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A Review On-SARS-CoV-2 Omicron Variant

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ABSTRACT: Severe acute respiratory syndrome - coronavirus 2 is known to cause coronavirus disease (COVID-19), an infectious diseaseThe majority of those exposed to the virus can have moderate respiratory issues and can recover without the need for specific treatment. Some, on the other side, can become gravely unwell and require medication. People over the age of 65, as well as those with existing medical disorders such as cardiovascular risk factors, diabetes, severe pulmonary disease, or cancer, are often more likely to form serious illnesses. COVID-19 can make anyone sick and cause serious illness or even death at any age. The Omicron variation in SARS-CoV-2(severe acute respiratory syndrome coronavirus 2) is the newer coronavirus strain to be identified as a "variant of concern" by the World Health Organization (WHO). Researchers from everywhere in the world, including South Africa, are looking into this variety in order to fully comprehend different aspects of Omicron, but it might take a long time to learn everything there is to know. Due to the scarcity of studies, misinformation about the Omicron variation is spreading around the world, posing a serious threat to healthcare systems and everyday life. Here, we reviewed the finding and characteristics of the Omicron variant, compared the transmission capacity of the Omicron variant with other variants, discussed on the influence of the Omicron variation on the severity of COVID-19 in cancer as well as diabetic patients, and discussed potential strategies and treatments options to avoid and overcome the Omicron variant's prevalence.

KEYWORDS: Characteristics, Omicron, Prevention strategies, Transmission capacity, SARS-CoV-2, Vaccination.

INTRODUCTION

On the recommendations of WHO's Technical Advisory Group on evolution of Viruses, WHO recognized variation B.1.1.529 as a strain of concern on Nov 26, 2021, and called it Omicron (TAG-VE). This statement was made based on information provided to the TAG-VE, that Omicron has various alterations that could affect how it acts, such as how easy it spreads or how serious the sickness it produces.[1]

Omicron has been born into a COVID-19-weary society, replete with rage and despair at the pandemic's extensive detrimental social, emotional, and economic effects.The appearance of the alpha, beta, and delta (SARS-CoV-2) Variant of Concerns (VoCs) is linked to new waves of infections, which spread throughout the globe at times.[2] Because of its ability to escape natural immunity, the delta VoC's greater transmissibility was associated with, the higher viral load, longer duration of infectivity, and wide rates of reinfection, resulting in the delta VoC fast becoming the globally prevalent variation.[3,4,5] In many nations, the delta VoC continues to drive additional waves of infection and is the dominating VoC during the fourth wave. Concerns regarding reduced vaccine efficacy due to new variations have shifted our perspective on the COVID-19 endgame, dispelling the concept that worldwide vaccination is sufficient to suppress SARS-CoV-2 infection.[6]

On Nov. 11, 2021, Botswana reported the 1st sequenced omicron case, and several days later, Hong Kong reported another sequenced case in a tourist from South Africa.[7] Following the discovery that the newest variant was correlated to an S-gene target failure on a specific PCR assay due to a 69–70del deletion, equivalent to the alpha version, many sequences from South Africa were discovered. Although there are likely unidentified incidences in numerous nations around the world before then, the first confirmed case of omicron in South Africa was a patient diagnosed with COVID-19 on November 9, 2021.In the South Africa, the overall average COVID-19 cases each day jumped from 280 cases per day the week before omicron was discovered to 800 cases each day

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the following week, owing in part to greater surveillance. COVID-19 cases are rapidly increasing in South Africa's Gauteng area; the fourth wave's early doubling time is faster than the prior three waves. [8,9,10]

Since, Omicron has been defined as a Variant of Complaint, WHO recommends that countries improve supervision and sequencing of cases, openly discuss genome sequences on public databases like GISAID, report preliminary cases or clusters to WHO, and conduct field exploration and laboratory evaluations to better understand if Omicron has various transmission or disease characteristics, or affects vaccine effectiveness.[1]

Transmission capacity of the Omicron variant as compare to other variants of SARS-COV-2:

