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A REVIEW ONOMICRON (VOC) PREVENTION, GLOBAL RISK ASSESSMENT AND EFFECTIVENESS OF COVID-19 VACCINES AGAINST OMICRON

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Highlights

- The omicron is a new variant of concern has higher transmissible rate.
- Effectiveness of vaccine against omicron vs. delta variant.
- Action taking by government authorities against omicron.
- Symptoms and prevention

ABSTRACT:

According to recent study, researchers found a Novel form of corona virus in November. The variant name is given SAR-COV omicron (B.1.1.529).it is higher number of mutation 26-32 spike. First case of omicron found in South Africa on November 9th. There exists a restricted statistics at the Omicron variant. Overall the synchronized dynamics of Omicron is greater complicated than CoV-2 or its variants like Delta. The sudden end result is that while Omicron will be greater contagious than even Delta, it might be a whole lot much less dangerous. This short note gives the highlights to identification and global spread of OMICRON which has spread over more than 150 nations by now, the detection of mutations with inside the RBD area of Spike protein is a challenge by surpassing vaccine immunity. Before had will speak approximately its transmission potentiality, infectivity, sickness morbidity in addition to its effect on COVID-19 vaccines. This article gives the information about the spike protein sequence that found in sub-clade of omicron.

Introduction:

WHO find a new variant of SARS-CoV covid (B.1.1.529) on 26 November 2021.WHO technical

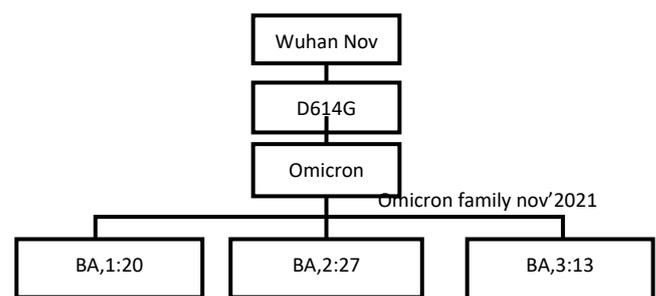
advisory group on SAR-CoV 2 virus evaluation (TAG-VE) given a name of this variant OMICRON. This variant have higher mutation rate as compared to other variant and its high number of transmission rate mainly 26-32 spike.^[1] it was first reported on south Africa and now its spread all around the world , in south Africa daily cases arises first case was reported of b.1.1.529 in 9 November according to WHO.^[2] And more than 1200people are affected from omicron in South Africa till date 25 November there are some country which are found the cases of positive omicron like Netherlands, France, Germany, Portugal, Italy and cases also reported in India (Chandigarh).^[3] Primary indication of omicron shows it may increase number of re-infection with this variant as compared to other variant. Transmission of omicron virus occurs through fomites environment around the infected person.^[4] Thus, this brief is aware offers with the present day popularity of OMICRON, its mutations withinside the spike gene with their implications, vaccine effectiveness, and COVID-19 preventive and travel-associated advisories.^[5]

manage became definitely multifactorial, a key contributor is thought to had been the immunity obtained in the course of previous waves (specifically the delta variant wave) and a vaccination application that has been started the middle age of 2021, which prioritized aged human beings. Omicron consequently entered a South African population that had drastically greater immunity than any preceding SARSCoV-2 variant had encountered, specifically amongst individuals who might had been at finest hazard for severe outcomes. Omicron has additionally been proven to be some distance higher than previous variants at infecting human beings who've a few degree of preexisting immunity due to vaccination or a preceding infection, despite the fact that boosters lessen infection risk, and vaccines' effectiveness towards hospitalization is basically preserved As compared with human beings infected with previous variants, a better share of people infected with omicron will consequently have pre-existing immunity, each due to the fact greater of the population.^[6]

