

(REVIEW ARTICLE)



A review study on Omicron variant

Priya Gupta and Rahul Saxena *

Department of Pharmacology, Ravishankar College of Pharmacy, Bhanpur, Bhopal (M.P.) 462037.

GSC Biological and Pharmaceutical Sciences, 2022, 18(02), 130–135

Publication history: Received on 28 December 2021; revised on 06 February 2022; accepted on 08 February 2022

Article DOI: <https://doi.org/10.30574/gscbps.2022.18.2.0041>

Abstract

The Omicron variant is a variant of SARS-CoV-2, which was the main reason behind the severity of the third wave in India and other countries. This variant had increased more transmissibility as compared to other variant of COVID-19. Currently, the Omicron variant has dominated the number of infections all over the world. Omicron variant is considered highly infectious and contagious. There is rising concern throughout many states in country following expert's opinions for wearing mask and imposing social lockdown wherever required. However to control over this, immunization programme of Covid vaccine to be continue. The current review discusses the Omicron infection from the existing literature and data.

Keywords: Omicron Variant; Vaccination; Mutation; RTPCR Test; R value

1. Introduction

On 26 November 2021, WHO designated the variant B.1.1.529 a variant of concern, named Omicron, on the advice of WHO's TAG-VE (Technical Advisory on Virus Evolution). It is the variant of COVID-19. The B.1.1.529 variant was first reported to WHO from South Africa On 24 November 2021. The WHO has also said that omicron variant is currently present in 57 countries and mainly in the continents of Africa, Europe, Asia, Americas. R-value of omicron in India is above 1.

2. Structural outlook of omicron

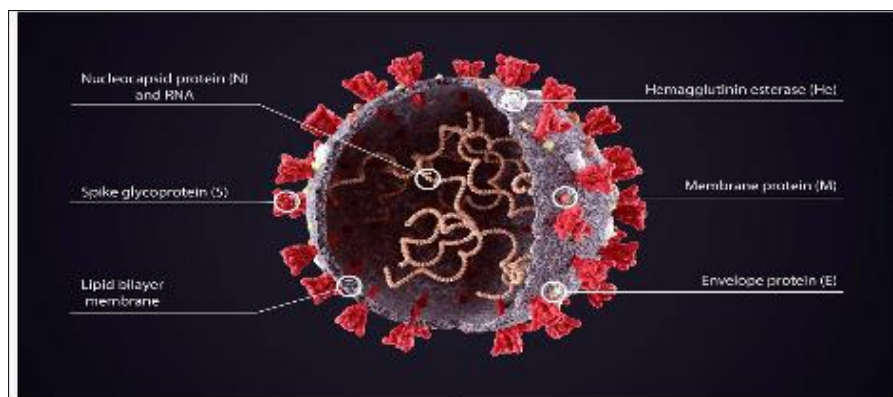


Figure 1 Structure outlook of Omicron Virus

*Corresponding author: Rahul Saxena

Department of Pharmacology, Ravishankar College of Pharmacy, Bhanpur, Bhopal (M.P.) 462037.

Copyright © 2022 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0.

3. Delta Vs omicron

HOW THE VARIANTS DIFFER	
<p>DELTA</p> <p>SYMPTOMS last about 10 days</p> <p>HIGH FEVER, 101-103F</p> <p>LOSS of smell (anosmia) and taste (ageusia)</p> <p>LUNG ENTRY within couple of days of infection</p> <p>HYPER IMMUNE response in the second week of infection in some</p> <p>BREATHING is difficult, pain in the chest</p> <p>OXYGEN saturation levels fall</p> <p>LUNG DAMAGE visible in CT scan</p> <p>MOST PATIENTS were unvaccinated, breakthrough infection occurred mostly in healthcare workers</p>	<p>OMICRON</p> <p>SYMPTOMS last about 4-5 days</p> <p>FEVER: Low to moderate, 99.5-100F</p> <p>EXTREME fatigue</p> <p>DIZZINESS and nausea</p> <p>NO LUNG pneumonia or apparent damage reported so far</p> <p>MOST patients were fully vaccinated, breakthrough infection rates very high</p> <p><i>Based on broad clinical observations; specific cases will differ; Older or immunocompromised patients and those with comorbidities are impacted more, and are at greater risk of more severe disease in all cases.</i></p>

Figure 2 Difference between Delta virus and Omicron Virus

3.1. Omicron with new sub variant (B.1.1.529)

- BA.1 : India (contains maximum character of Omicron)
- BA.2 : South Africa, Australia, Canada
- BA.3 : BA.1+BA.3 = replacing Amino acid position 69-70 in virus spike protein

On Clinical Sequencing BA.1 present in place of Normal Omicron

3.2. Transmissibility of omicron

The Omicron Covid-19 variant may be 105% more transmissible than Delta, according to a research by French scientists. (The study, published on the medRxiv site and yet to be peer-reviewed, analysed 131,478 tests in France from October 25 to December 18, 2021).

