

The Omicron Strain Of Coronavirus May Be More Transmissible Than Other Variants And Is Partially Resistant To Existing Vaccines

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ABSTRACT

The study first interpreted all the data from the alpha to the delta strain. Then comparative data characterized the omicron of the coronavirus strain. Omicron, the SARS-CoV-2 variant responsible for a cluster of cases in South Africa and that is now spreading around the world, is the most heavily mutated variant to emerge so far and carries mutations similar to changes seen in previous variants of concern associated with enhanced transmissibility and partial resistance to vaccine induced immunity. Daily case numbers in South Africa had been fairly low but then rose rapidly from 273 on 16 November to more than 1200 by 25 November, more than 80% of which were in the northern province of Gauteng, where the first cases were seen. Europe's first case of the variant was confirmed in Belgium on 26 November in a person who tested positive for covid-19 on 22 November. By 29 November cases had been reported in the Netherlands, France, Germany, Portugal, and Italy. The UK had recorded nine cases by the morning of 29 November, six of them in Scotland. Elsewhere in the world cases have been reported in Botswana, Hong Kong, Canada, and Australia, which has had extremely tight border controls through the pandemic

Keywords: alpha, delta, omicron strain of the coronavirus, clinical manifestations, vaccination

INTRODUCTION. The clinical impact of the new SARS-CoV-2 lineage B.1.1.7 on children and young people (aged 18 years or younger) regarding acute respiratory SARS-CoV-2 is yet to be fully defined[1]. Media reports of increases in admissions to hospital and more serious illness in children and young people have resulted in public confusion and implicated the B.1.1.7 variant as a more pathogenic infection within this group.^{1,2} This uncertainty has necessitated a public statement from the Royal College of Paediatrics and Child Health[2,3]. It is important to rapidly clarify the true impact of the second wave on children and young people within the context of a high prevalence of the B.1.1.7 variant, estimated to account for 70% of infections in the London region in January, 2021.⁴ Located in south London, King's

College Hospital lies within an area of high disease prevalence, admitting large numbers of patients in both SARS-COV-2 waves[4]. We have previously published data pertaining to children and young people admitted during the first wave5 and here, we compare those data with the characteristics of children and young people admitted with acute respiratorySARS-COV-2 thus far during wave[5]. Between March 1, and May 31, 2020, 20 children and young people were admitted to King's College Hospital. Between Nov 1, 2020, and Jan 19, 2021, 60 children and young people positive for SARS-CoV-2 were admitted.No significant differences were found in age, proportion of patients with comorbidities, proportion of patients from Black, Asia and minority ethnicity background, or deprivation score between groups (table 1).

Table 1. Aged 18 years or younger and positive for SARS-CoV-2

	Wave 1 (March1,toMay31,2020)	Wave 2 (Nov1,2020,toJan19,2021)
Numberofpatients	20	60
Age,years	1(0·1–11)	6(0·7–13)
Sex		
Male	9(45%)	40(67%)
Female	11(55%)	20(33%)
Comorbidities	7(35%)	25(42%)
BAMEethnicity	6(46%;n=13)	20(42%;n=48)
IMDscore	28·3(11·6–36·1)	20·5(14·7–32·2)
Clinicalseverity(modifiedWHOdefinition)*		
Criticaldisease	4(20%)	2(3%)
Severedisease	1(5%)	3(5%)
Moderatedisease	5(25%)	8(13%)
Mildldisease	8(40%)	27(45%)
Asymptomaticorincidentalfindings	2(10%)	20(33%)
Management		
Oxygen	7(35%)	5(8%)
Non-invasiveventilation	3(15%)	2(3%)
Invasiveventilation	4(20%)	1(2%)
Remdesivir	1(5%)	4(7%)
Steroids(lowdose)	0	5(8%)
Monoclonal	0	1(2%)
antibodies(casirivimabandimdevimab)		

Disease severity necessitating oxygen therapy or ventilatory support was infrequent in both waves and was lower as a proportion of total admission in the second wave than in the first. These early second wave data show that many children and young people have been admitted to hospital. This might be due to the higher prevalence of SARS-CoV-2 within our local community. Indeed, the number of adult patients admitted to King's College Hospital in the second wave has also increased by about a third. Importantly, we have found no evidence of more severe disease having occurred in children and young people during the second wave, suggesting that infection with the B.1.1.7 variant does not result in an appreciably different clinical course to the original strain. These findings are in keeping with early national data. Severe acute respiratory SARS-CoV-2 remains an uncommon occurrence in children and young people[6-9].