A comparison How omicron variant is differ from delta	
Delta	Omicron
Symptoms-last about ten days	Symptoms seems last about 4-5 days
Fever- 103-105F	Fever- 99.5-100F (low to moderate)
Loss of smell and taste	No loss of smell and taste
Lung affected within couple of days infection	No lung activity is reported
Oxygen saturation level is fall	No oxygen saturation affected
Breathing is difficult , pain in chest	Pain in chest occurs in several days of infection
Vaccine prevention seems low	Vaccine prevent infection % very high

Other variant of corona virus -

- **Alpha (B.1.1.7):**it was the first variant of concern described in the United Kingdom (UK) in end of November 2020
- **Beta (B.1.351):** first time it was reported in South Africa in December 2020
- **Gamma(P.1):** firstly reported in Brazil in starting of January 2021
- **Delta (B.1.617.2):** first reported in India in early December 2020



Common mutation sharing between omicron sub variant

- BA.1 + BA.2 none shared mutation
- BA.1 + BA.3 they are shared five common mutations
- BA.2 + BA.3 they are shared seven common mutations

Figure 1, Lineage of Omicron family viruses, the date showing detection of particular variant.

The important factor omicron variant interpretation is affected high number of population level and suppresses the immunity of the affected population. As we know the previous three waves of covid are dominated by the D614G, beta and delta variants by the middle of the November 202, South Africa reported some cases of covid daily that was the earliest day of pandemic. Although this quick length of

Subtype of Omicron

WHO found three subtype of omicron in recent study?

- BA.1
- BA.2
- BA.3

The Omicron variant has been giving continuously surprised to by its unexpected appearance, its obtusive capacity to keep away from each vaccines and immune responses, and its fast spread internationally. There's some other wonder buried in the emergence of Omicron. The version isn't always a single strain, however as a substitute family. We have to take all 3 sub lineages seriously. BA.1 is the maximum prolific sub lineage, detected in most nations worldwide and presently accounting for 99% of cases in the United States. BA.2 is less prolific at this time, however has overtaken BA.1 in Denmark, Nepal, and the Philippines because the most frequently detected variant, and has a not much more presence in India, the United Kingdom, and several different international locations. The third, BA.3, is yet to take off globally, most effective accounting for several hundred cases on the maximum [7]. Each of those variants is as unique from each other as Alpha, Beta, Gamma, and Delta are from each other. What this indicates for the modern nation of the pandemic is uncertain. However, one factor is clear: SARS-CoV-2 has an huge ability not only to continue to produce new variants, however variants that wonder us both of their number and their biological properties.

Omicron (BA.1) is already recognized to have a few uncommon biological properties relative to the alternative variants. Most strikingly, it's far 2.7-3.7-fold extra transmissible than Delta. The starting place of the increased transmissibility is somewhat of a mystery, because the attention of virus in nasal sections isn't always exceptionally excessive, and is, in fact, lower than that of Delta. Moreover, the affinity of the BA.1 Spike for the ACE2 receptor is only two times as excessive as the Wuhan strain. We speculate that the increased transmissibility can be in the mutations determined in the nonstructural, structural, and accent proteins found at some point of the genome. [8]

The BA.2 subtype of the Omicron corona virus variant has been seems to a substantial increase advantage over the presently predominant BA.1 type, the United Kingdom's Health Security Agency has said (UKHSA).on Friday there has been an increased growth charge of BA.2 as compared with BA.1 in all areas of England in which there have been sufficient cases to examine them, and that "the obvious growth advantage is currently substantial

The agency said there has been no records at the severity of BA.2 as compared with BA.1, however reiterated that a preliminary evaluation did not discover a difference in vaccine effectiveness towards symptomatic disease between the two Omicron subtypes. [9]

Why omicron is a variant of concern

Viral infection can cause serious effect. [10]RNA viruses are recognized to mutate rapid and evolve to evolve and live on in converting environments. The maximum regarding characteristic of the OMICRON variation is the constellation of greater than 50 mutations; of them approximately 30 mutations are withinside the spike protein. The greater worrisome are the 15 mutated web sites inside the receptor-binding domain (RBD) that interacts with human cells earlier than mobileular entry consequently probable improving the transmissibility. [11]

