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Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Review Article

COVID-19 and ophthalmology- Challenges and mitigation of disease

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ARTICLE INFO

Article history:
Received 04-09-2020
Accepted 11-01-2021
Available online 30-06-2021

Keywords:
SARS- CoV-2
COVID- 19
Ophthalmologist
Respiratory hygiene

ABSTRACT

The SARS-CoV-2 infection has become a global health crisis with an uprising trend of infection and death in the world. Considering the contagious nature and the human to human transmission of the disease, it is utmost important to follow the infection control measures in the ophthalmic practice. The pink eye or conjunctivitis is the associated symptom reported along with the respiratory illness and fever in patients of COVID-19. So the triage policy, using noncontact procedures, understanding the risk factors of the disease, postponement of routine ophthalmic patient's visit, following respiratory hygiene, hand hygiene, using personal protective equipment (PPE) are some of the measures to keep the infection in control are explained in this article. The surface disinfection, equipment disinfection are also important considering the environmental contamination nature of the disease. So in order to minimize the infection every ophthalmologist should work as per the guidelines and measures and work with the local designated infection control authorities.

1. Introduction

In today's scenario world is fighting with a completely new virus called as novel coronavirus SARS-CoV-2 which created an emergency situation by causing a disease COVID-19. The first case was detected in December 2019 in the city Wuhan of Hubei provenience of China since then it created an international public health crisis later termed as a pandemic situation by World Health Organization. The pathogen of COVID-19 is a novel coronavirus severe acute respiratory syndrome Coronavirus 2 [SARS-CoV-2], identified as a member of the Coronaviridae family.[1] Another coronavirus, named SARS-CoV-1, was responsible for severe acute respiratory syndrome. Corona viruses are envelope positive strand ssRNA viruses. They cause around 15% of upper respiratory infections otherwise known as common colds. There are two serotypes of corona viruses that were identified in 1960s: group I or 229E, and group II or OC43. A third strain, SARS-CoV was discovered in 2003, followed by a fourth strain, HCoV- NL63. There are no vaccine available and immunity following infection wanes after a year or two.[2] The main symptoms of COVID-19 are fever, Sore throat, Dry cough, fatigue, myalgia and Shortness of breath. These are similar to the symptoms of any viral infection like common cold, influenza etc. Patients typically present with respiratory illness, including fever, cough and shortness of breath; diarrhea is common early in infection, and conjunctivitis has also been reported.[3] Other less specific symptoms include headache, eye pain and fatigue. Complications in severe cases include pneumonia, renal failure, cardiomyopathy and encephalopathy. Symptoms can appear as soon as 2 days or as long as 14 days after exposure.[4]

The fatality rate of COVID-19 in aged peoples is quiet high than in comparison with the younger age groups (nearly 8%) and children (below 1%). The reported death rate from COVID-19 is approximately 5.93% (as of 10^{th} April) overall.[5] The disease is reported to be more infectious causing transmission from human to human through various

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https://doi.org/10.18231/j.ijceo.2021.058

ways. Initially patients may be asymptomatic and in carrier state which may transmit the virus to other peoples during the incubation period. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. The other health conditions like asthma, diabetes, cardiovascular disorders, immunocompromised conditions and cancer are the reported comorbid factors causing the disease fatal in geriatric age group.[6] The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. If another person is nearby and inhales the droplets or touches the surfaces around and then touches his face, eyes or mouth, he can get the infection.

2. Ophthalmology and COVID-19

Health workers like doctors, nurses and ward boys across the globe are at risk and most dies due to COVID-19. Ophthalmologists and ENT specialists are particularly having risk due to close working nature with patients while doing examination procedures like slit lamp examination, direct ophthalmoscopy, and oral examinations.[7] The aerosol transmission can cause COVID-19 spread from infected patient to an ophthalmologist. The unprotected contacts with infected patients increases the risk of transmission in these specialists. So it is recommended to use protective eyewear and slit lamp protector. While official advice and protocols vary from country to country, the World Health Organization (WHO) has recommended using protection for the mouth, nose and eyes when caring for patients potentially infected with COVID-19, and self-isolation for 14 days for anyone suspected of being in contact with an infected person. The virus can cause potential impact to human health in the form of severe disease and fatalities and transmission from asymptomatic cases.

In the field of ophthalmology most of the reports are suggestive of follicular reaction of the conjunctiva which causing follicular conjunctivitis in the mild form may cause due to aerosol contact or tear of the infected person.[8,9] The conjunctivitis having associated with fever, dry cough and shortness of breath and living in hotspot areas are more likely to be a patient of COVID-19. The patients visiting to ophthalmic outpatient department from the hotspot areas or area from the high prevalence could be infected with SARS-CoV-2 irrespective of indications for the ophthalmic checkup. So World Health Organization recommended protection guidelines should be followed while dealing with COVID-19 case or a suspect of the disease. The disinfection practice adopted by the ophthalmologist in daily routine process can be done in outpatient department with alcohol based disinfectant usage which can prevent the clinic base spread of the disease and protect the ophthalmologist and patients from the possible infection of SARS-CoV-2. The proportion rate of asymptomatic cases is also high so every possible precaution is necessary while doing ophthalmic practice. The ophthalmologist Dr. Li Wenliang, MD, who talked about the coronavirus initially, and later died from the disease, was supposed to get infection from an asymptomatic glaucoma patient.[10] So such incidents are pointing to the asymptomatic case transmission of the disease which can increase the fatality rate in the ophthalmologist. There are certain studies published in various research journals that the virus can survive up to 24 hours on cardboard, up to 4 hours on copper, and up to 2 to 3 days on plastic and stainless steel.[11] It can remain viable up to 3 hours in the aerosol. So it is most important to practice the surface disinfection after encountering the patients during ophthalmic visits. One may avoid the direct ophthalmoscopy, tonometry, applanation procedures, sac syringing, fluorescent dye test and other contact procedures to avoid the contamination. Evidences are reported to found the viral RNA in the room of a COVID-19 patients suggest to use the personal protective equipment (PPE) with meticulous disinfection techniques to avoid the environmental contamination. Practice of using mask, probably a surgical mask during ophthalmic examinations is recommended and those dealing with COVID-19 patients should use N-95 mask. Practicing respiratory hygiene along with eye protector/face protector and face mask during the examination is an effective way to tackle the situation of contamination through asymptomatic cases. A protective plastic or acrylic sheet [Figure 1 a], old MRI or CT scan or X-ray sheets can also be one option to place in between the eyepiece and ocular of the slit lamp to avoid the direct exposure of aerosol coming from the patient's breath as well as a plastic lamination can be done to autorefractometer and other equipment to protect from contamination and ease to sanitize it [Figure 1 b].[12]