3.3. Mutation in omicron

Omicron has the most mutation of any variant of SARS-CO-2, the virus that cause COVID-19

3.3.1. Delta

It has 13 mutations of these, nine are in the spike protein, the protrusion on the surface of the virus that helps it latch onto human cells. Specifically, two are in a molecular hook, called the "receptor-binding domain," helping it cling to cells more tightly

3.3.2. Omicron

It's a mutation monster at least 32 are in the spike protein and 10 in the receptor-binding domain. While it kept many of the most successful mutations found in earlier variants, including Delta, it also possesses changes found nowhere before.

3.4. Severity of omicron variant

If someone is not vaccinated or have never been affected form the SARS Cov-2, then the chances are that particular may become infected with the Omicron variant, possible going to have severe complication related with Respiration. Since the cases and hospital admissions have increased, but still there is no increase in use of ICU beds and ventilations.

4. General sign and symptoms of omicron variant

As of 28 November 2021, the World Health Organization's update states, "There is currently no information to suggest that symptoms associated with Omicron are different from ... other variants". [53]

A study performed between 1 and 7 December by the Center for Disease Control found that: "The most commonly reported symptoms [were] cough, fatigue, and congestion or runny nose" making it difficult to distinguish from a less damaging variant or other virus. [54]

Research published in London on 25 December 2021 suggested the most frequent symptoms stated by users of the Zoe Covid app were "a running nose, headaches, fatigue, sneezing and sore throats." [55]

A unique reported symptom of the Omicron variant is night sweats. [56]

5. Global study

The Omicron variant is a variant of SARS-CoV-2, the virus that causes COVID-19. It was first reported to the World Health Organization (WHO) from South Africa on 24 November 2021. [1] On 26 November 2021, the WHO designated it as a variant of concern and named it "Omicron", the fifteenth letter in the Greek alphabet.

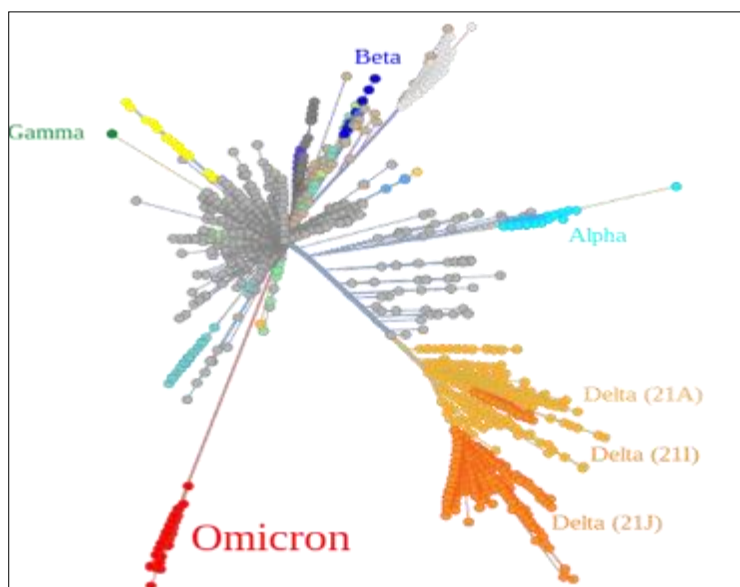


Figure 3 Omicron Family

Omicron variant and other major or previous variants of concern of SARS-CoV-2 depicted in a tree scaled radially by genetic distance, derived from Nextstrain on 1 December 2021

The variant has an unusually large number of mutations, several of which are novel [4] [5] (see § Mutations) and a significant number of which affect the spike protein targeted by most COVID-19 vaccines at the time of the discovery of the Omicron variant. This level of variation has led to concerns regarding its transmissibility, immune system evasion, and vaccine resistance. However, a growing body of evidence indicates the Omicron variant is less virulent than previous strains, especially compared to the Delta variant [6] [7]. The variant was quickly designated as being "of concern", and travel restrictions were introduced by several countries in an attempt to slow its international spread.

Omicron is believed to be far more contagious (spreading much more quickly), [8] to multiply around 70 times faster than the Delta variant in the bronchi (lung airways), [9] but to be less able to penetrate deep lung tissue, leading scientists to consider this reason as the cause of reduction in the risk of severe disease requiring hospitalisation, when compared to previously identified variants of concern [10]. However, the extremely high rate of spread, combined with its ability to evade both double vaccination and the body's immune system, means the total number of patients requiring hospital care at any given time is still of great concern [10].