Epidemiologists are concerned that the changes in the Omicron variety could make it more transmissible than earlier versions. More research is needed to see if the Omicron version is much more contagious than the other types or not.[1] The main worries concerning omicron are whether it is more infectious or severe than other variant of concerns, as well as whether it can evade vaccine protection. Although we lack definitive immunological and clinical data, we can generalise from what we know about omicron mutations to provide preliminary indications on transmissibility, severity, and immune escape. Omicron has a few deletions and over 30 mutations, several of which (e.g., 69–70del, K417N, T478K, T95I, G142D/143–145del, N501Y, N679K, N655Y, and P681H) overlap within the alpha, beta, gamma, or delta variant of concerns. Increased transmissibility, stronger viral binding affinity, and antibody escape have all been linked to these deletions and alterations. Other omicron mutations that have been linked to higher rates of infection and affect binding tendency. Higher transmissibility is anticipated, in case the overlapping omicron mutations remain their known effects, especially due to mutations close to the furin cleavage site. [7,11,12] Although, it's uncertain whether the Omicron variant worsens COVID-19, although preliminary research suggests that it does. In South Africa, the Omicron variant enhanced hospitalisation for COVID-19 patients, which could be associated with COVID19 problems. Furthermore, it is unclear if the Omicron variation promotes other variants, particularly the Delta variant, implying that more research is needed.[1]

Symptoms associated with Omicron as well as other variants of SARS-COV-2:

According to the WHO, there is no evidence that the symptoms associated with the Omicron variant differ from those associated with other variants. Nonetheless, the WHO claims that the Omicron variant, like other COVID-19 variants, could potentially raise death rates. The following symptoms, which are similar to those of other COVID-19 variants, can be caused by the Omicron variant:

The most prevalent signs and symptoms are fever, cough, tiredness, loss of taste or smell.

The less prevalent signs and symptoms are headache, sore throat, diarrhoea, aches and pains, skin- rashes, and discoloration of the fingers or toes as well as irritated or red eyes.

The severe signs and symptoms are shortness of breath or difficulty breathing, chest pain, loss of speech or mobility, or confusion. [13,14]

Characteristics of Omicron:

Three major COVID-19 outbreaks have been reported in South Africa since early 2020. Two of them are caused by the Beta and Delta variations, respectively. Within 100 days of the outbreak, the ratio of persons infected with the Beta variant had climbed to 50% of total daily infections, according to epidemiological statistics. During the same time frame, however, the Delta variant's infection rate increased to 80%, indicating that the Delta version is more transmissible among people than the Beta variant. In South Africa, the percentage of people infected with Omicron reached 90% in about 25 days. The Beta, Delta, and Omicron types' early doubling times were calculated to be roughly 1.7, 1.5, and 1.2 days, respectively. According to these findings, the Omicron form is much more aggressive than the Delta and Beta variants. It's also worth noting that a recent systematic review study based on community epidemiological data in South Africa found a link between Omicron and an elevated risk of SARS-CoV-2 reinfection. The probability of a fresh COVID-19 outbreak in South Africa, and possibly the rest of the world, should not be underestimated. [10,15] Analysis of the Omicron variant's genomic sequences revealed a wide range of non-synonymous mutations, including some in spike which has been linked to illness transmissibility, severity, and immune evasion. In total, more than 60 substitutions, deletions, and insertions have been watched in the Omicron variant, making it the variant with the most mutation sites of all the SARSCoV-2 variants evaluated so far.[16] The Omicron variant of ORF1a has six amino acid changes (K856R, A2710T, L2084I, T3255I, I3758V, and P3395H) and two deletions (amino acid 2083 and amino acids 3674–3676). Two alterations are found within ORF1b in the variation (P314L and I1566V). ORF9b also has a P10S substitution as well as a three-reside excision at sites 27–29. The envelope (E), membrane (M), and nucleocapsid (N) proteins all have one substitution (T9I), three substitutions (A63T D3G,

