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Commentary

Variants of SARS-CoV-2

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Corona Virus Disease 2019 (COVID-19) was caused by Serve Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Covid 19 was appeared in Wuhan, China in December 2019. World Health Organization announced the SARS- CoV-2 as a pandemic on 11 March 2020 [1]. Because of COVID-19, patients suffer pneumonia, multiple organ failure, and severe symptoms of acute respiratory distress syndrome (ARDS) [1]. After a person has been infected with COVID-19, symptoms usually appear within five to six days. However, symptoms may arise between two and 14 days after exposure to coronavirus [2]. Due to the high mutation rate, rapid changes occur in the genome of SARS- CoV-2. Within two years, many mutated strains were discovered, for example, as alpha, beta, gamma, delta, omicron, and deltacron (Figure 1). These mutated variants were responsible for the second, third, and fourth waves in different parts of the region. To protect from the COVID-19 infections, Oxford, AstraZeneca, Pfizer, BioNTech, Moderna, Covaxin, and Covishield are used. In this review article, we discussed different variants of coronavirus strain and provided probable situation of COVID-19 in near future.

SARS-CoV-2 alpha variant was initially discovered in November 2020 from a swab received in September within the UK and started to transmit in no time by middle of December. It contains a mutation in spike protein which helps to entry within the human cell [9].

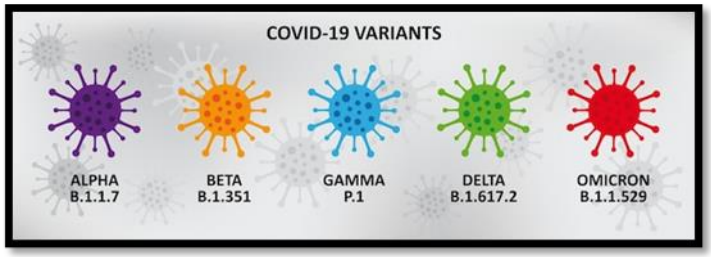

Figure 1: Different variants of SARS-CoV [11].

An N501Y mutation modifies spike protein binding to cellular receptors that make the virus more transmissible (figure 2). The Alpha variant is 50% more transmissible than the initial Wuhan strain. Disease severity is more in alpha variant infections. The vaccine of COVID-19 as well as treatment by antibody are considerably effective against this strain. E484K variety of mutation in the alpha variant may assist the virus to invade body's immune weapon system by evading neutralizing antibodies produced by vaccination or infection that occurred previously [7].

The SARS -CoV-2 alpha variant is expounded to higher transmissibility than the wild sort of virus. The lineage of this strain is B.1.1.7. The emergence of B.1.1.7 was due to increasing transmission over preceding lineages specified by epidemiologic studies.

The transmission rate is much more than an initial strain of SARS-CoV-2. This strain was labeled as an alpha variant of coronavirus by World Health Organization (WHO). Alpha variant of coronavirus showed symptoms like Fever, Cough, and Coryza [3].

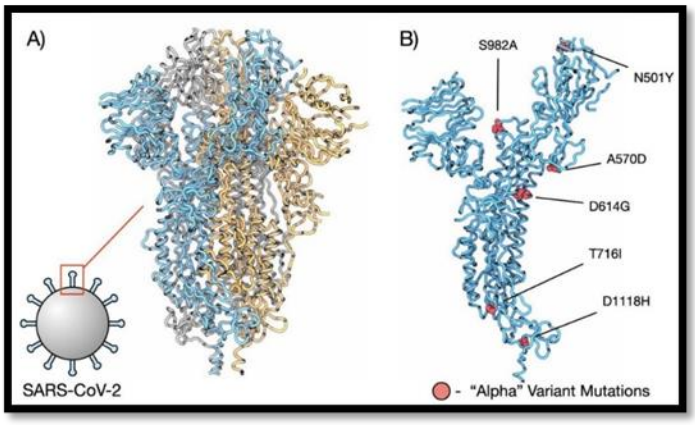

Figure 2: SARS- CoV-2 alpha variant [9]

The beta variant of SARS -CoV-2 emerged in South Africa in July 2020. It was found in more than 48 countries. Besides three mutations reported in the Alpha (or Alpha plus) variant namely, E484K, N501Y, and D614G, the Beta variant has one more mutation, known as, K417N mutation [7]. Mutation in this strain helps to escape the immune system. There was no evidence of the severity of this strain. It caused more than 95% of infections in the country during and after the second wave. A beta variant replaced by a delta variant was a potentially transmissible variant that emerged in India and was spread rapidly all over the world. The lineage of the beta variant is B.1.351. Runny nose, persistent cough, loss of smell and taste, fever, muscle cramps, pink eyes, and diarrhea were the symptoms of the beta variant [4]. Oxford, AstraZeneca, Pfizer, BioNTech, and Moderna vaccines protect from COVID-19 [7].