Omicron is the variant belong to the category of pango lineage B.1.1.529,and its characterized by 30 amino acid changes in their structure s we compared to the old virus three small deletion and one small insertion original virus (A67V, Δ69-70, T95I, G142D, Δ143-145, Δ211, L212I, ins214EPE, G339D, S371L, S373P, S375F, K417N, N440K, G446S, S477N, T478K, E484A, Q493K, G496S, Q498R, N501Y,

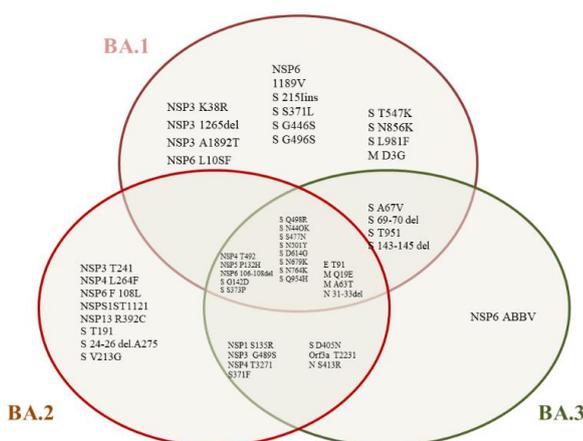


Figure 2. Showing the similarities and differences in all three subtype

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Y505H, T547K, D614G, H655Y, N679K, P681H, N764K, D796Y, N856K, Q954H, N969K, L981F). and there are 15 binding protein which carries a number of change deletion and insertion in their genomic structure (NSP3 – K38R, V1069I, Δ1265, L1266I, A1892T; NSP4 – T492I; NSP5 – P132H; NSP6 – Δ105-107, A189V; NSP12 – P323L; NSP14 – I42V; E – T9I; M – D3G, Q19E, A63T; N – P13L, Δ31- 33, R203K, G204R). omicron is the most mutant virus form of covid and according to several study vaccine are not affected several change in protein spike show how much Other dangerous to population because of higher transmissible rate. [12] If we compare this to delta variant of covid it has 32 spike mutations while delta has 20 spikes.

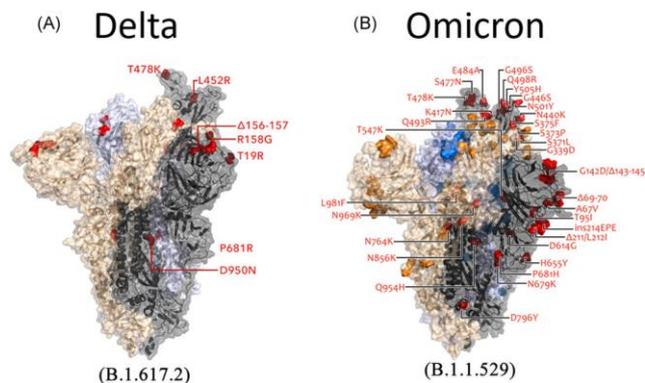


Image 1, A comparison of (A) Delta and (B) Omicron variant spike mutation (Image source: Modified from COVID-19 Genomics UK Consortium).

Analysis of spike protein sequences found out subclades ofOMICRON, that is, sub-clade 1 having a low collection frequency with mutations at 417K, 440N, and 446G site and sub-clade 2 with mutations at 417N, 440K, and 446S sites and observed globally at high frequency. [13] 10 Many of the mutations inOMICRON are not unusual place with the Delta version of SARS-CoV-2 however; a big wide variety of additional mutations can also additionally growth the infectivity of this novel version which desires to be studied. [14] The appearance the VOC Omicron variant and its fast unfold reflects the legacy of wealthy nations' collapse to equitably distribute COVID-19 vaccines globally. This failure additionally contributes to prolonging the virulent disease, and has located the entire global at continued hazard of COVID-19 and continuing effect on their economies. Whether VOC Omicron, will turn out to be 'a storm in a teacup' or 'a

deadly evolving hazard to international health security', its look almost years after its first detection, is a severe reminder that the COVID-19 pandemic is a long way from over. Richer nations want to take pay attention to the WHO slogan that 'none of us is safe until all of us are safe' which has been highlighted ad nauseam. [15]

