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Letter to the editor

COVID-19 Omicron - another deadly dilemma

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From Wuhan, China in December 2019, the coronavirus marked its origin which is currently a global public health challenge. On 11th March 2020, World Health Organisation (WHO) declared the coronavirus disease as a pandemic that has quickly engulfed the entire globe.[1] As of 26th December 2021, this current pandemic has resulted in 5,374,744 deaths around the world according to WHO.[2] One of the most essential tools against this virus is understanding the mutations, dynamics, and characteristics of this virus, followed by clinical manifestations, and the use of vaccines with drugs. The spread of the delta variant of the coronavirus has currently been on the rise as its transmission rate has been shown to be much higher than the previously known variants of the coronavirus.

Structure and Mutations of the Coronaviruses

Coronavirus is a virus that has been known to be of a zoonotic origin, with literature reporting its origin to be from bats.[2] From the start of the pandemic, different variants of the coronavirus have emerged that have challenged the public health communities to tackle them, as presented in Table 1. Coronavirus, like other RNA viruses, mutates as a result of the natural by-product of viral replication. However, coronavirus has fewer mutations than other RNA viruses primarily due to the presence of an enzyme to correct a couple of errors made during replication. These mutations then lead to changes in the phenotype of the virus such as changes in the transmissibility, virulence, and antigens. The variants that have a higher rate of transmissibility, drug resistance, and infectivity are known to be persevered in the selection. Such resistant variants then replace the pre-existing variants and globally they spread. Up till now, the variants of concern of coronavirus are alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1) and Delta (B.1.617.2). The first case of delta variant of the coronavirus was reported in India in October 2020 and was found to have a higher rate of transmission and infectivity as compared to the other variants previously known to exist.

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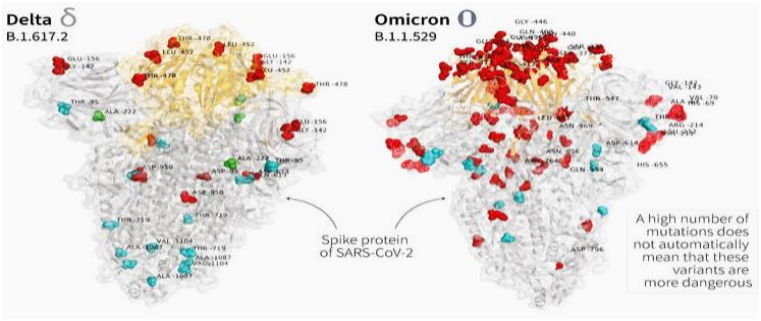
Table 1. Variants of Concern and Interest with their first origin of cases reported

Alpha	•United Kingdom, September 2020
Beta	•South Africa, May 2020
Gamma	•Brazil, November 2020
Delta	•India, October 2020
Epsilon	•India, October 2020
Zeta	•Brazil, April 2020
eta	•Multiple countries, December 2020
theta	•Phillipines, January 2021
lota	•United States, November 2020
kappa	•India, October 2020
lambda	•Peru, December 2020
mu	•Colombia, January 2021
Omicron	•South Africa, Novembe2021

Variant of Concern (Black), Variant of Interest (Blue)

Omicron variant of the Coronavirus

On 9th November 2021, a new variant of the coronavirus was detected from South Africa according to WHO which has been classified as coronavirus variant omicron (B.1.1.529).[4] This variant was then declared as a variant of concern by WHO on 26th November 2021. At the present moment, it is known that the rate of transmission of the omicron variant is much higher than the previously existing variants primarily due to a greater number of mutations, as presented in Figure 1. Preliminary data regarding omicron suggests that it has multiple spike protein mutations, with 30 mutations in the region of the virus that encodes these proteins that are responsible for the entry of the virus into the human cells, as presented in Figure 2. Such mutations that are found in the omicron virus are also known to be found in the previous variants of the coronavirus such as alpha and delta.[5] However, it has been found that fifteen spike mutations in the omicron are found in the receptor-binding domain, a region acting as the binding site for ACE-2 that allows entry inside the cells.[6] Regarding the mutations of omicron, according to Network for Genomic Surveillance in South Africa (NGS-SA), the cluster of mutations known as H655Y + N679K + P681H is associated with more effective entry into the human cells thereby suggesting the higher transmissibility of the virus.[7] Mutations such as R203K + G204R that have also been seen in alpha strain have been reported in omicron strain that is associated with a high infectivity rate. About the entry of the omicron virus inside the cell, it has been noted that transmembrane serine protease 2 (TMPRSS2) is a less efficient mechanism for the omicron virus to gain entry inside the cell.[8] Furthermore, it has been found that the presence of neutralizing antibodies prevents the virus from replicating, with cell-mediated immunity offering an intact immune response against the omicron virus.[9]



Source: Bambino Gesu hospital Rome

Figure 1. COVID 19 Delta and Omicron variants mutations comparison. The omicron variant shows greater number of mutations marked in "Red" compared to Delta variant. Areas with mutations scores, Red more than 70%; Orange 40 to 70%; Yellow 15 to 40%; Green 5 to 15%; Blue 1 to 5%,[7]

