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Omicron the New COVID-19 Variant, a Review

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Abstract

SARS-CoV-2 virus (COVID-19), the cause of coronavirus disease, has several variations. Some are thought to be particularly important or have been said to be so, because of their potential for greater transmissibility, Virus pathogenicity has grown, or vaccinations against them have become less effective. These mutations have a role in the COVID-19 pandemic's persistence.

The B.1.1.529-Omicron variant, found in many coronavirus cases reported in South Africa discovered late 2021, having a surprisingly great number of mutations which raise a concern toward the spreadablity of this variant and severity of illness in comparison to other corona virus variants as well as the effectivity of the available vaccinations. This review summarizes of the most recent information and the answers to most of the world's questions about Omicron.

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1. Introduction

SARS-CoV-2 keeps surprising us with different mutations and The Omicron variant is a late 2021 update of that virus. It still concerns; however, the world is better prepared and ready to tackle potentially bad variants compared to the beginning of the pandemic.

Early, there were few "mutant" variant viruses, the extra-contagious delta variant is the most famous one and the in charge of the most reported cases of COVID-19 in many countries. However, many mutations of severe acute respiratory syndrome coronavirus 2 SARS-CoV-2 have emerged resulting from the cross-species transmission of blending a pangolin coronavirus and a bat SARS-like coronaviruses [1]. The B-type mutated into other kinds include B.1, represents the ancestor of the significant global variations of concern, identified as alpha, beta, gamma, delta, and omicron by WHO in 2021(as shown in Table 1) [2]. The Omicron variation of SARS-CoV-2 carries an unusually great number of mutations. In addition to other important or earlier variants of concern, which are displayed in a tree scaled radially by genetic distance, derived from Nextstrain on December 1, 2021.scientists are trying to have better understanding about the ease of the virus ability to spread, illness symptoms are comparable to those already known types of COVID-19 or more sever and the protection of the available vaccine towards the new omicron variant.

Table 1. Currently global variations of concerns.

Mutation type	Pango lineage	Earliest taken samples	Date of designation
Alpha	B.1.1.7	UK, Sep-2020	18-Dec-2020
Beta	B.1.351	South Africa, May-2020	18-Dec-2020
gamma	P.1	Brazil, Nov-2020	11-Jan-2021
Delta	B.1.617.2	India, Oct-2020	11-May-2021
omicron	B.1.1.529	Multiple countries, Nov-2021	26-Nov-2021

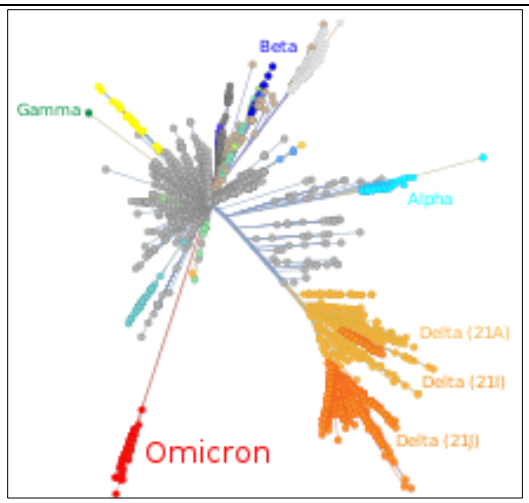

Figure 1. Tree for global variations of SARS-CoV-2.

2. Omicron Variant

The Omicron variant, also known as (B.1.1.529), On November 24, 2021, variation was reported for the first time by WHO in South Africa [3]. The WHO identified it as a variation of concern on November 26, 2021. The name is after the Greek letter omicron [4]. On November 25, it was identified in Botswana and Hong Kong, the case in Hong Kong being a traveler from South Africa. The first case in Europe was discovered on November 26 in Belgium. It was discovered in a tourist returning from Egypt, according to officials.

On November 27, the first confirmed case of the new variant in Israel was reported for a traveler who returned from Malawi, Africa.

