

Covid-19 Pandemic and its Variants (Delta and Omicron). Classification, Symptoms, Diagnosis and its Possible Health Impacts Especially on children

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Abstract

Covid-19 is continuously sprouting its tentacles in the form of new variants. With genetic instability in virus genomics and structure, Variants of Concern have emerged thick and fast from the original virus. Omicron is the latest of the variants which has emerged out to be the new concern to the health, economics and world order. With 34 mutations in spike protein and 15 in its receptor binding domain alone, Omicron is really a variant of concern. High number of non-synonymous mutations in spike protein has been revealed in omicron variant that are involved in transmissibility, disease severity and immune escape. A total of more than 60 mutations have been reported in omicron variant making it variant with the most mutations sites of all SARS-Cov-2 variants characterized so far. COVID-19's ability to induce long-term consequences was unknown at the start of the epidemic. However, it has been discovered that this is not the case, and people with "long haul COVID-19" might experience a variety of ocular problems.

Keywords: Covid-19; Mutations; Omicron; Ocular Problems

Introduction

Corona virus has emerged as new threat to the world order with its unprecedented emergence and pandemics. Owing to the flexible nature of virus genetic material, variants of corona viruses have emerged in thick and fast with varied transmissibility and virulence. Over the course of more than 270 million confirmed COVID infections worldwide, the virus has undergone remarkable diversification, producing >1,500 uniquely identified Pango lineages [1]. In order to prioritize monitoring and research of variants, WHO has classified these variants into three categories: variants of concern (VOCs), variants of interest (VOIs), and variants under monitoring (VUMs). The previous four VOCs include Alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1), and Delta (B.1.617.2). All these variants were of great concern and resulted in a new wave of pandemic and thousands of deaths in more than one country

and area, and even across the whole world. On November 26, 2021, a new variant namely Omicron (B.1.1.529) was designated as the fifth VOC by WHO, which immediately raised global concerns. The term "variant of concern" (VOC) for SARS-CoV-2 refers to the variants which have mutations in their receptor binding domain of Spike protein which in turn dramatically improve binding affinity in the RBD-hACE2 complex and thus causing fast dissemination in human populations [2]. Majority of the mutations in sequences are projected to be detrimental and swiftly removed or as neutral while some are predicted to influence functional characteristics and therefore possibly modifying infection rate, interaction with host immune system or disease severity [3]. On the other hand, development of SARS-CoV-2 has been marked by introduction of variants of concern, modifications in viral properties like disease transmission and antigenicity because of the change in human immunological composition [4].

Delta and omicron variant

The delta variant (B.1.617.2) was discovered for the first time in India in late 2020. In no time it became most prevalent strain in the world⁵ and therefore it was changed from Variant of Interest (VOI) to Variant of Concern (VOC). It is 40-60% more transmissible than alpha (B.1.1.7) [4]. Delta variant has about 18 mutations in its receptor binding domain of spike protein. The Omicron variant, also known as PANGO lineage BA.1 or B.1.1.529, was first reported on November 24, 2021 and received its VOC designation within 2 days on account of its unique mutational profile and the dramatic rise in cases observed in Gauteng, South Africa and thus recording the shortest interval period for classifying the omicron variant as VOC from VUM and therefore became variant of great public concerns [6]. Although the Delta variant is now the dominant SARS-CoV-2 variant Worldwide, the rise of Omicron infections in regions where Delta is circulating suggests that Omicron may overtake Delta to become the next dominant strain.

With its emergence from Africa, the Omicron variant emerged in other countries and became the latest of SARS-CoV-2 variants

to cause COVID-19 scare. Sequence analysis of Omicron variant reveals a lot of difference from other known variants and therefore it was found difficult to identify its closet relative. Phylogenetic analysis has revealed that the Omicron variant was derived from the Alpha lineage and only recently detected by genomic surveillance [7]. In comparison to the nine mutations or deletions found in Delta, the Omicron lineage we tested harbors 34 mutations (including three deletions and one insertion) in the spike protein, including 15 within the RBD region. These mutations are structurally focused at the top of the spike, in regions accessible to antibodies, raising the likelihood of immune evasion [7]. It is widely speculated that omicron variant might have gestated in immune compromised individuals like HIV infected individuals with co-infection by SARS-CoV-2 or might have evolved from non human species and recently spilled back in humans [4]. High number of non-synonymous mutations in spike protein has been revealed in omicron variant that are involved in transmissibility, disease severity and immune escape. A total of more than 60 mutations have been reported in omicron variant making it variant with the most mutations sites of all SARS-Cov-2 variants characterized so far [8].

Figure 1: Showing the impacts of Covid 19 especially on children.

Symptoms

The Omicron variant appears to be not worse than other variants or even less severe than Delta [9]. Studies suggest that the risk of re-infection with Omicron variant is higher than other variants. Hospitalizations in South Africa at the start of wave were increasing but have less severe symptoms than previous variants [10]. Symptoms of COVID vary and include runny nose, cough, headache, sneezing, fatigue and sore throat [11]. Influenza like symptoms have already been reported in first pandemic wave and include severe headache, lethargy, muscle aches and fatigue [12].

