

# Global variants of COVID-19: Current understanding

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**ABSTRACT****Background**

SARS-CoV-2 is an RNA virus that undergoes mutation producing a variety of strains. Mutagens include UV radiation, metals, and endogenous components of organisms. Each strain is specific in terms of virulence, immune response in the body and efficacy of the vaccines.

**Conclusion**

Researchers need to gather data and collaborate with global organizations to learn about the newly evolving strains. Information about the mutations and variants are inevitable in understanding virus transmission and developing vaccines to end the COVID-19 pandemic.

**Keywords**

COVID-19, SARS-CoV-2, strains, variant, Variants of Concern

## Background

Coronaviruses (CoV) are a family of single-stranded RNA viruses that can transmit infections human to humans (HCoV) documented over 50 years. Coronavirus infectious disease 2019 (COVID-19), was initially reported as the Wuhan Coronavirus or 2019 novel coronavirus, bleeding humanity since December 2019 [1, 2]. At the end of 2019, hospitals in Wuhan, China, reported 4 cases of respiratory illness “pneumonia of an unknown etiology” by surveillance which later emerged as a COVID-19 outbreak [3]. At the present date (June 23, 2021), COVID-19 cases continue to increase with several different mutated variants. According to WHO, the confirmed number of cases of COVID-19 is 178503429 with a death toll of 3872457 [4].

Mutations in the viral genome sequence give birth to different variants. Environmental mutagens include UV radiation, metal ions, and endogenous components of organisms that changed the genetic structure of the SARS-CoV-2 from time to time [5]. Coronavirus is an RNA virus that evolves and changes gradually [6]. WHO took the lead role with the researchers of national and international authorities to identify and assess the changes of transmission pattern of SARS-CoV-2, clinical presentation and severity, or their influence on public health and social measures (PHSM). WHO established a close monitoring network to detect “signals” of potential Variants of Concern (VOCs) or Variants of Interest (VOIs), assessing the risk factors concerning public health [Table-1] [4]. Four strains were identified as VOCs by WHO, namely Alpha, Beta, Gamma and Delta.

The Alpha strain (B.1.1.7), which originated from the UK, has accounted for an increase from 3% of cases in October 2020 to 96% of cases by February of the following year, resulting in a third wave across the country. B.1.1.7 gradually dominated in the US because of its high transmission rate and lethality, which is 30-70 percent more than the original strain found in Wuhan, China.

The Beta strain (B.1.351) was first spotted in South Africa in May 2020, which was only announced in December and was said to affect younger age groups compared with previous variants. Since then, the presence of the strain is

noticed in 80 countries. E484K mutation makes this strain deadly as it escapes the immune system and the prime cause of the third wave of Coronavirus in South Africa [7-9].

The Gamma strain (P.1) surfaced in Manaus, Brazil, in November 2020, responsible for two waves of Coronavirus. Data from the patients revealed twice transmissibility of this Gamma strain compared with previous strains. This variant drove a deadly second wave as only 54 to 79 percent protection was observed [8, 9].

As of June 21, 2021, WHO reports that the highly contagious Delta variant (B.1.617.2) is the fastest and fittest coronavirus strain yet, affecting the most vulnerable people, especially in areas with low COVID-19 vaccination rates. Delta variant, which was first identified in India, can be more lethal because it is 60% more transmissible and [10] higher risk of secondary attack rate [11, 12].

Delta variant eventually affects the most vulnerable individuals who would succumb to the disease and potentially die [13]. The Delta variant, an existing variant of concern, has driven the deadly second wave of infections this summer in India [14].

According to WHO, the Delta variant currently identified in 92 countries, spreading infections [15]. Centres for Disease Control and Prevention raised the alarm saying that 10% of all new cases in the United States are due to the Delta variant and become dominant. Similar trends followed in The United Kingdom, where the delta variant gradually took over the first detected native alpha variant and responsible for more than 60% of fresh infections in the U.K. [13].

A spike protein mutation in the Delta coronavirus resulted a new variant termed Delta Plus. The Delta COVID-19 variant (B.1.617.2) was first identified in India in October 2020, later found in other countries. Variants of Concern (VOCs) was declared on May 1, 2021. This new variant, referred to as Delta with K417N mutation, has been found in several other countries, including Britain, the United States, Canada, Japan, Nepal, Poland, Portugal, Russia, Switzerland and Turkey. A majority of these reported cases are from the US, Britain and Portugal [16].

**Table 1: SARS-CoV-2 Variants of Concern (VOCs) and Variants of Interest (VOIs) [4]**

WHO label	Pango lineage	GISAID clade	Nextstrain clade	Earliest documented samples	Date of designation
<b>Variants of Concern (VOCs)</b>					
Alpha	B.1.1.7	GRY (formerly GR/501Y.V1)	20I/501Y.V1	United Kingdom, Sep-2020	18-Dec-2020
Beta	B.1.351	GH/501Y.V2	20H/501Y.V2	South Africa, May-2020	18-Dec-2020
Gamma	P.1	GR/501Y.V3	20J/501Y.V3	Brazil, Nov-2020	11-Jan-2021
Delta	B.1.617.2	G/452R.V3	21A/S:478K	India, Oct-2020	VOI: 4-Apr-2021 VOC: 11-May-2021
<b>Variants of Interest (VOIs)</b>					
Epsilon	B.1.427/ B.1.429	GH/452R.V1	20C/S.452R	United States of America, Mar- 2020	5-Mar-2021
Zeta	P.2	GR	20B/S.484K	Brazil, Apr-2020	17-Mar-2021
Eta	B.1.525	G/484K.V3	20A/S484K	Multiple countries, Dec-2020	17-Mar-2021
Theta	P.3	GR	20B/S:265C	Philippines, Jan-2021	24-Mar-2021
Iota	B.1.526	GH	20C/S:484K	United States of America, Nov- 2020	24-Mar-2021
Kappa	B.1.617.1	G/452R.V3	21A/S:154K	India, Oct-2020	4-Apr-2021

## Conclusion

Countries all over the world gird themselves against the new coronavirus variants, and researchers need to gather data and collaborate with global organizations to make them aware of greater threats. Information about the mutations and variants are inevitable to understand the virus transmission and develop vaccines to end the COVID-19 pandemic.

## Abbreviation

Coronavirus disease 2019 (COVID-19), Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), Variants of Concern (VOCs), Variants of Interest (VOIs)

## Authors' contribution

- Study planning: BR, NH, PB
- Manuscript writing: BR, JKD, NH
- Manuscript revision: BR, JKD, NH, PB
- Final approval: BR, JKD, NH, PB
- Agreement to be accountable for all aspects of the work: BR, JKD, NH, PB

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## Competing interests

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