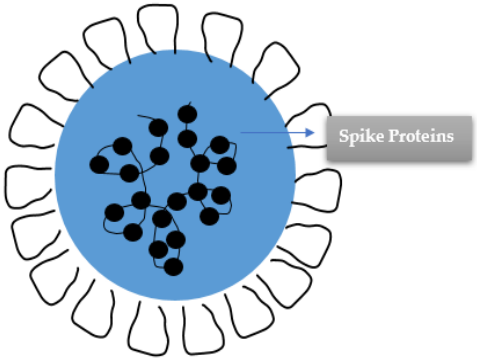


Figure 2: Region of the coronavirus where mutations occur (spike protein zone)

Possible clinical manifestations of Omicron

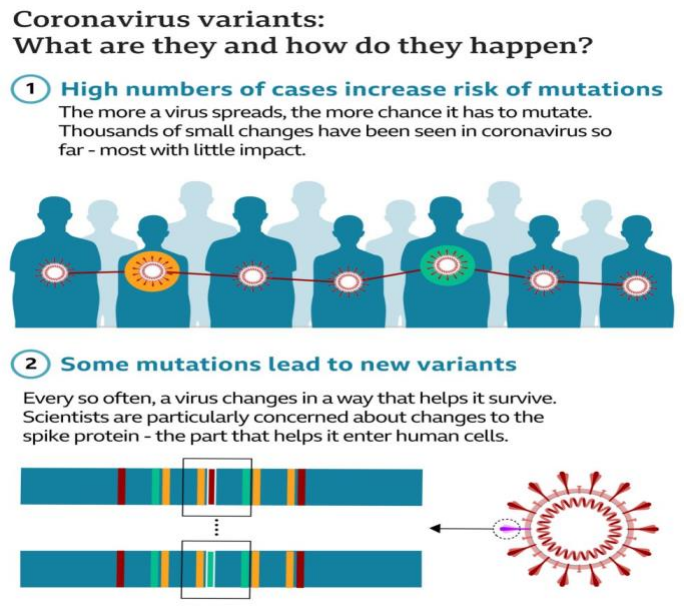
According to the National Institute of Communicable Diseases (NICD) of South Africa, so far, no unusual symptoms have been reported of the patients reported positive for the omicron strain.[7] The patients that have been infected with omicron, some remained asymptomatic whilst others presented with mild symptoms, of which none required oxygen supplementation.[10]According to WHO, those who have previously contracted the coronavirus can easily be reinfected with the omicron variant as compared to other variants of concern.[11]

Perspective of vaccines against the Omicron variant

Since vaccines have been the major tool against the coronavirus, the potential efficacy of the current vaccines against the omicron variant has been studied. Primary immunization provided limited protection against symptomatic omicron, however, booster resulted in increased protection but waned over a period of time.[12] Drugs such as corticosteroids are continued to be administered to the patients suffering from severe infection as the degree of severity is directly related to the rate of mortalities. Since the potential degree of transmissibility and infectivity of the omicron variant appears to be higher than other previously existing variants, many countries around the world have placed travel restrictions along with local restrictions in order to contain and control the spread of it. The omicron has been detected in many countries with deaths being reported from the new COVID-19 variant. It is commendable that makers of COVID-19 vaccines are planning for the likelihood of needing to adjust their products to protect against the omicron variant. Moreover, anti-viral drugs such as remdesivir and molnupiravir have also been studied that reportedly can be used to treat patients infected with omicron strain.[13]

Possible future threat of Omicron

Since the coronavirus transmits quickly amongst the individuals, this increases its chances of mutations, as presented in Figure 3. The omicron variant of the coronavirus has a greater number of mutations as compared to previously existing variants that make its infectivity and transmissibility rates higher. This variant of concern has led to various strategies being implemented by different public health organisations in countries around the globe such as the implementation of lockdown situation that was previously eased, acceleration of the vaccination programs, and travel bans on the countries known to have reported cases of the omicron variant. Furthermore, the concern regarding this virus's transmission has further increased anxiety amongst the general population along with increasing possible financial burden on different countries. According to the WHO, the omicron variant has a very high risk of transmission and infectivity, therefore, urging individuals to continue to implement preventive measures such as social distancing, wearing masks, and hand sanitization.[11] The efficacies of currently available vaccines vary as different mutations of the coronavirus have shown different degrees of resistance to the vaccines. So, it is of primary importance to follow preventive measures against the coronavirus as much as possible.



Source: Center for disease control prevention, United Kingdom

Figure 3. How mutations lead to new variants of the coronavirus.[14]

Future recommendations

As the coronavirus pandemic is currently spreading throughout the world, different variants continue to emerge placing public health sectors at immense pressure to tackle it. There has been a subsequent increase in the number of cases of omicron variant of coronavirus in countries such as South Africa, Netherland, Saudi Arabia, South Korea, India, Hong Kong, Belgium, Australia, and UAE.[10] Since the coronavirus continues to mutate producing different variants, studies are required in terms of vaccine as it is the most effective preventive measure to control the spread of the virus. Moreover, researchers also need to focus on drugs that can be effective against the coronavirus in order to reduce the number of mortalities and morbidities.

Author Contribution

1. A.L: Writing-original draft, conceptualization, data collection, data analysis.

2. N.A: Conceived and designed the analysis, wrote the paper, performed the analysis.

3. A.M: Conceived and designed the analysis, collected data.

4. M.K.A: Conceived and designee the analysis.

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