A gamma variant of SARS-CoV-2 was reported by the National Institute of Infectious Disease (NIID) of Japan in January 2021 [3]. Like other variants of coronavirus, it also contains E484K, N501Y, D614G and K417T. It is 1.7-2.4 times more transmissible than other strains. The lineage of this strain is P.1. It caused more illness than previous variants of coronavirus. This strain has affected the children as compared to the adults. Headache, cough, and normal flu-like symptoms were observed [3]. Existing COVID-19 vaccines were used to protect against this variant [7].

SARS -CoV-2 Delta Variant was first discovered in 2020 in India. Delta variant was responsible for the severity of the second wave in India. Delta variant causes several infections over the world. Delta Variant found in over 80 countries. It was the most common variant in India during the second wave. Delta contains the D614G mutation, in addition to this, it also contains L452R mutation, which increases infectivity rate, a T478K mutation, which helps in avoiding recognition by the immune system; and a P681R mutation is associated with an enhanced ability to trigger the severe disease (figure 3). 'Delta plus' variant, first recognized in Nepal, has an extra K417N mutation [7]. Delta plus variant of Delta was considered highly infectious. The transmissibility rate was 40-60%, which was more than other strains (the lineage of the delta variant is B.1.617.2). Headache, sore throat, and fever symptoms were observed during the second wave [2].

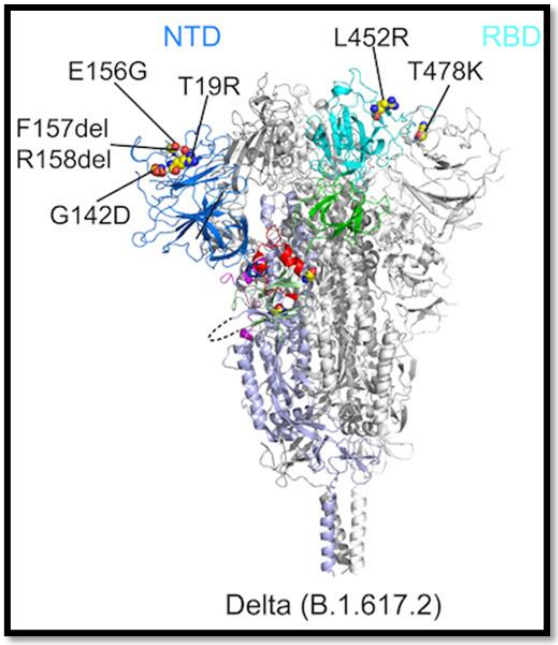

Figure 3: SARS -CoV-2 Delta Variant [12]

SARS-CoV-2 Omicron Variant was first discovered on 24 November 2021 in South Africa. Omicron was detected in Oslo, Norway, in 117 attendees, following a Christmas party. The attack rate was 74% and in most of the cases, symptoms developed. As of 13 December, none have been hospitalized. Most participants were 30-50 years old. There were many mutations in Omicron which include N501Y, D614G, K417N, and

T478K (figure 4). Many mutations were not characterized yet (7). The omicron variant was more transmissible than any other variant of coronavirus. 26 to 32 mutations in spike protein were studied in the omicron variant. The infection rate of omicrons was 91%, less fatal than the delta variant, with 51% less risk of getting admitted in hospitals. The lineage of omicron was B.1.1.529. Body ache, cough, fainting, fever, headache, loss of smell and taste, running nose, night sweats, skin rash, sneezing, and sore throat were common symptoms of omicron [5].

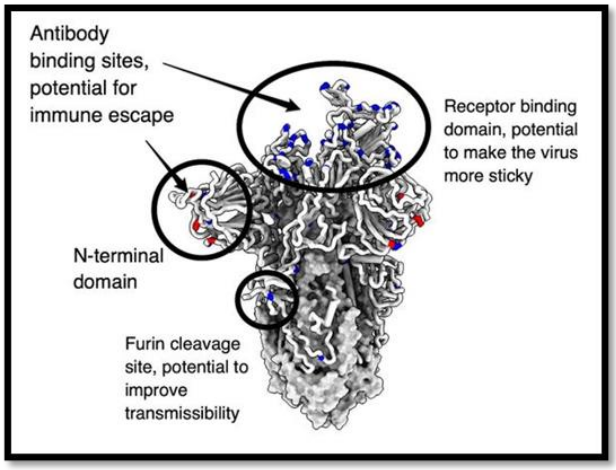

Figure 4: SARS-CoV-2 Omicron Variant [10]

SARS-CoV-2 Deltacron variants were also reported. On 20 January 2022, the University of Cyprus in Nicosia observed that the genome of SARS-CoV-2 contains elements of both the Delta in addition to Omicron variants. This new strain was named Deltacron. Symptoms of the deltacron variant were sneezing, runny nose, fatigue, and headache [6]. The new strains of SARS-CoV-2 arrived.

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