The new variant was first detected on 22 November 2021 in laboratories in Botswana and South Africa based on samples collected on 11–16 November. [11] [12] The first known sample was collected in South Africa on 8 November [13] [14]. In other continents, the first known cases were a person arriving in Hong Kong from South Africa via Qatar on 11 November, and another person who arrived in Belgium from Egypt via Turkey on the same date. [15] [16] As of 7 January 2022, the variant has been confirmed in 135 countries. [17] The World Health Organization estimated that by mid-December, Omicron likely was in most countries, whether they had detected it or not. [18]

6. Analytic approach

The modeled scenarios of the epidemic trajectory in the U.S. consider varying degrees of transmissibility and immune evasion: high transmissibility and low immune evasion together with high immune evasion and low immune evasion Table 1. Modeled scenarios with faster relative growth rates (of Omicron as compared to Delta) indicate that a large surge of infections could begin in the U.S. in early January 2022 and that the peak daily number of new infections could exceed previous peaks. With low immune evasion, the surge could be lower and occur as late as April 2022. Multiple modeling groups in the United States, as well as those from other countries' public health agencies, have identified similar trends.

Recent case data of the Omicron variant from the United Kingdom and elsewhere are consistent with the faster growth scenarios which increases the plausibility of faster growth scenarios. 1 3 4; 5 6; 7; 8 9; 10; 11 12 13; 14 15; 16; 17; 18

Table 1 Transmissibility value and Immune escapicity of Omicron relative to Delta

Scenario*	Inherent transmissibility relative to Delta	Immune escape relative to all prior strain
Faster growth (Higher transmission**. Mid escape)	1.6x	43%
Slower growth (higher transmission. Low escape)	1.5x	10%
Faster growth (Unchanged transmission. High escape)	1.0x	85%
Slower growth (Lower transmission. Mid escape)	0.8x	50%

7. Effectiveness of vaccine against omicron variant

A third dose (better known as Precautionary dose) of Covid-19 vaccine can boost a person's resistance to Omicron variant of coronavirus by as much as 88%, new studies conducted in the UK have found.

This is a significantly higher degree of protection against the latest mutated strain when compared to second dose, whose effectiveness begins to wane after a period of six months.

Sharing a UK Health Security Agency (UKHSA) report compiling the findings of these studies, Dr Eric Topol, professor of molecular medicine and director of the Scripps Research Translational Institute, pointed out that vaccine effectiveness drops to 52 per cent against Omicron around 6 months after taking the second shot of a Covid-19 vaccine.

However, a third or booster dose substantially bumps up immunity and lowers the odds of contracting a Covid infection with serious symptoms that could lead to hospitalisation.

“That's a big boost of protection for 3rd dose vaccine vs hospitalisation from Omicron infection. Vaccine effectiveness increased from 52 per cent (due to 2-dose waning after 6 months) to 88 per cent after the 3rd dose,” Dr Eric Topol said in a tweet.

8. Targeted people of omicron

According to the Prof. Neil Ferguson from Imperial College London said that “This level of immune evasion means that Omicron poses a major, imminent threat to public health and community. And those who are unvaccinated are more susceptible to containing COVID-19.

9. Diagnostic test for presence of omicron

The FDA has published guidelines on how PCR tests will be affected by Omicron. Tests that detect multiple gene targets will continue to identify the tests as positive for COVID-19. S-gene dropout or target failure has been proposed as a shorthand way of differentiating Omicron from Delta. The variant can also be identified by sequencing and genotyping.

9.1. RTPCR Report

It states that in Genes N, Genes S, Genes E, Genes ORF, the Genes S is absent which indicates the presence of Omicron Variant.

This is main reason behind confirmation of Omicron infection, due to a S gene target failure (SGTF), as well as people with existing genotype data.

10. Why social distancing and wearing mask important

According to the study, when the viral particles leave the lungs, they quickly lose water and the lower levels of carbon dioxide in the environment result in a rapid increase in pH. This affects the virus's ability to infect human cells. (The Guardian reported). In a typical office environment, where humidity of the surrounding area is generally lower than 50 per cent, the virus became half as infectious within five seconds, after which the loss in infectivity became slower and more gradual. Meanwhile, in a more humid environment, for instance, a steam room or shower, the decline is significantly slower. However, the researchers found that the temperature made little difference to viral infectivity, contradicting the belief that the disease spreads faster in hotter climates.

11. Omicron tally in India

Omicron Variant Cases in India, Coronavirus 3rd Wave, and The Omicron tally in the country reached 4,868. Maharashtra has the highest number of cases (1,281) of the new variant, followed by Rajasthan (645).

12. Alert by centre government

Union Health Secretary Rajesh Bhushan writes to chief secretaries of all States/UTs for taking immediate measures to ensure optimal availability of medical oxygen at health facilities. At the moment, the coronavirus exists in pockets, for instance the North East. But the golden rules apply; wear a mask and get vaccinated," said Dr Samiran Panda, additional director general Indian Council of Medical Research (ICMR).