WHO encourages countries, through laboratory networks, to support and build capacity for sequencing and strain identification of viruses. National and local authorities are encouraged to continue strengthening existing SARS-CoV-2 control activities, including epidemiological surveillance, strategic testing, and strengthening routine systematic sequencing of a representative sample of SARS-CoV-2 isolates from across the country, where possible. A holistic response should continue to be taken against all cases of SARS-CoV-2 transmission. [10]

Distribution of the alpha version

The first case was detected in mid-September 2020 in London, in November 2020, it was confirmed in a sample taken in September during the SARS-CoV-2 pandemic in the United Kingdom; the virus began to spread rapidly by mid-December and correlates with a significant increase in the number of cases of SARS - CoV-2 infection in the world[11].

On February 2, 2021, Public Health England reported that they had found "a limited number of B. 1.1.7 VOC-202012/01 genomes with E484K mutations", which they called "Variant of concern, 202102/02" (VOC -202102/02). One of the mutations (N501Y) is also present in the beta and gamma variants [11].

A study conducted by the Center for Mathematical Modeling of Infectious Diseases of the London School of Hygiene and Tropical Medicine showed that the transmission of the Alpha variant (line B. 1.1.7) is usually significantly higher than that of previously existing SARS-CoV-2 variants in Denmark, Switzerland and the United States. This is due to a mutation inside the receptor-binding motif (RBM), which can change the recognition of antibodies and the specificity of ACE2 binding and lead to the virus becoming more infectious[12]. A Danish study showed that people infected with the B. 1.1.7 line are 64% (32-104%) more likely to be admitted to hospitals compared to people infected with another line.

The alpha variant became dominant for: South-East England at week 48, the last week of November 2020. England in the 51st week of 2020. Great Britain in the 52nd week of 2020. Scotland and Northern Ireland in the first week of 2021. Wales in the second week of 2021. Ireland in the second week of 2021. In Bulgaria, genome sequencing showed that this variant prevails with 52.1% at week 4, and 73.4% at week 9[13].

Delta-coronavirus (Indian strain). The Indian strain is distinguished by a set of mutations that affect a significant functional region of the S-protein, which allows the new variant of the coronavirus to partially evade the action of

antibodies in both people who have previously suffered Covid and those who have been vaccinated. And this feature makes the delta variant the most unfavorable of all the WHO-listed coronavirus strains that require special attention (it also includes British, Brazilian and South African variants)[14].

The risk of hospitalization in people with the delta variant of coronavirus is twice as high as in people with the alpha variant, but vaccines are effective against both varieties. Such data was published in the Lancet journal by the National Health Service of Scotland when it analyzed the statistics of the incidence of coronavirus from April to June: during this period, the delta strain of coronavirus was spreading in India, but vaccination was already carried out[15-18].

It should be noted that the coronavirus changes over time and acquires new mutations that cause concern among scientists and doctors.

In the UK, the dominant British strain (alpha variant) was replaced by the Indian strain (delta variant). Chris Robertson and colleagues from the National Health Service of Scotland studied how the incidence of coronavirus has changed. The scientists used patient information from the EAVE II platform, which contains medical data of 99 percent of the Scottish population. The analysis included the period from April 1 to June 6. According to researchers, by the end of May, about 70 percent of covid cases were caused by the delta variant[19,20].

The researchers calculated the risk of hospitalization for patients with alpha and delta variants, adjusting for age, gender, concomitant diseases and time trend. It turned out that the risk of getting to the hospital with the delta variant is almost twice as high as with the alpha variant (HR = 1.85).

