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Arfa Tehzeeb^aMaham Asif^bRaisa Iqbal^cWarda Arooj Kausar^dMubashar Rehman^e

A Review on the Continually Occurring Mutations in COVID-19

Abstract

The emerging pandemic situation has created unease and dismay at every level, from governing bodies to population and from pharmaceutical manufacturers to front-line servers. Everyone is scarified by the death-dealing and ruinous effects of COVID-19. The encouraging and positive news about vaccine development and successful trials of vaccine proved to be remedial, but another dilemma arises in the form of mutation of the deadly virus. Question marks are arising about the lethality of mutated strain, lack of management and protective measures by the governing bodies, and ambiguities are aroused about the effectiveness of vaccines against them. After an all-inclusive and particularized study and genomic examination of the virus, the researchers have put forward the details that “Coronavirus Mutation is Worrying but Not Terrifying”. The upshot is that it is required to screen, but at present, their mark suggests that the new strain in the UK is more transmissible but neither severe nor resistant.

Key Words: COVID-19, Mutated Strain, Vaccine Development

Introduction

Viral diseases are one of the serious health diseases as they sweep rapidly. COVID-19 disease is a severe respiratory disease that affects the lungs completely. According to scientist’s coronavirus belongs to viruses like SARS and MERS. As it is a newly emerging disease, it spreads rapidly and affects the human population at a larger rate. Different people face different symptoms of the COVID-19 virus. In some countries, a different strain of virus is emerging. This mutated viral strain is considered to be more dangerous.

Researchers are startled by the genetics of this newly discovered virus. According to scientists, the mutated virus causes more complications and is more severe. Data is collected, and experiments are conducted; it is noticed that mutations are occurring in the COVID-19 virus. In this review, we summarize

the origin, lethality, prevention of the genetic mutations and strain changes that are continuously appearing in the COVID like any other virus.

What is a Mutation?

The term mutation inclines to conjure up images of dangerous new viruses with enhanced abilities sweeping across the planet. The mutation refers to the change in the genomic sequence of the virus. Mutation in SARS-COVID-19 means the change in the sequence of molecular arrangements of RNA virus. Mutations arise naturally as the viruses replicate; mutations are expected and are part of evolution. This RNA virus has undergone several mutations, but very small figures have provided evidence of appreciable change to virus behavior. Mutations that make the virus more infectious doesn’t necessarily make it

^a Department of Pharmacy, Faculty of Biological Sciences, Quaid I Azam University, Islamabad, Pakistan.

^b Department of Pharmacy, Faculty of Biological Sciences, Quaid I Azam University, Islamabad, Pakistan.

^c Department of Pharmacy, Faculty of Biological Sciences, Quaid I Azam University, Islamabad, Pakistan.

^d Department of Pharmacy, Faculty of Biological Sciences, Quaid I Azam University, Islamabad, Pakistan.

^e Assistant Professor, Department of Pharmacy, Faculty of Biological Sciences, Quaid I Azam University, Islamabad, Pakistan. Email: ph.mubashar@hotmail.com

more dangerous. Scientists have concluded that mutations in COVID, RNA virus, reflect the adaptive nature of the virus, probably making it more transmissible but may not contribute to the severity of rejection and resistance to vaccines.

Origin of Mutation in Coronavirus

The SARS-COV 2 is linked with bats mostly, but still, its origin and the intermediate host is not identified. Recently its vaccine was made, but at the same now the world is facing its variant form. The virus is changing from time to time as the first virus detected in China is not the same as the virus in most corners of the world. But the major mutated virus was observed in Europe.

Actually, right now, scientists do not have any idea about the origin of mutations, but at the same time, a number of hypotheses are being made, such as treatment of chronically ill patients by using experimental therapies, as we saw a number of recovered COVID-19 patients donated the plasma to COVID patients such therapies may lead to mutation in COVID-19. ([Mandavilli, 2020](#))

Many scientists also agree that immune-compromised patient provided the best opportunity for the virus to evolve, these mutations are not much dangerous, but at the same time, they have increased replicating ability and infectivity of the virus. Everybody was living in a panic situation, and they tried to use different methods to overcome this virus, but unfortunately, it seems that that experimental time was actually an opportunity for the virus to evolve. A small number of SARS-COV 2 variants are identified in the UK and some other countries, and in some cases, their association with mink farming is also seen, especially in Denmark. This variant has some new kind of mutation which were not observed previously, and it is referred to as 'cluster 5'. ([Staff, 2020](#))

