

Eye in COVID-19: A Brief Review

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ABSTRACT

This is a brief review covering the currently available literature on ocular manifestations of COVID-19, and prevention strategies for ophthalmologists. A literature search was carried out of Pubmed, Google Scholar and WHO database of publications on COVID. Keywords used in the search were eye, ocular manifestations, ophthalmology, COVID-19, nCoV-2019, and coronavirus disease. All available articles were reviewed and those pertinent to the study topic were included. Considering the dearth of information available, ophthalmology journals were also searched separately for relevant articles. Major ocular manifestation of COVID reported in literature is red eye, which usually presents before the onset of respiratory symptoms. Since the eye can be a possible transmission route for SARS-CoV-2, infection control measures should be undertaken by ophthalmologists, including use of personal protection equipment and eye/face covering. A framework for structuring ophthalmological services during the COVID pandemic is also presented in this review.

Key Words: COVID-19, Ophthalmologist, Conjunctivitis.

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INTRODUCTION

The COVID-19 pandemic, caused by the SARS CoV-2 virus, a member of the beta coronavirus genus, has led to widespread public health concerns across the globe¹. According to the WHO global situation report of 10th April 2020, there are more than 1.5 million confirmed cases with almost ninety two thousand deaths globally². In South East Asia, 12,978 confirmed cases have been reported so far, with 569 deaths due to COVID-9; considering the pattern of disease spread across the European region and America, this number is only expected to rise with time.

Many common public health concerns have been raised regarding COVID-19, especially its mode of transmission, symptoms, and preventive measures

carriers reported in the literature as well; or it can lead to acute respiratory distress syndrome (ARDS), against its spread³. COVID-19 initially presents as fever, cough, dyspnea, fatigue and myalgias; the clinical course may remain mild, with asymptomatic associated with need for ventilator support and high overall mortality⁴.

Ocular manifestations have also been reported in COVID-19, and have been purported by some to be the earliest sign of the disease in symptomatic individuals⁵. Previously other respiratory viruses, especially influenza, have been shown to use the eye as a portal of entry, with the H7 subtype having a particular ocular tropism⁶. Considering the scarcity of personal protection equipment (PPE), the mode of transmission through respiratory droplets, and the highly infectious nature of the disease, it is imperative that these manifestations are not overlooked.

We present here a brief review of major ocular manifestations in COVID-19 as well as preventive measures that can be undertaken by healthcare professionals (HCPs) in this regard. We also provide a basic framework to be followed while planning

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delivery of healthcare within a COVID-19 affected healthcare system.

MATERIAL AND METHODS

A literature search was carried out using Pubmed, Google Scholar and WHO database of publications on COVID. Keywords used in the search were eye, ocular manifestations, ophthalmology, COVID-19, nCoV-2019, and coronavirus disease. All available articles were reviewed and those pertinent to the study topic were included. Considering the dearth of information available, ophthalmology journals were also searched separately for relevant articles.

The earliest ocular manifestation of COVID-19, reported by Guangfa Wang, a member of the Chinese National Expert Panel on Pneumonia in January 2020, included redness of the eyes, which had occurred several days prior to the onset of pneumonia and positive testing for SARS-CoV-2⁵. This raised the suspicion that the exposed eye could be a possible extra-respiratory transmission route for the virus, following which the Chinese CDC recommended eye protection to healthcare workers exposed to COVID-19.

An observational study was carried out in a Chinese hospital on 114 patients who underwent consecutive nasopharyngeal and conjunctival swab tests for detection of SARS-CoV-2 on RT-PCR. The study reported negative conjunctival samples from all the patients, 79% of whom had tested positive for COVID-19 on nasopharyngeal swabs. Furthermore, no obvious ocular symptoms were documented in the study; it was suggested, however, that the presence of the virus in the conjunctival sac or tear fluid might occur for a very brief period of time, and in suspected patients presenting with red eye, testing with conjunctival swabs concurrent with nasopharyngeal swabs would hold diagnostic significance^{6,7}.

