

## REVIEW ARTICLE

**Omicron and vaccine booster dose – an update**

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**Abstract**

Mutations in coronavirus is not unheard off. The variant, Omicron B.1.1.529 has overall 50 mutations and is considered as a variant of concern. Though the new variant has shown changes throughout its genome, S gene changes predominate. Significant changes in the S encoding gene, S gene, influences not only the transmissibility properties of SARS-CoV-2 but also the efficacy of existing vaccines. Increased transmissibility and ability of this variant to evade host immune responses conferred either due to past infections or due to vaccination driving increase in number of infections. However, the severity of the infections is low in comparison to its predecessors. A meta-analysis of ten studies analyzing the effect of COVID-19 vaccine booster dose, it was found studies report 10-to-42-fold increase in omicron neutralization. COVID appropriate behaviors, if followed rigidly can bring a meaningful change in the viral spread and resultant health impacts.

**Keywords**

Covid19, Omicron, Third Dose, Variant of Concern

**Introduction****Mutations in corona virus and emergence of Omicron:**

Mutations in coronavirus is not unheard off. Ever since late 2020, virus is consistently evolving with structural changes that are significantly altering its transmissibility and antigenicity leading generation of new variants.(1) These progressive and consistent mutations have far reached consequences on the response to the viral infection with respect to changing immune profile of large human population subjected to most rapid vaccination drives ever in the history. Mutations evidenced in Alpha, Gamma, Lambda are associated with increased infectivity.(2) The new variant, named, Omicron B.1.1.529 variant has overall 50 mutations.(3) Previous genomic surveillance reports a similar change in at least two

lineages and omicron is probably a derivative of any of these lineages. Omicron has also lineage independent residue mutations indicating epistatic factors and probably do not contribute to the viral survival and pathogenicity.(4) The mutations in omicron resulted in increased transmissibility and improved binding affinity. Such mutations also enables virus to partially escape the antibodies.(5)

**Rising numbers of omicron infections:** The omicron variant of SARS-CoV-2 has led to a spike in infections throughout the globe. The number of new covid-19 infections recorded worldwide from 24 June 2022 to 30 June 2022 by more than 100% from the previous week in Kazakhstan, Iraq, Turkey, Tunisia, Nigeria, Armenia, Canada, Pakistan, Cambodia and Bangladesh says the

World Health Organization's weekly epidemiological report.(6) But the true increase is likely to be significantly higher because of insufficient testing leads to under-reporting.(7) Although, the highly contagious omicron variant reached Latin America later than in Europe and North America, presently it causing a regional surge in these countries.(8) Brazil recorded almost all new variants in its latest genomic sequencing.(9) More than half of the reported cases from Europe, Southeast Asia and Americas are of omicron variant.(9) Though the increase in infections are resulting in increased hospital admissions, fortunately, there are not much increase in death rate.(9) The resultant fresh increase in the cases, is pushing the health systems into their maximum capacity.(7) As Latin America is mostly vaccinated, the increase in the omicron cases is not very significant.(10)

**Severity of omicron infections:** An early national cohort data from Scotland suggest decreased hospitalization due to omicron in comparison to delta variant.(11) A lower mortality, severity and hospitalization is reported in a hospital based study from South Africa.(12) Clinical presentation of this variant of concern is not different from the earlier manifestations of corona infection. Many of the infected patients have same presentation profile with upper and lower respiratory tract infection with cough, fever, body ache, nasal stuffiness, throat pain and tiredness. Encouragingly, the total hospitalizations due to confirmed omicron cases are much less than the previous delta predominant wave.(13,14) Analyses of more than 52 thousand S gene target failure (SGTF) COVID cases from California, showed substantially reduced risk of severe clinical endpoints and shorter durations of hospital stay (not peer-reviewed).(15) Less virulence of virus, high immunity from previous infections or vaccinations are important in explaining lesser severity of the present omicron wave.

**Vaccination and booster dose:** Since, the beginning of pandemic there was increased hope to develop vaccine against the infection leading to a stress on research and development of vaccines in all countries worldwide. There is different type of vaccines: inactivated, protein subunit and genetically engineered vaccines have been developed till now. In India, Covid vaccination has been started on 16th January 2021 with two vaccines approved by Government of India i.e., Covishield & Covaxin. Gradually, other vaccine Sputnik also been approved. As per WHO data base, vaccines which have been approved till 26th November 2021 are, Pfizer/ BioNtech, SII/ Covishield, AstraZeneca/ AZD 1222, Janssen/Ad26.COV 2.S, Moderna (mRNA 1273), Sinopharma Covid-19 Vaccine, Sinovac-CoronaVac and Bharat Biotech BBV152 Covaxin Vaccine.(16)