Symptoms and prevention of omicron variant

Here are some few important symptoms of omicron variant are as follow

- A medical practitioner in Gauteng south Africa said patient who suffer omicron shaving flu like symptoms and in other mild cases he observed dry cough, fever ,sweating in night, and body or muscle ache
- According to Dr Angelique Coetzee, he is the chair of the South Africa Medical Association, who first raised the alarm over Omicron. Omicron patient show tiredness and there is no age limit to any age group it may affect all age group patient. But there is no patient find out who suffering from oxygen demand like pervious one variant and patient may also suffered from low muscle ache flu and body ache. According to his only some patient reported high temperature not all.
- According to Dr Unben Pillay some patient of omicron strain recovered without any prescription or hospitalization. [16]

OMICRON is a novel form of covid virus there is nor exact prevention is known. [17] The signs and symptoms of omicron normally begin with body ache, generalized weakness, fatigue, headache and fever withinside the preliminary days and finally they could additionally develop a cough that is sometimes dry in conjunction with a chilly in which there may be water from the nose, sneezing, etc. The cough is commonly dry which resolves over the following few days. Most of the time i.e. in 80% of the patients, fever is resolving over the primary three days and if now no longer, then that will become a signal of mild to severe infection which wishes close monitoring," said Dr Sonam Solanki.

She adds, isolating on the proper time and stopping the spread of virus from yourself on your other own circle of relative's individuals is key. [18] That is why the use of the rapid antigen is key and if the rapid antigen is negative and you're still symptomatically doing the RTPCR will assure which you do not pass over any covid omicron instances and also you ensure that you

don't end up spreading it to extra people. Even when you have to move out, be well masked. When you've got signs and symptoms and also you need to step out for something because you need to be in an N95 masks, the health practitioner suggested Dizziness, Drowsiness, Myalgia, muscle pain, Headache, A sore throat, Nausea ^[19] We realize that the omicron contamination is plenty extra infectious than the alternative mutant that is why we need to be very cautious. It may be very infectious this is why we want to be well masked up in public areas and in high-threat areas like hospitals, medical centers are very important. When you've got signs and symptoms and also you want to step out for something because you need to be in an N95 masks. A easy cloth or surgical masks won't suffice in case you are symptomatic and coughing," Dr Sonam stated. ^[20]

Opinion of Omicron variant of concern and vaccine efficacy

As in keeping with World Health Organization (WHO) to this point no research indicated the greater severity of the OMICRON variant over different VOCs. Concerns over the excessive transmissibility, virulence, extended chance of reinfection, and decrease in the effectiveness of to be had diagnostics, vaccines, and therapeutics are nevertheless unresolved. ^[21] SARS-Cov-2 is a +sense single stranded RNA virus. Viron is about 50-200 nm diameter which consists of mainly four structural protein: spike (S), envelope (E), membrane (M) and nucleocapsid (N). ^[22] A synthetic intelligence (AI) model (TopNetmAb) primarily based totally simulated observe through analyzed the effect of 15 RBD mutations at the OMICRON infectivity and efficacy of existing vaccines. Analysis found out that mutations at N440K, T478K, and N501Y sites may also impart ten instances and times extra infectivity to OMICRON than the unique SARS-CoV-2 and Delta variation, respectively. Analysis of 35,670 reinfections amongst 2.8 million positive cases from South Africa validated massive population-stage proof for evasion of immunity from previous infection. This cautioned that the OMICRON variant is concerned in infections with recovered individuals. ^[23] Substantiating this, OMICRON (pseudotyped) assemble while tested in opposition to a panel of human sera acquired from the convalescent COVID-19 patients, confirmed ED50 of 66, representing an 8.4-fold reduction in neutralization. ^[24] Whether

OMICRON can prevent vaccine-triggered immunity or not, is below speculation. However, the surprising upward push in OMICRON positivity and growing quotes of hospitalization in South Africa are a count number of situation and want similarly evaluation. ¹⁸ In the dearth of OMICRON variation-unique vaccine, the already approved (FDA/EUA) vaccines stay the countermeasures to reduce disorder severity and mortality towards the presently circulating SARS-CoV-2 versions together with OMICRON. ^[25] WHO actively coordinating with global researchers to assess the transmissibility, severity of OMICRON infection, the overall performance of vaccines, and to be had diagnostic tests.