In a non-peer reviewed retrospective cohort study, 67 confirmed and suspected cases of COVID-19 underwent concurrent nasopharyngeal and conjunctival swabs; 1 patient with confirmed COVID had positive conjunctival PCR for SARS-Cov-2, while 2 others had probable positive PCR results from conjunctival swabs. Interestingly, however, none of the patients with positive conjunctival swabs had any ocular manifestations, and the patient who reported red eye prior to testing were found negative for SARS-CoV-2 on conjunctival swab PCR⁸. In another brief

report from Thailand, out of 48 patients who tested positive for SARS-CoV-2 and underwent a complete ocular examination including direct ophthalmoscopy and corneal scrapings in suspected cases, no ocular manifestations were found⁹.

Apart from anecdotal evidence for red eye as a manifestation of COVID-19, no objective evidence is available regarding any other ocular signs and symptoms. However, considering the ocular manifestations reported with other coronaviruses previously, especially SARS¹⁰, it is imperative that medical practitioners should be on the lookout for suspicious ocular symptoms in patients with suspected or confirmed COVID-19, and that such patients should undergo a complete ocular examination, conjunctival swabs, and follow up ocular examination as well.

Preventive Measures for Healthcare Professionals

The first ocular manifestations were reported from centers where wearing eye protection was not within the normal routine of donning personal protection equipment⁵. In many countries, ophthalmologists do not normally use eye protection in the form of goggles or face shields during daily clinical activities⁹. In the context of COVID-19, it was found in a survey conducted on accident and emergency (A&E) ophthalmologists that 79% had no training in using PPE; more than 50% were dissatisfied with the guidelines that did not recommend PPE for ophthalmology practitioners; and a similar number were unaware of the recommended PPE for close patient contact¹¹. Considering that ophthalmologists have close contact with patients for slit lamp eye examinations, and face a high burden of eye disease on daily basis, it is important that they are aware of the correct preventive measures that need to be undertaken in the healthcare settings. Infection control measures for ophthalmologists need to be stepped up, with proper training of healthcare staff and utilization of a triage system and telemedical services to reduce unnecessary patient presentation^{12,13}.

Based on the guidelines issued by the Royal College of Ophthalmologists¹⁴ and the American Academy of Ophthalmology (AAO)¹⁵, we present the following brief recommendations for prevention of COVID-19 in ophthalmology healthcare workers:

1. Eye protection and face protection should be used by HCPs working in the inpatient department

within two meters of patients, in emergency and acute hospital clinics and outpatient departments, and in operation theaters or high dependency units, especially when performing an eye review. For aerosol generating procedures such as intubation, single use eye protection must be utilized.

Routine Ophthalmological Issues	Urgent Ophthalmological Issues	Elective and Emergency Surgical Procedures
<ul style="list-style-type: none"> Defer routine issues and cancel previous appointments Refill necessary medications Postpone all face-to-face outpatient activity Postpone routine diabetic retinopathy screening (except for high risk situation e.g. pregnancy) Discharge all in-patients who are fit to leave Utilize telemedicine and virtual clinics for managing and advising patients. For communication, a senior ophthalmologist must be available. Reschedule appointments only after clearance has been obtained from public health authorities 	<ul style="list-style-type: none"> Major ophthalmological issues that require urgent eye examination and intervention are described in text. Stratify patients based on their symptoms and risk factors for COVID. Eye care, possibility of hospital admission and extent of personal protection will vary for each patient subtype. A simple system of classification is proposed below: <ol style="list-style-type: none"> No respiratory illness and risk factors: use standard precautions. * Limit speaking during slit lamp examination. Respiratory illness but no COVID-19 risk factors: gowns, gloves, surgical mask and eye protection must be used. Respirator filtering mask should only be used if aerosol generating procedure is planned. Disinfect examination room after examination. Patient does not need to be kept in the hospital. High risk patient: Do not treat in eye clinic. Refer patient to ER; any possible eye care should be provided in hospital setting. Documented COVID-19: Keep patient in hospital setting. Manage eye problem after screening based on urgency. For transmission prevention, N95, goggles/face shield, gowns and gloves should be used. 	<ul style="list-style-type: none"> Defer all non-urgent elective operations In emergency procedures, restrict general anesthesia to cases where no other option can be availed, since general anesthesia is an aerosol generating procedure. While performing any aerosol generating procedure: use disposable gloves, fluid resistant gown, N95 respirator filtering mask and eye/face protection. Do surgery under local anesthesia, with documentation of high risk to both medical personnel and patient. If surgery needs to be done, full set of PPE should be used for all patients

Fig. 1: Framework for provision of eye healthcare during COVID-19. *standard precautions include frequent hand washing, use of PPE, cough etiquette, disinfection of examination rooms.

