

# Ocular Manifestations of Coronavirus Disease 2019(COVID-19): Its Remedy and Prevention

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## ABSTRACT

SARS-CoV-2 is a Coronavirus that causes COVID-19 with mild to severe respiratory illness. It is highly contagious disease transmitted through direct or indirect contact with infected people or contaminated surfaces mainly through respiratory droplets. Several research articles are published which evaluated the ocular findings in patients with Coronavirus disease 2019. Commonly patients are suffering from initial ocular symptoms followed by systemic symptoms of the disease. Transmission even from the ocular surface could be possible via tears and other secretions through eyes. The most frequently noted initial symptom of COVID-19 is follicular conjunctivitis with acute and diffuse bilateral red eye. Similarly other ocular manifestations include eye Corneal sub epithelial infiltrates with epithelial defects, episcleritis, acute anterior Uveitis, Retinitis, Optic neuritis, Cataract, Vitreous hemorrhages and cranial nerve palsies. As a remedy for ocular manifestation, orally administered Ribavirin has been used in vision threatening cases. For mild to moderate ocular symptoms, antihistaminic eye drops with ocular lubricating drops and cool compress are till now applied. To be in safe side and to prevent the transmission from the ocular surfaces, all eye care practitioners are advised to wear personal protective equipment including gowns, gloves, masks and face shields during the ophthalmic procedures.

## KEY WORDS

Conjunctivitis, Coronavirus, COVID-19, Ocular manifestation, SARS-Cov-2.

## INTRODUCTION

The Coronavirus disease 2019(COVID-19) pandemic has instigated several global turmoil both medically and socioeconomically. It has affected many subspecialties including Ophthalmology and is a major public health concern in the present era.<sup>1</sup> It is caused by severe acute respiratory syndrome Corona virus-2(SARS-CoV-2), a novel, enveloped single stranded RNA virus. COVID-19 has mainly affected respiratory system with life threatening results.<sup>2,3</sup> Various literatures have suggested that it has some ocular manifestations too that should not be ignored as the ocular surface can also be a mode of transmission of the disease. The SARS-CoV-2 has been detected in several body fluids including tear and discharge of patients suffering from conjunctivitis.<sup>4</sup>

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## OCULAR PATHOGENESIS OF CORONAVIRUS

Corona virus targets the angiotensin converting enzyme 2 (ACE 2) receptors in airway epithelium, mainly nose and upper respiratory tract mucosa. Such receptors are present in corneal and conjunctival epithelium as well. Angiotensin converting enzyme 2 serves as the receptor for the virus and may be transmittable via human tears and ocular secretions.<sup>5</sup> Ocular diseases may occur during the initial period of infection or during follow up. Some studies support that ocular changes manifest once the disease become systemic while other studies suggest that the ocular findings can be an initial findings and should raise suspicion for COVID-19. Eye can be a pathway for infectious droplets to enter the body. <sup>1,5</sup>The conjunctiva of an eye is easily exposed to infectious droplets and fomites during close contact with infected individuals and contaminated hands. So the conjunctiva can be an important portal of entry for respiratory viruses while tear and conjunctival secretion may contain virus and spread viral infection. Anatomically mucosa of the ocular surface (mainly conjunctival and corneal epithelium) and the upper respiratory tract are connected by the nasolacrimal duct.<sup>6</sup> So when the infected droplets comes in contact to eyes, it is partially absorbed by the cornea and conjunctiva but mostly drained into the nasal cavity through nasolacrimal duct and then transported toward the lower part of respiratory tract including nasopharynx and trachea. Later on the pathogens can be swallowed into the gastrointestinal tract spreading the infection.<sup>6</sup> But till now, it is not very clear how the virus accumulates in the ocular secretion. It has been assumed that there might be direct inoculation of the ocular surface from the respiratory droplets and aerosolized particles. The virus might migrate from nasal mucosa through nasolacrimal duct and there would be hematogenous spread to the lacrimal gland that might ultimately spreads in the conjunctival fornices. <sup>6</sup>

