



(REVIEW ARTICLE)



COVID-19 vaccine coverage and the necessity of its urgent development towards Omicron the new SARS CoV-2 B.1.1. 529 variant

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Abstract

A SARS-CoV-2 variant belonging to Pango lineage B.1.1.529 with a significant number of S-gene mutations compared to the original virus was found in early November 2021. On 26th November 2021, the World Health Organization (WHO) designated the mutation as a variant of concern and assigned it the name Omicron. The difference is identified by 30 changes in the spike protein, three minor deletions, and one minor insertion, 15 of which are in the receptor-binding area. The Omicron variant is the most diverging variety discovered in substantial numbers so far during the pandemic, raising significant concerns that it may be associated with significant reductions in vaccination efficacy and an increased risk of reinfections. Omicron pseudo- or live virus isolates are urgently needed to understand better the virus's escape potential against both vaccination, and infection-acquired immunity is urgently required.

Keywords: Omicron; SARS CoV-2 B.1.1. 529 variant; COVID-19; Vaccine

1. Introduction

At the beginning of November 2021, a SARS-CoV-2 variant belonging to Pango lineage B.1.1.529 with a large number of S-gene mutations compared to the original virus was discovered. The World Health Organization (WHO) recognized the variation as a variant of concern (VOC) on November 26, 2021, and issued the designation Omicron to it. 30 alterations distinguish the variation in the spike protein, three modest deletions and one tiny insertion, 15 of which are in the receptor-binding region. This variation was discovered on November 11, 2021, in Botswana and November 14, 2021, in South Africa. As of November 26, 2021, travel-related incidents had also been discovered in Belgium and Hong Kong. Multiple mutations in the spike protein's receptor-binding region imply that Omicron is susceptible to immunological escape from antibody-mediated protection. Immune escape from cell-mediated immunity, on the other hand, is more difficult to anticipate.

In general, there is substantial uncertainty on the degree of Omicron's immunological escape potential. Additional study is necessary to understand better the escape potential associated with vaccination and infection-induced immunity. The research is ongoing, and the results will be published in the following weeks. Despite concerns, it is plausible to presume that vaccinations now available provide some protection against severe illness and death. Public health authorities should step up efforts to increase COVID-19 vaccination coverage in all eligible groups, with a particular focus on high-risk populations of severe illness that remain unvaccinated or are not yet completely vaccinated. These individuals include senior citizens, health care professionals, and people who have pre-existing diseases that put them at danger of severe sickness or death [1]. For countries with access to diagnostic tests that include the S gene target in at least one of the gene targets: Prioritize specimens with SGTF (no discovery of the S gene but detection of other gene targets) for Omicron sequencing confirmation. While a rapid increase in SGFT may suggest Omicron circulation because the incidence of the Alpha variation (which also produces SGTF) is relatively low in the overwhelming majority of nations,

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confirmation of Omicron by sequencing is advised. In countries where diagnostic assays with the S gene target are unavailable, improved surveillance and sequencing are advised to characterize the circulating SARS-CoV-2 variants [2].

2. Immunity

The Omicron variant is the most diverging variety discovered in substantial numbers so far during the pandemic, raising major concerns that it may be associated with significant reductions in vaccination efficacy and an increased risk of reinfections. Several variations in the sequence coding for the spike protein have previously been reported and have been linked to improved transmissibility, immunological escape, or other features. A previously identified synthetic variation with 20 mutations in the spike protein was linked with practically 100% escape from convalescent and vaccinee sera. Because Omicron has more mutations in the S-gene than this variation, a considerable influence on neutralization is predicted. However, more virological research and vaccine efficacy trials are needed to determine the extent to which the variation would affect vaccination effectiveness and outbreak infection [3]. Even if current vaccines proved less effective against omicron, they were still likely to provide some protection, according to Wendy Barclay, leader of the G2P-UK National Virology Consortium and research chair in virology at Imperial College London, who urged the general public to take advantage of all vaccine shots available. "If we have an antigenically distant variation that isn't neutralized at a given level of antibody, that there's something we can do: we can enhance overall antibody levels, since quantity may sometimes compensate for lack of match," she explained. "I would highly advise individuals to take advantage of this opportunity to provide their immune systems with the greatest quantitative chance possible by receiving booster doses and the entire course of immunization" [4].

3. Vaccination

While the existence of several receptor binding domain mutations in Omicron's spike protein indicates a significant possibility of immune escape from antibody-mediated protection, determining immune escape potential from memory T cells aimed towards non-surface proteins following infection or vaccination is more challenging. Memory T cell responses may provide a path to long-term immunity in cases when viral evolution results in spike protein mutations that evade pre-existing neutralizing antibodies. This might happen by either providing more efficient assistance to activated naive B cells reacting to the altered spike protein (CD4 T cells) or by directly lysing SARS-CoV-2 infected cells (CD8 T cells) [5]. Although currently available vaccines may provide some level of protection against hospitalization and death, *in vitro* studies evaluating the neutralizing capacity of both vaccinee and convalescent sera against Omicron pseudo- or live virus isolates are urgently needed to better understand the virus's escape potential against both vaccination and infection-acquired immunity are urgently required. These data should be accessible within two to three weeks. Countries are recommended to prioritize persons who were initially targeted by COVID-19 immunization programs but are still unvaccinated or have not been adequately vaccinated. Increasing COVID-19 vaccination in all eligible age categories, but especially in the elderly, fragile, and healthcare professionals, should remain a top focus for public health officials. There is still a pressing need to overcome immunity gaps in the adult population and provide effective and equitable coverage across European nations and regions. A booster dosage must be considered for individuals aged 40 and higher, prioritizing the most vulnerable and elderly. Countries should also consider a booster dosage for all persons 18 and older at least six months after completing the initial series to strengthen protection against infection due to fading immunity, thereby reducing transmission in the community and preventing further hospitalizations and deaths [6].

4. Conclusion

The advent of the VOC Omicron form and its rapid dissemination results from wealthier countries' reluctance to deliver COVID-19 vaccinations globally in an equitable manner. This failure also contributes to the pandemic's prolongation, putting the entire world at risk of COVID-19 and its economic consequences. Because SARS-CoV-2 is still circulating and VOC Omicron has emerged in Africa and elsewhere, vaccine development must adapt and evolve over time. It is encouraging that, in light of the development of VOC Omicron, vaccine makers have stated that they want to adapt and modify their present COVID-19 vaccinations.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there are no conflicts of interests.

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