3. Mutations

Mostly, the mutations in COVID-19 have occur in the spike of the proteins. The mechanism to attach to human cells, the protein spike is considered as the main antigenic target for the antibodies from infections and vaccinations, has 32 mutations [5]. In comparison to the original virus, the variation has 30 amino acid alterations. Three of which are minor deletions in addition to one injection in the spike protein.

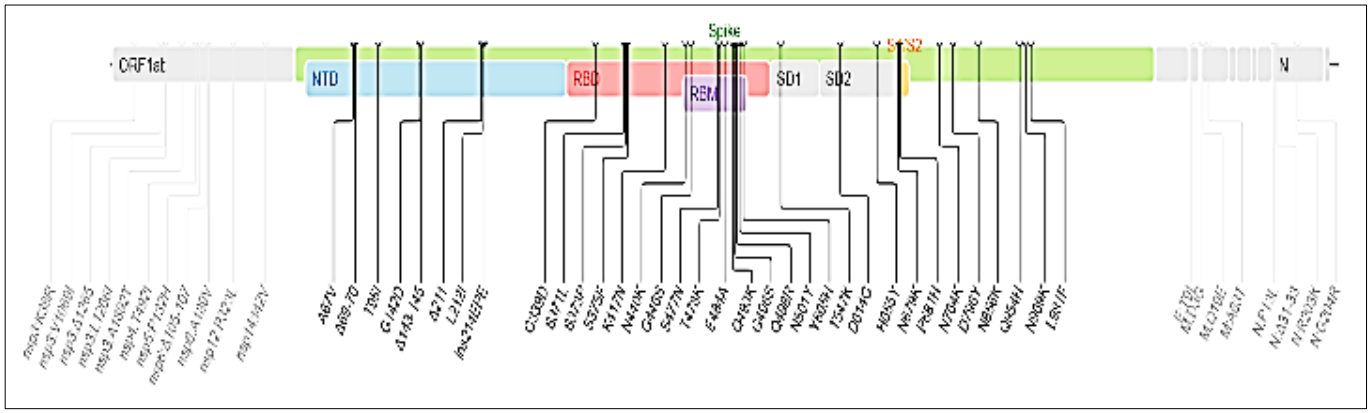

Figure 2. Genomic sequence.

Also, 15 are in the receptor-binding domain (residues 319-541) [6]. Three changes at the furin cleavage site are notable in this variation which raises the SARS-CoV-2 infectivity [7]. However, the mutation of virus is very difficult in the absence of protease enzyme that inhibited by Paxovid. Mutations in the genomic region are listed in Table 2 [7].

Table 2. Mutation in the genomic region of the virus.

Spike protein	A67V, Δ69-70, T95I, G142D, Δ143-145, Δ211, L212I, ins214EPE, G339D, S371L, S373P, S375F, K417N, N440K, G446S, S477N, T478K, E484A, Q493K, G496S, Q498R, N501Y, Y505H, T547K, D614G, H655Y, N679K, P681H, N764K, D796Y, N856K, Q954H, N969K, L981F.
Envelope protein	T9I
Membrane protein	D3G, Q19E, A63T
ORF1ab	-nsp3: K38R, V1069I, Δ1265, L1266I, A1892T. -nsp4: T492I. -nsp5: P132H. -nsp6: Δ105-107, A189V. -nsp12: P323L. -nsp14: I42V.
Nucleocapsid protein	P13L, Δ31-33, R203K, G204R.

Thus, Omicron is still not a complete escape variant, despite a large number of mutations. Vaccines and antibody medication that works on spike protein must re-equip with the proper mechanism to overcome any possible mutation occur on the virus protein.

4. Transmissibility

There is a big concern that the new Omicron variant can be more transmissible in comparison to the Delta variant. Until now, the reported cases of COVID-19 in South Africa are still low and any super spreading episodes involving a particular variation might have a greater proportionate effect. Furthermore, immunological escape might explain the high reported growth rate. More information is needed to offer a credible assessment of the variant's transmissibility [8]. As of 4 December 2021, all known cases were collected in Table 3 [9-11]. The previous results in South African COVID-19 cases suggested that the vaccinated people after earlier infection with COVID-19 have shown more protection, which reveals that a huge antibody are triggered in the initial shots after previous contagion. On the other hand, the fear came from the vaccinated people where they can contribute to the spread to unprotected people who don't have a strong defense even when vaccinated like elderly people and people with health conditions [1].