A vaccination is a biological preparation that provides active acquired immunity to a particular disease. ^[26] The high issue over the present day vaccines is their lowering effectiveness towards COVID-19 over a period. Vaccination is the most important discoveries in medical science which prevent several viral infections. ^[27] The efficacy dropped nearly to 1/2 of for the Pfizer vaccine ^[28], that is, from 86% to 43% from February to October, Moderna vaccine from 89% to 58%, and J&J vaccine from 86% to 13%. Prominent E484A mutation with others as K417N and Y505H in RBD of OMICRON decreased the efficacy of Eli Lilly mAb cocktail, and Celltrion Ab Regdanvimab withinside the AI anticipated model. Preliminary statistics shows an expanded danger of reinfection and restrained antibody-mediated neutralization with this variant. In vitro research through Wilhelm et al ^[29], confirmed 11.4- and 20-fold discount in neutralization potential towards OMICRON the usage of sera acquired from double BNT162b2 and double mRNA1273- vaccinated individuals. No neutralization efficacy became discovered the usage of sera from ChAdOx1 vaccinated individuals. ^[30]

While in present study shows multiple mutations in spike of omicron signify high likelihood of immune escape from protection of antibody. Memory T cells directed at non-surface proteins following infection or vaccination are more difficult to determine. Memory T cell responses may offer a route to durable immunity where virus evolution leads to spike protein mutations that escape pre-existing neutralizing antibodies. ^[17] This could occur also by present more capable support to activated immature B cells responding to the altered spike protein (CD4 T cells), or through direct lyses of SARS-CoV-2 infected cells (CD8 T cells) Currently

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study of omicron show it is more transmissible form of SARS-COV2 it's have higher spike protein number of transmissible . In current situation of disease there are number of vaccine available in market there are no significant it will cure completely but some level of these vaccine protect against hospitalization and death. Live virus is spread highly in globe so urgently required to understand its escape potential against vaccination and non vaccination. Countries are mainly targeted by covid 19 vaccination for some level of protection. Country also considers a booster dose for all adult 18 years after completion of primary series. In the absence of sturdy proof and research on vaccine efficacy with the OMICRON variant, it will likely be too early to remark or arrive at the end at the vaccine efficacy. [31]

We up to date estimates of vaccine efficacy in opposition to infection and excessive sickness from the Delta variant the use of 10 recent research covering six countries. The resulting pooled effect length is proven in Table below.

Effectiveness at preventing												
Vaccine	Ancestral		Alpha		Beta		Gamma		Delta		Omicron	
	Severe disease	Infections										
AstraZeneca	94%	63%	94%	63%	94%	69%	94%	69%	94%	69%	71%	36%
Cansino	66%	62%	66%	62%	64%	61%	64%	61%	64%	61%	48%	32%
Coronavac	50%	47%	50%	47%	49%	46%	49%	46%	49%	46%	37%	24%
Covaxin	78%	73%	78%	73%	76%	72%	76%	72%	76%	72%	57%	38%
Johnson & Johnson	86%	72%	86%	72%	76%	64%	76%	64%	76%	64%	57%	33%
Moderna	97%	92%	97%	92%	97%	91%	97%	91%	97%	91%	73%	48%