Simultaneously with the spread of the new variant, the population was vaccinated in Scotland: on April 1, 44.7 percent of people received the first dose of the vaccine, and 7.6 percent received the second. The vaccine developed by Pfizer showed 92 percent effectiveness against the alpha variant and 79 percent against the delta variant. The vaccine created by AstraZeneca was less effective: 73 percent-against the alpha variant and 60 percent - against the delta variant[21].

The researchers concluded that the Indian strain of coronavirus increases the risk of hospitalization by about two times, compared with the British one. At the same time, the vaccines are effective against both types of coronavirus.

Recently, the US Centers for Disease Control and Prevention reported on the incidence of coronavirus infection after vaccination. A total of 10,262 cases of infection were registered (per 101 million vaccinated), and 160 people died[22].

The second unpleasant feature of the Indian strain is the speed of its transmission from person to person. The virus has become more "tenacious": it attaches to cells faster, and a smaller dose of it is enough to infect cells. Inside the body, the delta variant is transmitted faster from cell to cell, reaching high concentrations in body tissues.

At the same time, the incubation period was reduced. Epidemiologists from China report that several generations of the virus change in just 10 days, because it is able to be repeatedly transmitted from person to person during this period. Previously, the average incubation period for the transmission of one generation of the virus, that is, from one person to another, was 5-7 days[23].

As of June 16, 13,397 cases of coronavirus infection were registered in Russia, and 5,782 infected people were

registered in Moscow. The next day, the number of cases in the country increased by another 660 people, in Moscow-by 413. On Friday, 18.06.2021, a sharp jump was established: coronavirus infection was confirmed in 17,262 Russians, more than half of them-9,056-residents of the capital. There was no such high indicator in Moscow for the entire time of the pandemic. Previously, the peak of the spread of SARS-COV-2 in the capital in one day was considered to be December 24, 2020, when 8,203 cases were detected[24].

Now that Western countries are coming out of isolation, Russia risks falling into a new vicious wave of the virus. And officials are beginning to recognize that the pandemic in the country will not end in the near future if the number of vaccinations does not sharply increase[25]. Next, we offer the spread of new strains of SARS-CoV-2 in the world(Figure 2).

Figure 2. Countries and areas reporting variants Alpha, Beta, Gamma and Delta, as of 15 June 2021

