.
5. A Cancer Survivor had the Longest Documented COVID-19 Infection. Here's what Scientists Learned. Available from: https://www.science.org/content/article/cancer-survivor-had-longest-documented-covid-19-infection-here-s-what-scientists-learned [Last accessed on 2021 Dec 03].
6. Wang R, Chen J, Wei GW. Mechanisms of SARS-cov-2 evolution revealing vaccine- resistant mutations in Europe and America. J Phys Chem Lett 2021;12:11850-7.
7. Deer May be Reservoir for SARS-cov-2, Study Finds. Penn State University. Https://www.psu.edu/news/research/story/deer-may-bereservoir-sars-cov-2-studyfinds/?Utm_audience=Combined&utm_source=newswire&utm_medium=email&utm_campaign=Penn%20State%20Today&utm_content=11-03-2021-22-18&utm_term=Research%20-%201 [Last accessed on 2021 Dec 03].
8. Torjesen I. Covid-19: Omicron may be more transmissible than other variants and partly resistant to existing vaccines, scientists fear. BMJ 2021;375:n2943.
9. Lam SD, Waman VP, Orengo C, Lees J. Insertions in the SARS-cov-2 Spike nterminal Domain May Aid COVID-19 Transmission. Bioinformatics 2021. DOI: 10.1101/2021.12.06.471394
10. UK Health Security Agency. SARS-cov-2 Variants of Concern and Variants Under Investigation. Brifing 31. United Kingdom: UK Health Security Agency; 2021. p. 42.
11. Available from: https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/scientific-brief-omicron-variant.html [Last accessed on 2021 Dec 02].
12. Iacobucci G. Covid-19: Runny nose, headache, and fatigue are commonest Symptoms of omicron, early data show. BMJ 2021;375:n3103.
13. Omicron COVID Variant: All You Need to Know about the New UK Coronavirus Strain. United Kingdom: BBC Science Focus Magazine. Available from: https://www.sciencefocus.com/news/omicron-covid-variant [Last accessed on 2021 Dec 07].
14. Omicron Symptoms: What to Look Out for from New Covid Variant. The Independent; 2021. Available from: https://www.independent.co.uk/news/world/africa/omicron-variant-symptoms-list-covidb1970921 [Last accessed on 2021 Dec 07].
15. Current Testing Tools Uncompromised by New COVID-19 Variant of Concern Omicron (B.1.1.529)-World. Reliefweb. Available from: https://www.reliefweb.int/report/world/current-testing-tools-uncompromised-new-covid-19- variant-concern-omicron-b11529 [Last accessed on 2021 Dec 02].
16. UK Health Security Agency. SARS-cov-2 Variants of Concern and Variants under Investigation: Technical Briefing 32. United Kingdom: UK Health Security Agency; 2021. p. 38.