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Novavax	89%	83%	89%	83%	86%	82%	86%	82%	86%	82%	65%	43%
Pfizer/BioNTech	95%	86%	95%	86%	95%	84%	95%	84%	95%	84%	72%	44%
Sinopharm	73%	68%	73%	68%	71%	67%	71%	67%	71%	67%	53%	35%
Sputnik-v	92%	86%	92%	86%	89%	85%	89%	85%	89%	85%	67%	44%
Othervaccine	75%	70%	75%	70%	73%	69%	73%	69%	73%	69%	55%	36%

To Neutralizing the antibody studies have been confirmed a 20- to 40-fold reduction in neutralizing antibody degrees with the two-dose Pfizer-BioNTech vaccine for the Omicron variant in comparison to ancestral variants. The Russian vaccine is based on recombinant adenovirus vectors (rAd26-S and rAd5-S). [32]A test-negative case-control has been studying in South Africa showed a reduction in two-dose Pfizer-BioNTech vaccine efficacy towards all symptomatic disease from 80% for the Delta variant to 33% for the Omicron variant.1 Protection towards extreme sickness turned into reduced from 93% for the Delta variant to 70% for the Omicron variant.1 The reduction in efficacy has turned into similar in a test-negative case-control study in England that confirmed a reduction from 79% for the Delta variant for two-dose Pfizer-BioNTech vaccine 10-14 weeks after the second one dose to 50% for the Omicron variant for all symptomatic disorder.2,3 To estimate the baseline efficacy of every of the vaccines against the Omicron variant, we carried out the common relative reduction in the vaccine efficacy towards all symptomatic disease from the South Africa and England research to the efficacy towards Delta variant infection. For extreme sickness (hospitalization and death), SARS-CoV-2 is a group of virus that cause disease in mammals like human it cause respiratory tract infection range mild to lethal. [33] we use the relative discount in vaccine efficacy for extreme sickness from the South Africa have a look at.

A single study indicates that a 3rd dose of the Pfizer-BioNTech vaccine returns neutralizing antibody levels to levels much like the ones produced in reaction to ancestral variants like alpha and beta. The England case-control study indicates that safety levels are advanced with a booster dose however now no longer to the level observed against the Delta variant.^[34] We assumed that a 3rd dose 2nd dose for the Johnson & Johnson vaccine) might bring about vaccine efficacy towards the Omicron variation this is the common of the baseline efficacy towards the Delta variant and the baseline efficacy towards the Omicron variation.

Global risk assessment

In all around the world number of scientist or researcher are carrying about the studies of characteristic of omicron .according to the expert if any major surge of covid 19 (omicron) takes place it may consequence .increasing number of cases,regard change of severity may increase health demand .increase death rate and it also effect the population in several way like economically .But there is a good news till date no death is reported due to omicron

The risk related of omicron variant concern in very high number of reason first is global risk of covid -19 will be high it may affect the globe economy and may affect the morbidity or mortality .second is in compare of other or old variant of covid -19 omicron mutation rate is very high and also higher transmissibility.^[35]

Other reviews during the couple of year from the numerous nations which imply that people with weakened immune systems may be infected with SARS-CoV-2 for numerous weeks or months. (By contact with infected person, individuals who are in any other case healthy take on average, it may take around weeks to clear an infection.) Such extended infections have specially been documented in people receiving cancer chemotherapy and different immunosuppressive agents. But they have got additionally adverse effect which may cause serious health issue also visible in people with superior out of control HIV.

Some researchers have proposed that prolonged infection may want to give an explanation for the emergence of SARS-CoV-2 ‘variants of concern’ (VOCs). Such variants like omicron are highly transmissible when we compared to it firstly identified SARS-CoV-2, or are capable of in part evade the immune responses that rise up from

infection or vaccination. We described a case from South Africa in June wherein SARS-CoV-2 endured in someone with advanced out of control HIV for more than six months. Repeated genomic sequencing revealed significant step changes in the evolution of SARS-CoV-2, and a number of the variants emerging had comparable mutations to the ones discovered in three of the VOCs.^[14]