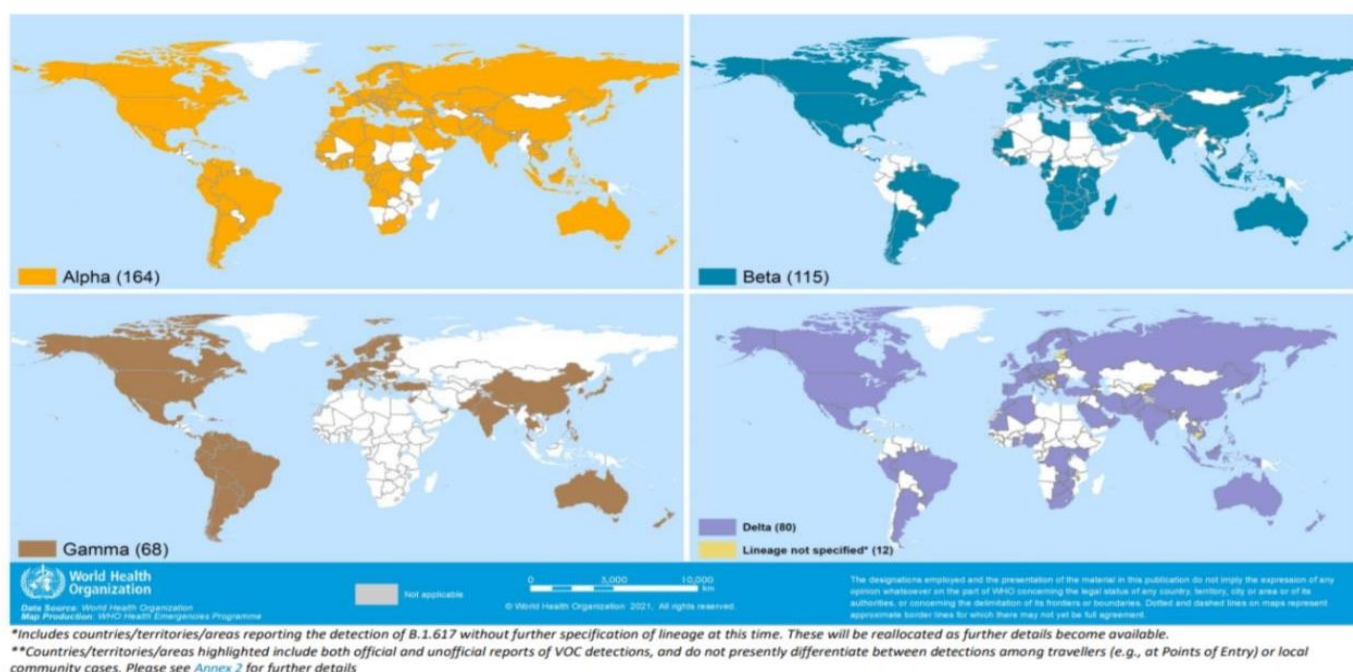


Table 2. SARS-COV-2 WeeklyEpidemiologicalUpdateEdition44,published15June2021

WHO label	Pango lineage	GISAID clade	Nextstrain clade	Earliest documented samples	Date of designation
Variants of Concern (VOCs):					
Alpha	B.1.1.7	GRY (formerly GR/501Y.V1)	20I (V1)	United Kingdom, Sep-2020	18-Dec-2020
Beta	B.1.351	GH/501Y.V2	20H (V2)	South Africa, May-2020	18-Dec-2020
Gamma	P.1	GR/501Y.V3	20J (V3)	Brazil, Nov-2020	11-Jan-2021
Delta	B.1.617.2	G/478K.V1	21A	India, Oct-2020	VOI: 4-Apr-2021 VOC: 11-May-2021
Variants of Interest (VOIs):					
Epsilon	B.1.427/ B.1.429	GH/452R.V1	21C	United States of America, Mar-2020	5-Mar-2021
Zeta	P.2	GR/484K.V2	20B/S.484K	Brazil, Apr-2020	17-Mar-2021
Eta	B.1.525	G/484K.V3	21D	Multiple countries, Dec-2020	17-Mar-2021
Theta	P.3	GR/1092K.V1	21E	Philippines, Jan-2021	24-Mar-2021
Iota	B.1.526	GH/253G.V1	21F	United States of America, Nov-2020	24-Mar-2021
Kappa	B.1.617.1	G/452R.V3	21B	India, Oct-2020	4-Apr-2021
Lambda	C.37	GR/452Q.V1	20D	Peru, Aug-2020	14-Jun-2021

Omicron: What We Know About the New Coronavirus Variant

On Friday 26 November 2021, the WHO announced (WHO 2021c) that a new SARS-CoV-2 Variant of Concern, named Omicron (initially named B.1.1.529), appeared to be increasing in almost all of South Africa's provinces, particularly Gauteng. The rapid spread, especially among the younger age group, in Gauteng, South Africa, has placed WHO and global health systems on high alert. The SARS-COV-2 VOC was first reported to the WHO from South Africa on 24 November, 2021. Cases of VOC Omicron had also been identified in Botswana, Belgium, Hong Kong and Israel. On 29 November, 2021, three days after the announcement by WHO, cases of VOC Omicron have been detected in Austria, Australia, Belgium, Canada, Czech Republic, Denmark, France, Germany, Italy, the Netherlands and the United Kingdom.

Intense research into the new coronavirus variant first identified in southern Africa has just begun. World leaders have urged people not to panic — and to get vaccinated, if they can. First identified in Botswana and South Africa, this new iteration of the coronavirus has prompted concern among scientists and public health officials because of an unusually high number of mutations that have the potential to make the virus more transmissible and less susceptible to existing vaccines. The World Health Organization has called Omicron a “variant of concern” and warned that the global risks posed by it were “very high,” despite what officials described as a multitude of uncertainties. Cases have been identified in dozens of countries on every continent except Antarctica. It's too early to say how widespread the variant will become in the United States. As of Dec. 4, cases have been identified in more than a dozen states, but experts say that number is likely to increase in the coming days and weeks. The first person to have tested positive for the variant returned to San Francisco from South Africa on Nov. 22 and tested positive on Nov. 29, according to the Centers for Disease Control and Prevention.