## OCULAR MANIFESTATION OF COVID -19

COVID-19 has been linked to various ocular signs and symptoms in several case reports. There is possibility for ocular transmission with the conjunctiva as a conduit as well as a source of infection.<sup>7</sup> The repeatedly noted initial symptoms of COVID-19 is bilateral diffuse red eye (viral follicular conjunctivitis) with the prevalence ranging from 0.8% to 31.6% of the patients who are laboratory confirmed cases of COVID-19. <sup>8,9</sup>Along with the conjunctival congestion, the other ocular symptoms are conjunctival secretion, chemosis, episcleritis, lid swelling, keratitis, ocular pain, photophobia, dry eye and tearing.<sup>10,11</sup> Ocular manifestation can occur before, parallel or after the presence of systemic manifestation. Conjunctivitis itself could be the only manifestation of COVID-19 without any subsequent

systemic manifestation.<sup>12</sup> COVID-19 in some cases has affected cornea in the form of pseudodendritic corneal lesion and diffuse corneal sub epithelial infiltrates with overlying epithelial defects.<sup>11</sup> There are significant cases where conjunctiva and cornea are both involved in the form of Keratoconjunctivitis with even decreased vision in affected eye. Not only the external ocular surface, COVID-19 has affected internal ocular surface including lens, Optic nerve, Retina, Uvea and Vitreous. There are some reported cases of acute anterior uveitis, cataract, optic neuritis, papilloedema, retinitis and vitreous hemorrhages with significant loss of vision. Similarly rare neuroophthalmic presentations such as cranial nerve palsies including III, IV and VI nerves with binocular diplopia and ophthalmoplegia have been reported in the literatures within a few days of fever and cough onset. Pupillary changes have also been observed with mydriasis and pupillary nerve fiber damage.<sup>11</sup> Few published articles have mentioned nystagmus, homonymous visual field deficits, orbital cellulitis and acute dacryoadenitis as other less common ocular findings.<sup>5,11</sup> But most of the literatures have mentioned that the primary ocular manifestation of COVID-19 is bilateral acute red eye (conjunctivitis) with follicular reaction with average duration of 5.9 days. One or more ocular manifestations can be seen in hospital admitted COVID-19 patients.<sup>6,12</sup>

## REMEDIES AND PRECAUTIONS FOR COVID-19

Although the chance of having Coronavirus in tear is small and prevalence of ocular manifestation in confirmed COVID-19 cases is low, all eye care practitioners including Ophthalmologists, Optometrists and health care workers need to be vigilant. Screening of the patient with conjunctival congestion for suspected COVID-19 by Ophthalmologist is advocated during the out break of pandemic. All eye care workers should be aware of the possibility that patient may present only with signs and symptoms of viral conjunctivitis initially due to SARS-CoV-2 infection and may develop systemic manifestation several days later.<sup>1,4</sup> For ocular manifestation cases, the treatment option was varied across studies ranging from artificial tears to antiviral eye drops.<sup>4</sup> Systemic treatment of COVID-19 infection has been shown to improve ocular signs and symptoms too. Since SARS-CoV-2 is an RNA virus, a broad spectrum antiviral that targets RNS synthesis, such as the nucleoside analogue Ribavirin has been successfully used. Orally administered Ribavirin in combination with pegylated interferon has been used with resolution of all symptoms including ocular pathology following six days of treatment.<sup>1</sup> Some of the cases with ocular manifestations are treated with combination of Oseltamivir and hydroxychloroquine with good results. Some case reports indicated that ocular symptoms can be effectively treated using combination

therapy of a topical antibiotic and corticosteroid, a regimen of cold compress, artificial tears and topically administered ganciclovir. Although topical antiviral and antibiotics can be used, they are typically not considered as first line treatment of viral conjunctivitis because of the risk of cross contamination between eyes with improper dropper hygiene and development of drug resistance.<sup>1</sup> So it is first advised to alleviate the symptoms with artificial lubricating tears, topical antihistamines and cold compresses. Similarly when considering the use of topical steroids, the risk of inadequately monitored intraocular pressure should be considered during this pandemic.<sup>1</sup>

#### PREVENTION OF COVID-19 DURING EYE CARE PRACTICES:

Since the viral like conjunctivitis can be the presenting symptom of COVID-19, the individuals should be treated with extra caution as early detection may result in an improved prognosis and mitigate spread.<sup>15</sup> Although the risk of transmission from human tears is considered low, there remains a possibility. So all eye care providers should use gowns, gloves, masks, N95 respirators and face shields with goggles during the ophthalmic procedures.<sup>4,12</sup> The WHO has already recommended the use of personal eye and face protective equipment, strict hand hygiene and to refrain from touching mucous membranes without taking full precaution. Special precautions are needed during direct ophthalmoscopy, lacrimal irrigation and probing, intraocular pressure measurement with contact tonometry and ophthalmic surgeries. For patients with confirmed or suspected COVID-19, ophthalmic consultation should be completed within the quarantine ward to avoid cross infection.<sup>6,14</sup>

#### CONCLUSION

Since the literatures have described some cases with initial ocular symptoms followed by systemic symptoms of COVID-19, all eye care practitioners should be cautious and consider the possibility of COVID-19 infection in any patient presenting with acute red eye. All personal protective equipments (PPE) are recommended to avoid hospital related viral transmission.

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