Omicron reinfection is estimated to be at 5.41 times higher compared with delta, suggesting a lower levels of immunity from prior infections.(17) There is growing evidence for improved vaccine effectiveness for

symptomatic infections modelled on Poisson regression estimating the hazard ration in omicron. A significant decrease in risk of omicron for those with three doses of vaccine in comparison with people with only two doses.(17) A study by Imperial college of London, an WHO collaborating center for infectious disease modelling, found that a second dose of Pfizer has low protection against omicron symptoms.(17) Vaccine efficacy of third Pfizer dose was estimated at 55-80% against omicron.(17) In a report from Israel, there was significant decrease in both confirmed COVID infections and severe COVID infections among patients who have taken third dose of vaccine.(18) A meta-analysis of ten studies analyzing the effect of COVID-19 vaccine booster dose, it was found studies report 10-42 fold increase in omicron neutralization.(19) This review strongly favors vaccine boosters for limiting the breakthrough COVID infections.(19)

An early national cohort data from Scotland suggest a third or booster vaccination dose offer substantial protection against symptomatic omicron infection.(11) A study done in United States of America in Dec 2021 to know that effect of two doses or three doses or unvaccinated on infection rate among individuals. This study added a role of 3rd dose of mRNA vaccine as an effective measure to provide protection against infection with COVID whereas effect on decreasing the delta variant is more as compared to omicron.(20)

Without emphasis on brand loyalty, the studies have shown a beneficial mismatch of vaccine, particularly a third dose of Pfizer over previous two doses of Moderna and Johnson and Johnson.(21)

**Covid appropriate behavior:** 'Prevention is always better than cure'. With non-availability of specific and effective treatment protocols for COVID infection, there is absolute need to prevent its spread. In this regard WHO and authorities worldwide have reinforced the importance of preventive measures and practices in a sustained manner, to deal with the disease over the long run. Greeting without physical contact, maintaining physical distance of 6 feet, using of face mask all the time, frequent and thorough washing of hands with soap or sanitizer, avoiding touching of nose, eyes or mouth, avoiding unnecessary travel, limiting going to crowded places or large gatherings are some of the COVID appropriate behaviors,(22) if followed rigidly can bring a meaningful change in the viral spread and resultant health impacts.

## Conclusion

With available data about the Omicron variant following points to the urgent requirements as a part and parcel of our global response or surveillance:

- Universal vaccination is still our best bet against severe COVID-19.

- Strengthened global health architecture to protect and promote the wellbeing of all people.
- Surveillance system for timely and transparent sharing of genomic data, precisely sharing information that is of global concern.

## Recommendation

As COVID19 is an emerging situation, intense monitoring and comprehensive reporting provides holistic scenario and facilitates global health agencies to take action. Therefore, there is need for concentrated monitoring and complete real-time reporting. With emerging variants information about vaccine aids in effective prevention and thus controlling of the infection.

## Authors Contribution

PNB, AP and SV contributed to data collection and analysis. All the authors contributed to the design and writing.