13. Conclusion

Omicron appears to be extremely transmissible. The initial calculations from Discovery also suggest that the risk of reinfection is 40% higher with omicron among people who have already had the delta variant and 73% higher in those who got infected during the first wave in 2020. Omicron is able to multiply 70 times faster in human bronchial tissue than the until-now-dominant strain, delta, according to a preliminary study from Hong Kong University, Omicron is highly successful in the upper respiratory tract, which would explain the explosion of infections, but it is 10 times less efficient than its predecessors in the lungs, which suggests it is less deadly. Omicron variant of coronavirus has been held responsible for the third wave of the pandemic in India. Based on what is known so far, Omicron variant is considered highly infectious and contagious. There is rising concern throughout many states in country following expert's opinions for wearing mask and imposing social lockdown wherever required. However to control over this, immunization programme of Covid vaccine to be continue.

Compliance with ethical standards

Acknowledgments

We would like to thank Principal, Ravishankar College of Pharmacy for helping and providing guidance throughout in preparing of this review article.

Disclosure of conflict of interest

No conflict of Interest.

References

- [1] Michelle Robert. Booster at least 80% effective against severe Omicron. Internet. BCC News Online. © 2021 [cited 2021 Dec 23] Available from , <https://www.bbc.com/news/health>.

- [2] Anonna Dutt. Mutated Omicron variant of COVID-19: Mild and yet dangerous. Internet. The Indian Express. ©2021[cited 2021 Dec 29] Available from, <https://indianexpress.com/article/explained/mutated-omicron-variant-delta-coronavirus-update>.
- [3] On Hospitalisation Rate for Omicron, "Good News" From These two studies. Internet. NDTV News ©2021[cited 2021 Dec 30] Available from,<https://www.ndtv.com/world-news/omicron-covid-variant-omicron-variant-in-world-covid-new-variant-on-hospitalisation-rate-for-omicron-good-news-from-these-2-studies>.
- [4] Sam Hancock, Computational Comparison of SARS-CoV-2 Delta and Omicron variant binding affinity with ACE2. Internet. NEWS Medical and Life science ©2021[cited 2021 Dec 31] Available from, <https://www.news-medical.net/news/20211208/Computational-comparison-of-SARS-CoV-2>.
- [5] Emily Head, Dr. Sabine L. van Elsland. Omicron largely evades immunity from past infection or two vaccine dose. Article. Imperial College London ©2021[cited 2022 Jan 3] Available from, <https://www.imperial.ac.uk/news/232698/omicron-largely-evades-immunity-from-past>.
- [6] Update on Omicron. Internet. World Health Organization ©2021. [cited 2021 Dec 22] Available from, <https://www.who.int/news/item/28-11-2021-update-on-omicron>
- [7] World Health Organization. Coronavirus update (Live): 336,790,193 cases and 5,560,718 deaths from COVID-19 virus pandemic. Worldmeter - real time world statistics. 2022.
- [8] Dr. Bruce Aylward. World Health Organization ©2021. [cited 2022 Jan 18] <https://www.cnbc.com/who-says-omicron-wont-be-last-covid-variant-as-global-cases-surge-by-20percent-in-a-week.html>.
- [9] Ending Isolation and Precautions for People with COVIDS 19: Interim Guidance ©2021 [cited 2021 Dec 5] <https://www.cdc.gov/COVIDguidelines>.
- [10] The Indian Council of Medical Research (ICMR), New Delhi ©2021 [cited 2021 Dec 31] [https://www.icmr.gov.in/SARS-CoV-2\(COVID-19\)TestingStatus](https://www.icmr.gov.in/SARS-CoV-2(COVID-19)TestingStatus)
- [11] India COVID 19 vaccine tracker ©2022 [cited 2022 Jan 02] <https://www.mohfw.gov.in/InformationonCOVID19vaccines>.
- [12] Enhancing response to Omicron SARS-CoV-2 Variant. Internet. World Health Organization. ©2022 [cited 2022 Jan 5] Available from, [https://www.who.int/news/item/26-11-2021-classification-of-omicron-\(b.1.1.529\)-sars-cov-2-variant-of-concern](https://www.who.int/news/item/26-11-2021-classification-of-omicron-(b.1.1.529)-sars-cov-2-variant-of-concern).
- [13] Corum, J, Zimmer. C. "Coronavirus Variant Tracker". Article. The New York Times. ©2021[cited 2021 Dec 22] <https://english.elpais.com/usa/2021-12-17/first-conclusions-on-omicron-variant-is-growing-exponentially-and-it-is-not-clear-if-it-is-less-severe>.