Much remains unknown about Omicron, including whether it is more transmissible and capable of causing

more serious illness. There is some evidence the variant can reinfect people more readily.

In South Africa, where Omicron is already the dominant form of the virus, scientists have reported a sudden, sharp rise last month in coronavirus cases among people who had already been infected, in a study that has not yet been reviewed and published by a scientific journal. The authors noted that there was no such upswing when the Beta and Delta variants emerged.

The finding hints that Omicron may be less vulnerable to the body's immune defenses. Researchers in South Africa also reported that the variant appears to be spreading more than twice as quickly as Delta, which had been considered the most contagious form of the virus.

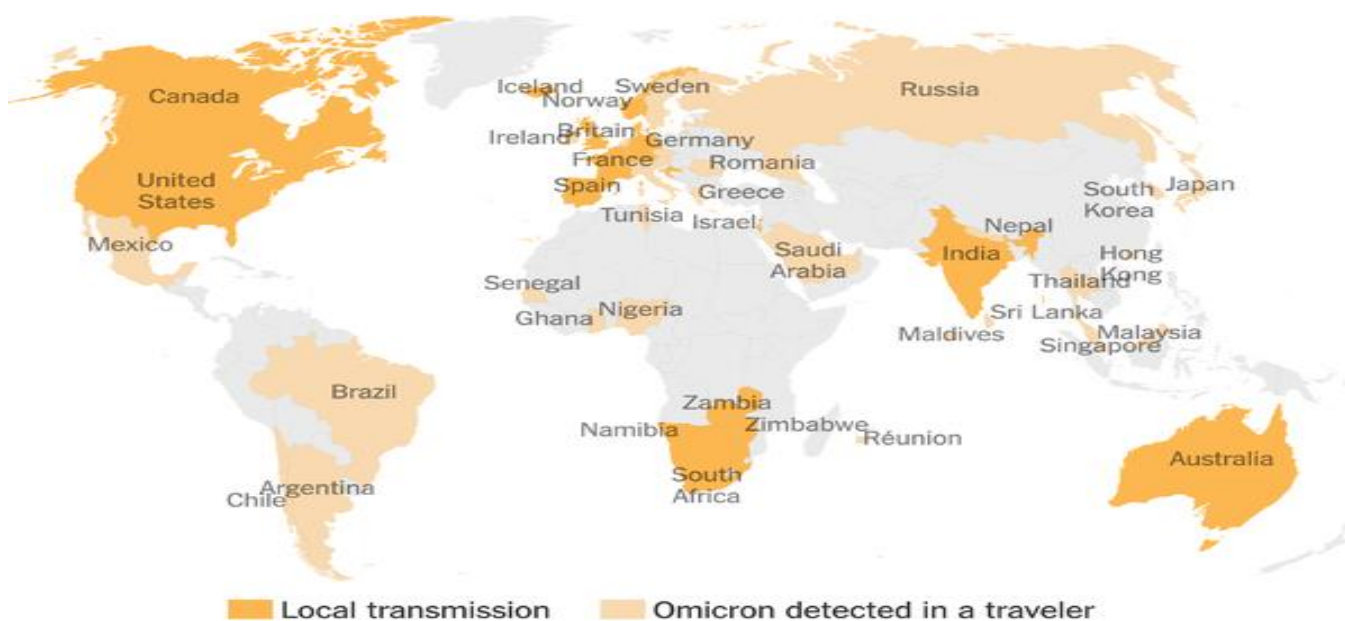


Figure 2. Tracking Omicron and Other Coronavirus Variants, as of 01 December 2021

Since its first appearance in November 2019, thousands of SARS-CoV-2 mutations have been identified from across the world (GISAID 2021), including Africa (Inzaule et al. 2021; Martin et al. 2021; Tao K et al. 2021; Wilkinson et al. 2021). These have had no major impact on protection induced by vaccines. Sequencing of VOC Omicron shows approximately 50 mutations in its genome, including more than 30 on the spike protein used to bind to host cells setting it apart from other known variants. This is a cause for concern since antibodies induced by vaccine or natural infection which neutralize the virus primarily target the spike protein. These may be potentially significant mutations which could alter responses to vaccines, treatments and transmissibility. Other mutations appear similar to changes seen in other variants associated with enhanced transmissibility. Whether VOC Omicron spreads faster, makes vaccines and drugs less effective, or whether it leads to more severe disease and deaths remains to be defined urgently.