## References

1. Harvey WT, Carabelli AM, Jackson B, Gupta RK, Thomson EC, Harrison EM, et al. SARS-CoV-2 variants, spike mutations and immune escape. *Nat Rev Microbiol.* 2021;19(7):409–24.
2. Mohammadi M, Shayestehpour M, Mirzaei H. The impact of spike mutated variants of SARS-CoV2 [Alpha, Beta, Gamma, Delta, and Lambda] on the efficacy of subunit recombinant vaccines. *The Brazilian Journal of Infectious Diseases.* 2021;25(4):101606.
3. Kuchipudi SV. Will omicron – the new coronavirus variant of concern – be more contagious than delta? A virus evolution expert explains what researchers know and what they don't [Internet]. *The Conversation.* [ Accessed on 25/06/2022 ]. Available from: <http://theconversation.com/will-omicron-the-new-coronavirus-variant-of-concern-be-more-contagious-than-delta-a-virus-evolution-expert-explains-what-researchers-know-and-what-they-dont-169020>
4. Quarleri J, Galvan V, Delpino MV. Omicron variant of the SARS-CoV-2: a quest to define the consequences of its high mutational load. *GeroScience* [Internet]. 2021 Dec 18 [cited 25/06/2022]; Available from: <https://doi.org/10.1007/s11357-021-00500-4>
5. Zheng J. SARS-CoV-2: an Emerging Coronavirus that Causes a Global Threat. *Int J Biol Sci.* 2020;16(10):1678–85.
6. The WHO coronavirus disease (COVID-19) explorer. *COVID-19 Explorer* [Internet]. COVID-19 Explorer. 2022. [ Accessed on 25/06/2022] Available from: <https://worldhealthorg.shinyapps.io/covid/>
7. Taylor L. Covid-19: Omicron drives weekly record high in global infections. *BMJ.* 2022;376:o66.
8. Taylor L. Covid-19: Brazil sees omicron cases soar but data blackout obscures true impact. *BMJ.* 2022;376:o133.
9. Fonseca P, Simões E. Brazil reels as COVID-19 cases soar; hospitals, economy under pressure. *Reuters* [Internet]. 2022 Jan 14 [cited 25/06/2022]; Available from: <https://www.reuters.com/world/americas/brazil-reels-omicron-spreads-weighing-hospitals-economy-2022-01-14/>
10. Latin America and the Caribbean: the latest coronavirus counts, charts and maps. *Reuters* [Internet]. [Accessed on 25/06/2022]; Available from: <https://graphics.reuters.com/world-coronavirus-tracker-and-maps/regions/latin-america-and-the-caribbean/>
11. Sheikh A, Kerr S, Woolhouse M, McMenemy J, Robertson C. Severity of Omicron variant of concern and vaccine effectiveness against symptomatic disease: national cohort with nested test negative design study in Scotland. 2021 Dec 22 [Accessed on 25/06/2022]; Available from: <https://www.research.ed.ac.uk/en/publications/severity-of-omicron-variant-of-concern-and-vaccine-effectiveness->
12. Abdullah F, Myers J, Basu D, Tintinger G, Ueckermann V, Mathebula M, et al. Decreased severity of disease during the first global omicron variant covid-19 outbreak in a large hospital in tshwane, south africa. *International Journal of Infectious Diseases.* 2022;116:38–42.
13. Karim SSA, Karim QA. Omicron SARS-CoV-2 variant: a new chapter in the COVID-19 pandemic. *The Lancet.* 2021;398(10317):2126–8.
14. Jassat W, Karim SA, Mudara C, Welch R, Ozougwu L, Groome M, et al. Clinical Severity of COVID-19 Patients Admitted to Hospitals in Gauteng, South Africa During the Omicron-Dominant Fourth Wave [Internet]. Rochester, NY: Social Science Research Network; 2021 Dec [cited 25/06/2022]. Report No.: ID 3996320. Available from: <https://papers.ssrn.com/abstract=3996320>
15. Lewnard JA, Hong VX, Patel MM, Kahn R, Lipsitch M, Tartof SY. Clinical outcomes among patients infected with Omicron (B.1.1.529) SARS-CoV-2 variant in southern California [Internet]. 2022 Jan [accessed on 25/06/2022] p. 2022.01.11.22269045. Available from: <https://www.medrxiv.org/content/10.1101/2022.01.11.22269045.v1>
16. WHO team, WHO headquarters. Coronavirus disease (COVID-19): Vaccines [Internet]. Q&As on COVID-19 and related health topics. 2022. Available from: [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-\(covid-19\)-vaccines?](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-(covid-19)-vaccines?)
17. Ferguson N, Ghani A, Cori A, Hogan A, Hinsley W. Report 49: Growth, population distribution and immune escape of Omicron in England+. . *Imperial College London.* 2021;10.
18. Bar-On YM, Goldberg Y, Mandel M, Bodenheimer O, Freedman L, Kalkstein N, et al. Protection of BNT162b2 Vaccine Booster against Covid-19 in Israel. *New England Journal of Medicine.* 2021;385(15):1393–400.
19. Lippi G, Mattiuzzi C, Henry BM. Neutralizing potency of COVID-19 vaccines against the SARS-CoV-2 Omicron (B.1.1.529) variant. *Journal of Medical Virology*[accessed on 25/06/2022]. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/jmv.27575>
20. Accorsi EK, Britton A, Fleming-Dutra KE, Smith ZR, Shang N, Derado G, et al. Association Between 3 Doses of mRNA COVID-19 Vaccine and Symptomatic Infection Caused by the SARS-CoV-2 Omicron and Delta Variants. *JAMA.* 2022;327(7):639–51.
21. Callaway E. Mix-and-match COVID vaccines ace the effectiveness test. *Nature* [ Accessed on 25/06/2022] Available from: <https://www.nature.com/articles/d41586-021-02853-4>
22. Mohfw, Government of India. An Illustrated Guide on COVID Appropriate Behaviour [Internet]. Ministry of Health and Family Welfare; 2021. Available from: <https://www.mohfw.gov.in/pdf/illustrativeguidelineupdate.pdf>