Diagnosis

SARS-CoV-2 infection is diagnosed by reverse transcriptase-polymerase assay (RT-PCR), serological evaluation of anti-viral immunoglobulin M (IgM and Ig G) antibodies and high throughput genome sequencing and lung X-ray [13]. However, FDA has approved PCR test and antigen test to diagnose SARS- CoV-2 infection [13]. In PCR, a fluid specimen from symptomatic persons or infected persons is swabbed from nose or throat or saliva to detect the genetic material of the virus. Antigen test usually looks for the virus specific proteins and is less specific than PCR test. Notably, existing public health prevention measures (mask wearing, avoidance of enclosed spaces, physical distancing, outdoor preference, and hand hygiene) that have been effective against past variants should be just as effective against the omicron variant. On the basis of data from previous Variants of Concerns, vaccinated people are likely to have a much lower risk of severe disease from omicron infection. Blending approach of public health measures and vaccination and is expected to remain an effective strategy [14].

Delta and omicron impact on health

The existing COVID-19 pandemic is a major global health disaster caused by the coronavirus 2 (SARS-CoV-2) that causes severe acute respiratory syndrome. The World Health Organization (WHO) identified the SARS-CoV-2 variant B.1.1.529, designated Omicron, as its fifth variant and called it as variant of concern on November 26, 2021. The information submitted to health officials and experts showed that Omicron has several mutations that might have ramifications for the continuing epidemic. As on 16th February 2022, there have been 414,525,183 confirmed cases of COVID-19, including 5,832,333 deaths, reported to WHO [20]. As of 13 February 2022, a total of 10,227,670,521 vaccine doses have been

administered. The dominant and first Pango lineage of the Delta variation is B.1.617.2. The Delta variation, which was first discovered in India, has developed into the predominant viral strain in the present epidemic. Clinical studies have indicated that the variation has a shorter incubation period, improved replication ability, and is more infectious than non-VOCs, in addition to greater transmissibility [15]. The spike protein causes host cells to adhere to each other, allowing entrance into the cells. The spike protein is also the protein that the immune system targets for viral elimination. When the immune system recognizes the spike protein as foreign, B cells generate antibodies to bind to it and eradicate it. S1 and S2 are the two subunits that make up the spike protein. The more the spike proteins evolve, the more difficult it is for the immune system to recognise them and for antibodies to bind to them, allowing the virus to be eradicated. This novel spike protein evades the immune system, allowing it to connect to human cells more efficiently and infect them more successfully. VOC is defined as “a variant for which there is evidence of increased transmissibility, more severe disease (e.g., increased hospitalizations or deaths), a significant reduction in neutralization by antibodies generated during previous infection or vaccination, reduced effectiveness of treatments or vaccines, or diagnostic detection failures,” according to the Centers for Disease Control and Prevention (CDC). Six Indian experts reported the variation as causing exceedingly dangerous symptoms such as stomach discomfort, nausea, vomiting, loss of appetite, hearing issues, and joint pain [16].

Researchers in Botswana and South Africa used whole-genome sequencing (WGS) to identify a SARS-CoV-2 variant in November 2021. It stood out because it had more than 50 mutations in its genome, 15 of which were in the spike protein’s receptor binding domain (RBD) [7]. The alpha, beta, gamma, and delta variants, as well as others of unknown significance share mutations with Omicron. Some of these mutations’ properties are currently being researched. It has already divided into two lineages just a few months after its formation. It’s fascinating to see how omicron behaves in cell culture. According to preliminary data, the median incubation time for omicron may be less than the original virus’s 5 days, at roughly 2–3 days. Runny nose, sore throat, headache, weariness (moderate to severe), sneezing, and night sweats are the most common symptoms described with omicron, and they are indistinguishable from a regular cold. In comparison to prior variations,

fever, cough, and loss of smell/taste are less prevalent. Symptoms normally linger a few days before disappearing completely. With the current omicron outbreak in the United States, hospitalizations of children infected with COVID-19 have increased recently, both in absolute numbers and as a percentage of overall COVID hospitalizations [18,21].

Impact on vision

COVID-19 may have disastrous consequences on nearly every aspect of the body, but optometrists are particularly interested in its direct impact on the eye. It's vital to keep in mind that the study into these specifics is still ongoing. However, in the less than two years after the epidemic began, new knowledge has emerged (<https://www.healio.com/news/optometry/20220131/how-the-covid19-delta-variant-affects-the-eye>).

Ocular symptoms have been linked to previous COVID-19 strains, but there isn't currently enough evidence to relate them to the delta version. Several people who have been infected with the delta variety have reported symptoms including eye redness and conjunctivitis, but this hasn't happened frequently enough to form a cluster (<https://www.healio.com/news/optometry/20220131/how-the-covid19-delta-variant-affects-the-eye>).

Long-term impact

COVID-19's ability to induce long-term consequences was unknown at the start of the epidemic. However, it has been discovered that this is not the case, and people with "long haul COVID-19" might experience a variety of ocular problems. COVID was linked to corneal nerve fibre loss as observed using corneal confocal imaging in a study published in the British Journal of Ophthalmology in July 2021 [17]. (<https://www.healio.com/news/optometry/20220131/how-the-covid19-delta-variant-affects-the-eye>). This virus can potentially cause major consequences in children [19]. One of them has been recognized as multisystem inflammatory syndrome in children (MIS-C). MIS-C has several characteristics with Kawasaki illness.

Conclusion

With Omicron as latest variant of concern, COVID-19 pandemic has emerged out to be the new challenge to the world scientists. Continuous mutations and rise of potent variants have created alarm bells worldwide. With its impacts on health, economics and world order, COVID-19 has been a daunting task to control. Omicron

as latest variant of concern has also created greater concerns to health with more than 30 countries involved in its impact. Nevertheless, Vaccines have played their part and somehow managed to limit the impacts of new variants that are emerging thick and fast.

Conflict of Interest

There is no conflict of interest among authors.

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