Table 3. Confirmed cases until December 4, 2021, in different countries.

Country	No. of cases	Country	No. of cases
South Africa	217	United Kingdom	150
Norway	50	Zimbabwe	50
Portugal	38	Ghana	33
United States	24	Botswana	19
Denmark	18	Canada	16

5. Vaccination

While several receptor-binding domain (RBD) mutations in Omicron's spike protein show a significant risk of immunological escape from an antibody-mediated protection strategy. The escape of the immune from memory T cells that works on surface spike protein towards the non-surface spike protein after infection or being vaccinated is hard to assess its efficiency. The mutation in spike proteins caused by the virus may inhibit the existing neutralizing antibodies, memory T cell responses may provide the path for long-term protection. This might happen by providing more effective assistance to activated naive B cells reacting to the muted spike protein (CD4 T cells). Alternatively, by directly cell lysis SARS-CoV-2 infected cells (CD8 T cells) [12,13].

Vaccines now available may provide some protection against hospitalization and mortality. In vitro investigations on Omicron pseudo or live isolate are critically needed to test the neutralizing ability of vaccinated or convalescent sera to deep understand the virus's breakout potential over-vaccination and infection-acquired immunity [14]. A study from South Africa have reported that two Pfizer shots are not enough to provide a protection against omicron. The results revealed a great drop in the strength of the antibody to omicron variant in comparison to other variants.

The main companies, BioNTech, AstraZeneca, Moderna, and Johnson & Johnson, have announced that they will be testing the ability of the existing vaccine to neutralize the Omicron variant, or an upgrade to the vaccines is required [15]. Moreover, Pfizer and BioNTech tested antibodies levels from people a month after getting a booster dose; they found high levels of omicron-neutralizing antibodies similar to the amounts of antibodies that have been proven as protective levels against earlier variants after two doses [2]. lab tests showed a booster increased by 25-fold people's levels of antibodies, so the booster of COVID-19 vaccine offers important protection against the omicron even though the initial two doses appear significantly less effective. However, two shots still can provide a good protection and reduce the severe symptoms or even death.

The first research regarding vaccine efficacy (VE) against the Omicron variant was from the UK. The study shows a decrease the protection, to no protection at all, against COVID-19 asymptomatic disease in vaccinated people with two doses of Pfizer-BioNTech vaccine, or with the AstraZeneca jab. While the third dose of Pfizer results in VE in the 70-75% range against omicron, these studies support BioNTech for boosters. However, the study did not address the protection against severe disease [1].

6. Symptoms and Testing of the Omicron

The first data from South Africa that came from substantial population-level evidence, suggests that the Omicron variant of SARS-CoV-2 shows an evasion of immunity from prior infection compare to the Beta and Delta variants. data also suggests that the virus can escape vaccine-induced immunity. However, this new variety appears to have the same symptoms as all previous coronavirus variants, as far as we know [16]. Headache, fever, nasal congestion, dry cough, shortness of breath, loss of smell.

On top of that, and regarding the performance of SARS-CoV-2 tests, the majority of commercially-available tests are unaffected by omicron. However, FDA's analysis has identified certain EUA-authorized molecular diagnostics whose performance may be impacted by mutations in the variant. Rapid COVID-19 Antigen Test, a PCR test, and the SARS-CoV-2 Antigen Assays are well designed to detect the Omicron variant.

In Iraq, the authorities announced that the Omicron variant has not been detected till Dec 2021. Moreover, a significant decrease in the number of positive cases is seen all over the country, although the vaccination rates are in very low percentages compared to other countries.

All that has been known about Omicron so far, make it not the most aggressive variant despite a large number of mutations. Moreover, the booster third dose of COVID-19 vaccine become mandatory in many countries in the world based on the studies and research that have been done to prevent its high transmissibility.

Conflicts of Interest

The authors declare that there is no conflict of interest.

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