It was observed that minks have the capability to keep the virus when they got the virus from infected humans and transfer it between them and also back to humans. This transferring can lead to genetic modifications in the virus. ([Staff, 2020](#))

After the arrival of new variants in the United Kingdom, it is being said that precautionary measure should be taken by everyone more strictly than ever because variants are more contiguous than the previous one. Since now, there is no evidence of its being more deadly. Researchers have found about 23 tiny mutations in the coronavirus samples, which were found in the UK, which help the virus to spread

more easily than others, and this variant is called B.1.1.7. But at the same time, a spike of variants are more susceptible to the vaccine. ([WEI-HAAS, 2020](#))

Numerous mutations have been identified in corona, RNA virus, a vast majority of these is neutral, meaning they are neither advantageous nor disadvantageous. Disadvantageous mutations are glad tidings for the public; they can disrupt the virus's functions, such as the ability to bind and enter human cells and decrease its ability to spread efficiently between humans but unfortunately, disadvantageous mutations usually selected get out, as they transmit in a less effective way. Advantageous mutations may help the virus to escape the immune response or to bind more efficiently and strongly. Advantageous mutations are selected over time naturally, making the strain dominant in a population. Neutral mutations can also spread rapidly, and mutations accumulate as the virus makes more copies of itself.

Coronavirus has mutated several times; most of these mutations reflect a common evolutionary process by the virus. The virus that causes infection initially is not the same strain as what first emerged in china. Genomic studies showed that it changed itself slightly, and people infected with this strain showed high viral loads in the nose and throat, yet they don't seem to get sicker. This mutation was termed D614G by the virologists.

It is the possibility that D614G is an adaptation that helps the virus to infect the cell or to compete with the viruses which don't carry change while altering little about its spreadability among the population.

Transmissibility

The spreading of diseases depends on the transmission rate of the agent as COVID-19 transmits rapidly among humans. This virus is to be spread through the respiratory route, mainly sneezing. A healthy person will get COVID positive when he is in close contact with an infected patient. This virus has been found with no evidence about transmission through direct skin been found yet. Recent studies show that an infected person can transmit the virus within two days.

Changes in genetic material cause mutations and transmit differently. COVID-2 is transmitted more rapidly and more severe as compared to its previous strain. In England, this strain was spreading and causing more complications during the month of November. The risk ratio of this virus is higher than

the COVID-1 strain. Some strains are less infectious, and some are more damaging.

Coronavirus appears to be spreading rapidly from person to person, even during the lockdown.

Last few days ago in the UK, a new variant virus of COVID-19 was spreading rapidly, and it is considered that it is more harmful and cause more severe symptoms. Some cases also appear in Belgium and Italy. Mutant strain is hard to the DNA sequence.

The mechanism of transmission of this strain is more rapidly and more deadly is to be identified yet. There is still not enough data to identify the severity of this variant COVID strain.

The variants are actually 50% more

transmissible than the original strain, and along with structural modification, which makes the virus bind more easily to human cells, another reason behind this increased contagious behavior is that it causes viral load inside the nose and respiratory tract of person which help it to spread easily during talking or coughing. Due to this enhanced contagious ability number of cases are increasing in the UK.

Detection of UK Variant

140,000 genomes of this virus have been extracted from the people who have been laid-up with COVID-19, detected up by the Covid-19 Genomics UK (COG-UK).

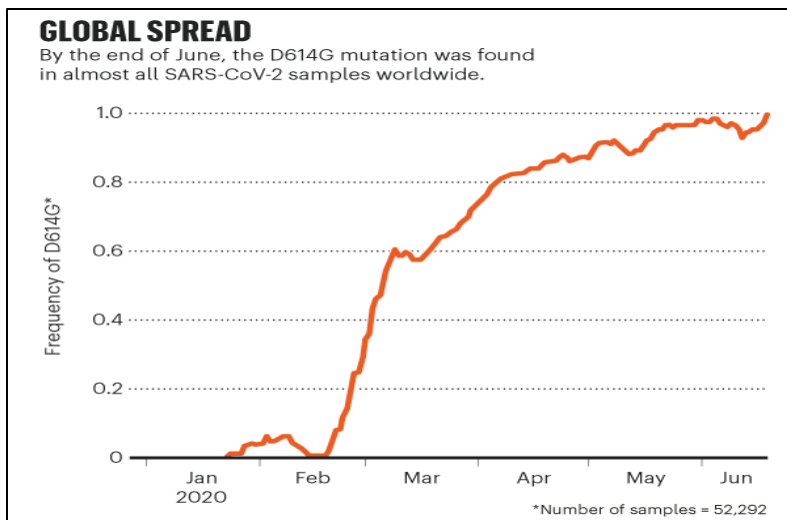


Figure: Global Spread

New Strain and Immunity

With the passage of time, the mutation is taking place in the standard COVID-19. And a question arises that whether these mutations are able to affect our body's defense system or not. A mutation like SARS-COV-2 shows replication and transmission at a much higher rate.