Clinical manifestations

Imperial College London studied more than a million people in England, while the alpha variant was dominant, and

found a wide range of additional symptoms associated with SARS-CoV-2. "Chills, loss of appetite, headache and muscle pain" were the most common in infected people, as were the classic symptoms.

The new variant of the virus detected in India (delta variant) is 60% more contagious than the previous strains and in some cases leads to deafness, gangrene and amputation of limbs in patients. Children and animals get sick with this variant much more often and suffer the disease more severely than those who have picked up the British strain. Infected people experience severe pain in the joints and abdomen, nausea, vomiting and eventually lose their hearing, that is, they develop neurological complications. There are also many reports of blood clots in the blood vessels of the intestines and extremities[26].

Currently, it is unclear if infection with the Omicron variant is associated with more severe disease. Due to the small number of cases attributed to the Omicron variant, assessment of disease severity is difficult. Preliminary information from South Africa indicates that there are no unusual symptoms associated with Omicron variant infection, and as with other variants, some patients are asymptomatic[27].

Vaccination

An effective way to prevent SARS-COV-2 and the development of severe forms is vaccination. An example of successful vaccination is Israel. The state has vaccinated 60% of the population, including 80% of people over 60 years old. Since 15.06.2021, vaccination of children from 12 years old has been started. 15.06.2021-the country canceled the mask mode. In the Republic of Kazakhstan, 4.16 million as of 16.06.2021, full vaccination of 1.53 million (8.2%). Thus, the dynamics of the increase in new cases of the disease is associated with the active spread of new variants of coronavirus after they occupy a dominant position, different in different countries and depends on the speed of introduction of anti-covid measures and their sufficiency, the coverage of the population with vaccines and the level of collective immunity[28].

The African Vaccine Acquisition Task Team of the African Union and the WHO-led COVAX consortium with its global partners had hoped to secure millions of doses of COVID-19 vaccines to achieve 60% coverage in Africa by June, 2022 (WHO 2021e; 2021f; Nkengasong et al. 2020). This has been a major disappointment (WHO 2021g). Richer nations focused on being the first to develop and roll out COVID-19 vaccines to their own populations, rather than focus on what was best for all of humanity. The statistics for rollout of COVID-19 vaccines in Africa are appalling. Whilst in Europe an average of 60% of the population have received COVID vaccines, in Africa only 5-10% (24% in South Africa) of the population have received the first dose (WHO 2021g). Vaccine acceptance rates have also been low in some African countries. Tragically, concerns regarding access to COVID-19 vaccines in Africa are similar to those raised during the HIV pandemic in the mid-1990s and early 2000s, when highly active antiretroviral treatment (HAART) was accessible in high-income countries but was too expensive for rollout in African countries (Nachega et al. 2021a) - a disparity that resulted in many preventable deaths in these high-burden settings.

CONCLUSIONS

There is an increase in the Delta variant (Indian strain) of coronavirus in the world (in the UK, the delta variant is more than 90%, and at the end of May it was only 40%. In Moscow, 89.3 percent of all new cases of coronavirus are associated with the Delta variant). As a rule, after 1.5-2 months after registration in the Russian Federation, a new strain comes to the Republic of Kazakhstan. The distinctive features are the shortening of the incubation period, high contagiousness and the rate of transmission of infection (one patient with the delta variant infects 5-6 people). Along with the classic symptoms of the disease, infected people experience severe pain in the joints and abdomen, nausea, vomiting, neurological complications may develop, and there is also evidence of the development of blood clots in the blood vessels of the intestines and extremities. These have had no major impact on protection induced by vaccines. Sequencing of VOC Omicron shows approximately 50 mutations in its genome, including more than 30 on the spike protein used to bind to host cells setting it apart from other known variants.

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