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and Q19E), and three substitutions and a three-residue excision, respectively. Although the aforementioned mutations appear across the viral genome, the other mutations are aggregated in the spike, accounting for more than half of the overall Omicron mutations found. Among them are 30 substitutions of A67V, E484A, T95I, L212I, Y145D, G339D, S375F, S371L, S373P, K417N, G446S, N440K, S477N, T478K, Q493R, G496S, Q498R, D614G, H655Y, N679K, N764K, P681H, D796Y, N501Y, N856K, Y505H, T547K, Q954H, L981F and N969K, three excisions of N211, H69/V70, and G142/V143/Y144, and one insertion of three amino acids (EPE) at position 214. The spike mutations found in Omicron outnumber those seen in the other four VOC variations by nearly three to four times. It's worth noting that the amino acid alteration D614G is present in all five VOCs. D614G has been linked to greater viral loads in the upper respiratory tract and patients who are younger in age, according to previous research. [17-19]

COVID-19 severity and the Omicron variant in cancer and diabetes patients:

The Omicron variant of SARS-CoV-2 is the newest coronavirus strain to be declared a "variant of concern" by the WHO.

Previous research has found that the Delta variant, as well as other variants, can sometimes worsen COVID-19 symptoms in cancer patients. COVID-19 has been shown to cause cellular senescence and oxidative stress, both of which have been connected to COVID-19-related problems in cancer patients. COVID-19 has also been linked to an increase in cytokine release, which has been linked to COVID-19's aggressiveness in numerous investigations. However, further research is needed to fully comprehend the impact of the Omicron variation in cancer patients.[14]

Covid-19 and diabetes have a bidirectional connection. Diabetes is linked to a higher incidence of severe Covid-19 in the one hand. Patients with Covid-19, in the other hand, have developed new-onset diabetes and severe metabolic consequences of pre-existing diabetes, such as diabetic ketoacidosis and hyperosmolarity, necessitating extremely high insulin dosages. These diabetic symptoms are difficult to control in the clinic and point to a complicated pathophysiology of Covid-19–related hyperglycaemia. The virus that causes Covid-19, the SARS-CoV-2, attaches to angiotensin-converting enzyme 2 (ACE2) receptors, that are found in critical metabolic organs and tissues such as pancreatic β - cells, adipose tissue, the small intestine, and the kidneys. As a result, it's possible that SARS-CoV-2 causes pleiotropic changes in glucose metabolism, which could exacerbate the pathophysiology of pre-existing diabetes or lead to new clinical conditions.[20]

We've got to wait and see how this new VoC affects clinical presentation. At this time, anecdotal data from front-line South African doctors reveals that patients having omicron are younger people with a clinical picture that is equivalent to prior versions.[10]

Treatments for the Omicron variant and other variants of SARS-COV-2:

The World Health Organization recently suggested two new COVID-19 medications on 14 January 2022, that will increase the number of treatment choices. The quantity to which these drugs will save lives is determined by their availability and affordability. For people with acute or serious COVID-19, the first medication, baricitinib, is strongly suggested. It belongs to a class of medications known as Janus kinase (JAK) inhibitors, which reduce immune system overstimulation. It is recommended by the WHO that it be used in conjunction with corticosteroids. The Baricitinib is an oral medication that is that is utilized in the treatment procedure of rheumatoid arthritis. It's a substitute to Interleukin-6 receptor blockers, which WHO approved in July 2021.

The use of sotrovimab, a monoclonal antibody medication, for treating mild to moderate COVID-19 in patients with elevated risk of hospitalisation has also been conditionally recommended by the WHO. Patients who are elderly, immunocompromised, or who have underlying illnesses such as hypertension, diabetes, or obesity, as well as those who have never been vaccinated, fall into this category.

Sotrovimab is a cocktail of monoclonal antibody that was suggested by the World Health Organization (WHO) in September 2021 as a substitute to casirivimab-imdevimab. The efficiency of monoclonal antibodies against Omicron is still being studied, although early laboratory investigations reveal that sotrovimab retains its activity.

