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Human coronaviruses: ophthalmic manifestations

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ABSTRACT

The 2019 novel coronavirus which causes severe acute respiratory syndrome (SARS) known as SARS-CoV-2 still remains as a global pandemic since its discovery and continues to spread across the world, given how highly contagious the virus is. We reviewed various articles that explore eye involvement in COVID-19 and other human coronaviruses, its human manifestations in comparison to animal studies and potential mechanism of viral entry into the eye surface. Evidence of animal studies depicted various complications of coronaviruses infection into the eyes, in both anterior and posterior segments of the eye. Conjunctival inflammation remains uncommon in association with COVID-19, with other ophthalmic findings. The risk of transmission via the ocular surface remains likely low, though it is inarguably present based on preliminary finding of viral load in ocular samples and expression of ACE2 on the ocular surface. Testing the tears sample for diagnosing SARS-CoV-2 was unreliable due to limitations of the testing kits and conflicting evidence of the viral titre in the ocular samples. Further larger, more precise and specific studies are required to allow us to better understand the pattern of virulence underlying the associations of SARS-CoV-2 in the eye despite its rare occurrence. This review article aims to enhance better awareness among clinicians regarding ocular manifestations associated with COVID-19 and necessary precautions should be implemented to minimise the risk of person-to-person especially in the nosocomial setting.

INTRODUCTION

When the novel coronavirus (CoV) which causes severe acute respiratory syndrome (SARS), namely SARS-CoV-2 or infamously known as COVID-19 was first recognised and reported since December 2019 in Wuhan, China, many of us understood that it is another type of severe airway disease. As time progresses, unfortunately COVID-19 had evolved into a global pandemic affecting the health of millions of people across the globe with increasing mortality as well. The virus has been associated with stroke, cardiovascular pathologies, neurological manifestations, dermatological signs as well as ocular pathologies. This review article aims to look into the ocular manifestations that have been reported to be associated with COVID-19 particularly, to enhance awareness among our colleagues of such ocular associations which can be an early sign of COVID-19 manifestation.

Human coronaviruses: history

The earliest discovery of human coronavirus (HCoV) was reported in 1965 in patients with a common cold which was named as B814.[1] Although most coronaviruses infections in human are associated with mild clinical symptoms, the notably pathogenic strains are SARS-CoV, Middle East respiratory syndrome Coronavirus (MERS-CoV) and the new SARS-CoV-2.[2]

The novel betacoronavirus, SARS-CoV was responsible for the first pandemic of the 21st century between November 2002 and August 2003 that resulted in 8098 cases with fatality rate of 9.6% to 11% according to WHO.[3 4] Two human CoVs were identified before SARS-CoV, HCoV-229E and HCoV-OC43.[5 6] Following the SARS outbreak, two more strains of human coronaviruses were found, HCoV-NL63 and HCoV-HKU1.[7 8] In 2012, MERS-CoV was first detected from a man who died from severe pneumonia and secondary renal failure in Saudi Arabia. The virus is responsible for the ongoing epidemic of respiratory disease in Middle East Region and the deadly outbreak in South Korea.[9–11]

On 7th January 2020, WHO announced the new betacoronavirus following the mysterious clusters of infectious respiratory disease in Wuhan, China.[12] Although the virus was named SARS-CoV-2, it was not the descendent from SARS-CoV.[13] Full genome sequencing of SARS-CoV-2 from five patients at an early stage of the pandemic had shown 79.6% similarity to SARS-CoV and 50% to MERS-CoV.[14] Furthermore, SARS-CoV-2 shares 96.2% of nucleotide identity with the closest bat coronavirus, which confirmed its zoonotic origin.[15] As of 15th October 2020, there have been around 37.1 million cases of SARS-CoV-2 globally with a mortality rate of almost 3%; 1 070 355 deaths had been reported to WHO.[16]