- Slit lamp barrier or breath guard must be used whenever slit lamp examination needs to be performed in the inpatient or outpatient department or acute eye clinics.
- Disposable gloves, aprons and water resistant gowns must be donned by professionals working in the operation theaters. Gowns are not essential for inpatient areas and outpatient clinics. Similarly, respirator masks are only suitable for use during aerosol generating procedures or in high dependency units; simple fluid resistant surgical masks should be used in all other places.
- A minimum distance of two meters should be kept from the patient except when clinical examination is required.
- Prior to any exam, especially in patients with conjunctivitis, history of fever, respiratory symptoms, travel, or COVID contact must be taken by the ophthalmologist.
- While checking intraocular pressure, disposable tonometer tips must be used by the ophthalmologists. Air puff tonometry should be

avoided; I-care tonometry can be used instead; whereas Goldmann applanation tonometry should be used only when essential.

- Investigations such as visual field testing, ocular computed tomography (OCT) and ultrasound B-scan should be avoided unless absolutely essential.
- Indirect ophthalmoscopy should be used in preference to slit lamp biomicroscopy whenever appropriate.

Framework for Delivering Ophthalmology Services

In lower middle income countries, there is a high burden of ophthalmic diseases. Considering the case of Pakistan, the burden of disease is on the rise, with almost 4.3% of the total population suffering from visual deficiency, ranging from moderate loss to complete blindness¹⁶. In a study conducted at a public sector hospital in Pakistan, ocular emergencies accounted for 20% of all ophthalmology department admissions, with 55% of the emergencies being traumatic¹⁷. Considering the high number of ocular emergency presentations, a framework of ophthalmology services has been devised—this framework is in accordance with the guidelines set forth by the AAO and the Royal College of Ophthalmologists. Ocular emergencies requiring urgent review include the following: acute glaucoma (IOP > 40 mm Hg); rapidly progressive glaucoma; wet active age-related macular degeneration (ARMD); severe uveitis; acute retinal detachments; proliferative diabetic retinopathy; retinopathy of prematurity; endophthalmitis; sight threatening trauma; orbital cellulitis; and giant cell arteritis, among others. If the patient is below 70 years old, with the disease being in only or better seeing eye, treatment must continue for these patients, while keeping standard precautions in view^{18,19,20}.

CONCLUSION

COVID-19 is currently impacting the global healthcare landscape in an unprecedented way. While ocular manifestations of COVID-19 have not been reported widely in literature, the eye remains a possible transmission route for SARS-CoV-2. Healthcare workers and ophthalmologists must take this under consideration and utilize proper eye protection equipment, social distancing, and infection control measures to reduce the impact of disease burden.

Conflict of Interest

Authors declared no conflict of interest.

Authors' Designation and Contribution

Muhammad Mohsin Ali; House Officer: *Literature review, manuscript writing, final review.*

Qudsia Anwar Dar; Senior Registrar: *Literature review, manuscript writing, final review.*

Zahid Kamal Siddiqui; Professor: *Literature review, manuscript writing, final review.*

Alishba Khan; House Officer: *Literature review, manuscript writing, final review.*