Most available data regarding D164G suggest that it does not stop neutralizing antibodies of the immune system from recognizing the new strain, i.e., SARS-CoV-2. The reason behind that is maybe the mutation does not happen in the spike protein's RBD. RBD binds with ACE2, a cell receptor protein that allows the virus to enter inside the cells. RBD is the main region that is targeted by many neutralizing antibodies.

But there are also evidences that other mutation might be able to avoid some antibodies. An experiment was conducted by Htioannou and Bieniasz, in which a livestock pathogen genetically modified the vesicular stomatitis virus use this variant to infect cells, and the virus continues to grow, even antibodies were present.

Their main objective was to identify the changes or any kind of mutation in the strain, which make spike protein able to avoid specific antibody recognition. These resistant spike protein mutants were taken from the blood of recovered people, as well as monoclonal antibodies used in therapies.

These mutations were found in the virus sequence but at very low frequency. This suggests

that mutation is not becoming more common because of positive selection.

Scientists are constantly predicting which mutation of SARS-CoV-2 are most likely to be important. Recently, another experiment is conducted by Jesse Bloom and his team in Seattle, Washington. 4000 mutated versions were created, and their effect on the spike protein expression was measured and its ability to bind to ACE2. It was discovered that most of these mutant variants had no effect on these properties. Well, few of these mutations were observed in COVID-19 patients, but there was no sign of natural selection for any of the variants.

The action of these mutations on antibodies was not observed, but the results suggest that one day the virus will acquire mutations that might change its activity towards antibodies and immunity.

New Strain and Vaccination

A new strain of COVID-19 is a concerned focus of WHO. An infected person with a new strain has chances of transmitting infection in 1.5 people, while the standard strain has a reproduction number of rounds of about 1.1 people.

N501Y is a mutant variant that is of concern these days. In recent research in India, 4000 genomes of coronavirus have been sequenced. But no specific variant is found in India. Only mutant strain is found in UK, Brazil and South Africa. According to recent studies, the vaccines prepared against coronavirus will be equally effective against the mutant strain of COVID-19. Though the transmission rate of N501Y is higher, it is not more lethal than the standard virus.

Pfizer-BioNTech and Moderna produced vaccines that have an efficacy rate of more than 90%. The UK is the first country who authorize the use of vaccine developed by American pharmaceutical giant Pfizer and its German partner BioNTech. The use of the vaccine is proving to be extraordinary. The vaccine is quite effective in producing antibodies that can attack and kill COVID-19.

It does not seem that B.1.1.7 can resist the authorized vaccines; still, the fact that are accumulating mutations in the spike protein could mean that vaccines may, in the remote future, become somewhat less efficacious. That problem would force the developers of vaccines to produce a product that would be able to target new targets.

From the recent studies, it is quite possible that the vaccine might provide immunity to different regions of the spike protein, not only the regions where mutation takes place. So, it means there is hope that the vaccine will work against the new mutant variant. ([Smith, 2020](#))

The latest research shows that the COVID vaccines might lose their efficacy and potency against the new viral strains, which are more deadly, While the Moderna Vaccine eliminates the viral loads to a larger extent, according to the 26th Jan report. An antibody that effectively clamps the SARS-COV-2 has also been engineered, according to the report generated on 29th January. The “Sputnik V” Vaccine produced in Russia has shown 91% effectiveness against COVID strains which is pretty much high as compared to the previous ones. But according to a report submitted on 11th March 2021, another more viral variant is coming forward, exhibiting more deadly forms. Still, there is hope as more dangerous forms of viruses bring out more efficient forms of vaccines. (Anon., 2021)

Conclusion

This review article summarized briefly the current research on the newly emerged variant strain of the novel coronavirus; it is concluded that it a normal process in a virus's biological life to mutate. Keeping in view all the environmental and genetic factors, the research do till now only suggests that this new strain is not as dangerous as it seems, although it is more easily transmitted, especially in younger people. There is no greater risk in the vaccines linked to it, and the increase in the number of affected cases is because of its improved genetic transmissibility. Still, to prevent it from affecting more people, a strict lockdown is necessary on the government level worldwide while the scientists are already working continuously on the vaccines.

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