The experts who developing the guidelines also reviewed at ruxolitinib and tofacitinib, two other medicines for severe and serious COVID-19. WHO issued a conditional guideline against their usage due to their uncertain effects. [21]

It's too early to anticipate whether vaccination or past exposure with SARS-CoV-2 protects against omicron infection.[22] In wake of the latest spread of the Omicron SARS-CoV-2 VoC, the TAG-CO-VAC (The Technical Advisory Group on COVID-19 Vaccine Composition, has been established by WHO to analyse and evaluate the public health implications of emerging SARS-CoV-2 Variants of Concern on the efficiency of vaccines of COVID-19, as well as, if necessary, making recommendations to WHO regarding COVID-19 vaccine composition) recommends for more global availability to existing COVID-19 vaccines for initial

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course and booster doses, in the hopes of reducing the emergence and the impact of subsequent VOCs. The TAG-CO-VAC proposes COVID-19 vaccine strain composition and fosters vaccine developers to collect data on the breadth and magnitude of the immune response for monovalent and multivalent VOCs vaccines on a limited scale – this data may then be used by the TAG-CO-VAC in a widening decision-making outline on vaccine composition. Though, more research is needed to assess the possible efficacy of currently available vaccines against the Omicron variant from a variety of businesses, including Pfizer-BioNTech. People with severe COVID-19 may benefit from IL-6 receptor blockers as well as corticosteroids, according to the WHO. Beside those, there are some anticancer or antiviral medications that have been shown to be successful for the Delta or other variants in earlier studies, but additional research is needed to determine the usefulness of anticancer drugs or antiviral drugs against the Omicron variant. [14,23]

Possible strategies to minimize as well as prevent the Omicron variant: **[**1,22,24]

SARS-CoV-2 variant transmission disruption: The exact properties of the Omicron version are unknown at this time. Given the spike mutations found in other VOCs, it's especially concerning that Omicron may have developed with the potential to spread more easily among people and to withstand currently effective antibody treatments. This situation emphasises the significance of maintaining population health prevention measures, for example mask usages, frequent ventilation, physical distance, and hand washing. These procedures were shown to be efficient in preventing the expansion of other variants, and they should be useful in stopping the expansion of the Omicron variant as well. Early diagnosis and quarantine are also important elements in limiting transmission of infection during a pandemic.

Enhancing COVID-19 vaccination rates: The situation with Omicron transmit in South Africa could be quite different from that in other countries. In South Africa, for example, only about 24% of the population has received all of their vaccinations. This figure is significantly lower than the global average vaccination rate of 42 percent. This could hasten the transmission of Omicron throughout South Africa, underscoring the country's urgent need for increased vaccine coverage. Despite the fact that the authorised COVID-19 vaccinations have demonstrated to be less effective against variant viruses, the vaccines have been shown to be helpful in controlling serious infections, hospital readmissions, and death. Several studies have revealed that 6 months after vaccination, serum neutralising antibodies drop considerably, and that subsequent immunisation with an additional booster dose helps to restore and also improve vaccine effectiveness, as a result, we feel that include an additional boosting dosage of the COVID-19 vaccine in the vaccination regimen would surely aid in the management of Omicron infection and spread.

According to the most recent research, existing COVID-19 vaccinations provide less immunity in the case of the omicron form than other VOCs. Although the effect of the Omicron spike mutations on the efficacy of currently available vaccinations has yet to be determined, vaccines based on wild-type SARS-CoV-2 have been shown to be less efficient in preventing variant infections. The vaccination based on the mutant spike had a higher level of neutralising antibodies against mutant viruses, but a lower level of neutralising antibodies against wild-type SARS-CoV-2, according to a previous study. These findings emphasise the significance of creating variant-specific vaccinations based on the mutant spike, particularly for the Omicron variant. The manufacturers of the two COVID-19-approved mRNA vaccines, Pfizer-BioNTech and Moderna, have suggested that vaccinations specific to omicron may be produced in few days.

CONCLUSION

Omicron has just been born into a COVID-19-weary universe, full of fury and sorrow over the pandemic's widespread social, emotional, and economic consequences. The origin, transmission capability, and immune-escape potential of the Omicron variety remain unknown in the aftermath of its appearance. It's also unclear whether further varieties based on Omicron may emerge in the future. However, there is no reason to suspect that the Omicron version of SARS-CoV-2 would not be the last version. Many researchers around the world are currently working to gain a better understanding of the Omicron variant, but more investigations would be needed to fully comprehend the severity, transmission capacity, diagnostic test efficacy, efficacy of currently available vaccines, and appropriate treatments.

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