REFERENCES

1. **del Rio C, Malani PN.** COVID-19—New Insights on a Rapidly Changing Epidemic. *JAMA.* 2020. Feb 28. Doi: 10.1001/jama.2020.3072.
2. WHO. Coronavirus Disease 2019 (COVID-19) Situation Report – 81: WHO; 2020 [cited 2020 10th April]. Available from: <https://reliefweb.int/sites/reliefweb.int/files/resources/20200410-sitreps-81-covid-19.pdf>.
3. **She J, Jiang J, Ye L, Hu L, Bai C, Song Y.** 2019 novel coronavirus of pneumonia in Wuhan, China: emerging attack and management strategies. *Clin Trans Med.* 2020; **9 (1)**: 19.
4. **Jiang F, Deng L, Zhang L, Cai Y, Cheung CW, Xia Z.** Review of the Clinical Characteristics of Coronavirus Disease 2019 (COVID-19). *JGen Intern Med.* 2020; Mar 4. Doi: 10.1007/s11606-020-05762-w. [Epub ahead of print]1-5.
5. **Lu C-w, Liu X-f, Jia Z-f.** 2019-nCoV transmission through the ocular surface must not be ignored. *Lancet (London, England).* 2020; **395 (10224)**: e39.
6. **Belser JA, Lash RR, Garg S, Tumpey TM, Maines TR.** The eyes have it: influenza virus infection beyond the respiratory tract. *Lancet Infect Dis.* 2018; **18 (7)**: e220-e7.
7. **Deng C, Yang Y, Chen H, Chen W, Chen Z, Ma K, et al.** Ocular detection of SARS-CoV-2 in 114 cases of COVID-19 pneumonia in Wuhan, China: an observational study (2/19/2020). 10.2139/ssrn.3543587.
8. **Zhou Y, Zeng Y, Tong Y, Chen C.** Ophthalmologic evidence against the interpersonal transmission of 2019 novel coronavirus through conjunctiva. *MedRxiv.* 2020.02.11.20021956; Doi: <https://doi.org/10.1101/2020.02.11.20021956>.
9. **Mungmungpantip R, Wiwanitkit V.** Ocular manifestation, eye protection, and COVID-19. *Graefes Arch Clin Exp Ophthalmol.* 2020 Mar 30: 1. Doi: 10.1007/s00417-020-04662-3. [Epub ahead of print]
10. **Chan W, Yuen K, Fan D, Lam D, Chan P, Sung J.** Tears and conjunctival scrapings for coronavirus in patients with SARS. *Br J Ophthalmol.* 2004; **88 (7)**: 968-9.
11. **Minocha A, Sim SY, Than J, Vakros G.** Survey of ophthalmology practitioners in A&E on current COVID-19 guidance at three Major UK Eye Hospitals. *Eye (Lond).* 2020 Apr 7. Doi: 10.1038/s41433-020-0857-5. [Epub ahead of print]
12. **Lai TH, Tang EW, Chau SK, Fung KS, Li KK.** Stepping up infection control measures in ophthalmology during the novel coronavirus outbreak: an experience from Hong Kong. *Graefes Arch Clin Exp Ophthalmol.* 2020; Doi:10.1007/s00417-020-04641-8.
13. **Hu VH, Watts E, Burton M, Kyari F, Mathenge C, Heidari F, et al.** Protecting yourself and your patients from COVID-19 in eye care. *Comm Eye Health,* 2020; **33 (108)**: S2.
14. **RCOphth COVID-19 Clinical Guidance for Ophthalmologists – The Royal College of Ophthalmologists.** [online] The Royal College of Ophthalmologists. Available at: <<https://www.rcophth.ac.uk/about/rcophth-covid-19-response/>> [Accessed 23 May 2020].
15. **Medscape. 2020. COVID-19 Guidance for Ophthalmologists (AAO, 2020).** [online] Available at: <<https://reference.medscape.com/viewarticle/927354>> [Accessed 23 May 2020].
16. **Hassan B, Ahmed R, Li B, Noor A, ul Hassan Z.** A comprehensive study capturing vision loss burden in Pakistan (1990-2025): Findings from the Global Burden of Disease (GBD) 2017 Study. *PloS one.* 2019; **14 (5)**.
17. **Qayyum A, Khokhar AH, Achakzai AS.** Prevalence of ocular emergencies in Quetta-Balochistan. *Pak JMed Sci.* 2009; **3 (3)**: 43-5.
18. **RCOphth. Management of Ophthalmology Services during the Covid pandemic 2020.** [online] Available from: <<https://www.rcophth.ac.uk/wp-content/uploads/2020/03/RCOphth-Management-of-Ophthalmology-Services-during-the-Covid-pandemic-280320.pdf>> [Accessed 23 May 2020].
19. **RCOphth: Management of Ophthalmology Services during the Covid pandemic. 2020.** [online] Available from: <<https://www.gov.uk/government/collections/coronavirus-covid-19-list-of-guidance>> [Accessed 23 May 2020].
20. **RCopath: Management of Ophthalmology Services during the Covid pandemic, 2020.** [online] Available from: <<https://rcopath.ac.uk/2020/03/covid-19-update-and-resources-for-ophthalmologists>> [Accessed 23 May 2020].