The usual threat posed through Omicron in large part depends on 4 key questions: (i) how transmissible the variant is; (ii) how properly vaccines and earlier infection defend against infection, transmission, clinical disorder and loss of life; (iii) how virulent the variant is as compared to different variants; and (iv) how populations recognize those dynamics, understand risk and observe manipulate measures, inclusive of public health and social measures (PHSM). Based at the presently to be had evidence, the general risk associated with Omicron remains very excessive. Omicron has a significant increase advantage over Delta, main too fast spread withinside the community with higher ranges of incidence than formerly visible on this pandemic. Despite a lower risk of extreme disease and death following infection than preceding SARS-CoV-2 variants, the very excessive levels of transmission nonetheless have led to significant increases in hospitalization, retain to pose overwhelming needs on health care structures in maximum countries, and might cause significant morbidity, mainly in vulnerable populations.^[20]

Indian Response to Omicron Variant

Amid a increase in Omicron cases in India, Union Health Ministry has alerted states and Union Territories about omicron and approximately the new COVID-19 variant, Omicron, and the health minister also add on according to scientific evidence and many recent research studies omicron is three time more transmissible has compare to pervious delta variant Union health secretary Rajesh Bhushan, in his letter, asserted that Omicron is three times as infectious as we compete the Delta variant of corona virus and war rooms need to be activated to comprise it^[36]

Recently, India has finished 1 billion vaccine doses and attained the capability to check around 1 million samples in line with day. Existing Virus Research Diagnostic Laboratory for viral diagnosis and INSACOG labs for genome sequencing are already in area for figuring out and tracking the currentOMICRON or any novel variant to detect the

infectious disease. Early and lively surveillance alongside with whole-genome sequencing will assist in knowledge the circulating variants and map their evolving approach. Following the COVID-19 suitable conduct like social distancing, hand hygiene, mask-wearing, and vaccinations continue to be to be the maximum critical attributes towards controlling viral transmission^[37].

The SARS-CoV-2 has been spring surprises again and again, baffling each scientists and country wide governments. Scientists are not able to be expecting the future behavior of the virus because it mutates and produces variants without warning. Governments are again and again driven between the horns of a dilemma – social restrictions, along with excessive lockdowns, to reduce viral spread in order to ‘flatten the epidemic curve’ cause lack of livelihoods and significantly harm the economy. After a curve due to one variant is flattened, a ‘new version of concern’ units the clock back, inflicting some other wave. Many advanced nations wherein social restrictions have been more effectively practiced have confronted 4 or 5 successive waves. India has so far experienced large waves, first with the unique virus variant and the second one with the Delta variant that emerged in India because the first wave became receding. Our wave pattern is precise withinside the world. Kerala stands out as an exception, which flattened the curves and had four waves just like developed countries.^[38]

Conclusion

The current evidence shows omicron variants have more ability of transmissible as compared to delta variant of virus. There are higher numbers of spike protein 32 in delta variant 20 spike protein. In particular country south Africa have higher number of patient in globe but in last few month it s spread in all over the world .there is significant that previous vaccine are less effective against Omicron variant and its protect the patient somewhere in hospitalization and death and helpful in speed recovery. Two doses of COVID-19 vaccines are not likely to defend in opposition to Omicron infection. While VE in opposition to Omicron infection is appreciably decrease than in opposition to Delta contamination, a 3rd dose of mRNA vaccine gives a few stage of safety against Omicron contamination in the instant term. However, the time of this safety and effectiveness against excessive sickness are uncertain. Additional

tools beyond the presently to be had vaccines, along with public health measures, antivirals, and up to date vaccines, are in all likelihood needed to defend against Omicron infection.until the article is written the present situation is under control and no major damage like delta variant of SARS-CoV.the cases of OMICRON are decrease significantly and the thing are getting normal.

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Conflict of interest

All authors have no conflict of interest

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(Retraction published Am J Trop Med Hyg. 2022 Sep 02;:1. The above articles, published in The American Journal of Tropical Medicine and Hygiene, have been retracted by the Journal. The decision is the result of an investigation based on concerns raised by a third party. Specific concerns are as follows. First, a)
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