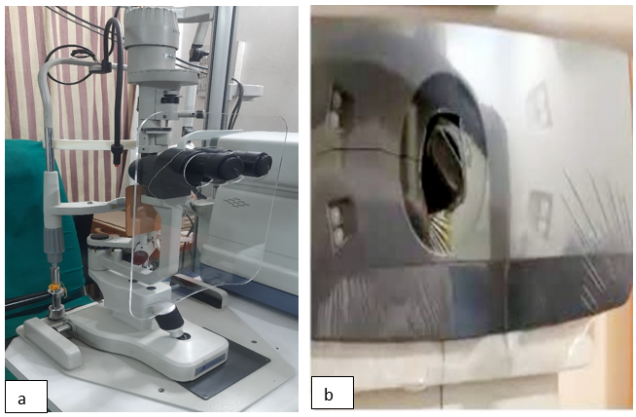

Fig. 1: a: Slit lamp protective breath shield; **b:** Autorefractometer plastic lamination

Considering the treatment part, there is no proven or prophylactic treatment present to tackle the COVID-19 pandemic. International research community is engaged in

Table 1: Triage of ophthalmology patients

Clinical situations	Management and precautions
Routine ophthalmic checkups	Postponement of routine checkups and consultations by at least 4 weeks Cancel contact lens practice to avoid body fluid contact
Urgent ophthalmic care required to the asymptomatic patients having no respiratory illness and no risk factors for COVID-19	Taking standard precautions while examination of patients with covering of mouth and nose with surgical mask and use of eye protection goggle
Urgent ophthalmic care required to the patients having respiratory illness and no risk factors for COVID-19	Ophthalmologist must use the gown, gloves, N-95 mask and minimum exposure with patient to avoid environmental contamination. Disinfection of consulting and waiting are should be done immediately after examination of patient
Urgent ophthalmic care required in patients present with risk factors of COVID-19	Patients should be examined in well-equipped hospital setup having COVID-19 management facilities with all due precautions of wearing surgical mask, eye protectors, face shields, gloves and gowns.
Urgent ophthalmic care required in known case of COVID-19	The magnitude of urgency of eye problem should be evaluated with a questioner and screening. Patients should be examined in well-equipped hospital setup having COVID-19 management facilities with all due precautions with use of PPE.

Table 2: The measures to be taken by ophthalmologist in clinic are as

For staff	Wearing face mask
	Thermal screening of every patient
	Patients education
	Maintain hand hygiene
	Filling of self-declaration and COVID-19 questioner from patients
	Sanitization in outpatient department
For patients	Follow respiratory hygiene by wearing face mask
	Maintain social distancing in waiting area
	Avoidance of self-medications
	Avoidance of cash transaction and hand to hand transfers
Emergencies in outpatient department	It will be up to ophthalmologist deciding the urgency considering the individual and social circumstances
High risk areas like OT, Registration, OPD, Counselling room, Consultation room, Patient waiting areas, Lifts, Washrooms	Cleaning with 1% Sodium Hypochlorite every 2 hourly
	Fogging can be done on weekly basis
Moderate risk areas like Meeting halls, Lounges, Cabins	Cleaning with 1% Sodium Hypochlorite every 3 hourly

finding the solution of the newer SARS-CoV-2 infection. The use of Chloroquine and Hydroxychloroquine is indicated as an antimalarial medicine and in autoimmune disorders are under trial to evaluate the safety and efficacy in treating the patients of COVID-19.[13] According to guidelines published by American Academy of Ophthalmology explained that the risk of irreversible maculopathy at higher doses for short period of times is unknown. An utmost care should be taken before administration of the doses with a complete baseline fundus examination and explaining the relative risk factors of macular toxicity to patients.[14] (Ruamviboonsuk P, Lai T, Chang A, Lai C, Mieler W, Lam D)

The robust protocol design and operational guidelines can be followed to tackle the symptomatic and asymptomatic patients of COVID-19 during the pandemic. An ophthalmologist should judge the urgency of ophthalmic checkup on the basis of signs and symptoms. A triage policy can be adopted during the ophthalmic visits of the patients in following categories (Table 1) [14]

The ophthalmic visits should be divided in scheduled appointments and ophthalmic emergencies. The scheduled appointments of ophthalmic routine checkups and elective surgical procedures should get postponed.

Precautionary measures for OPD ailments:

1. Slit lamp should have acrylic or plastic breath shield which are cleanable with alcohol swab or Sodium Hypochlorite solution
2. All OPD equipment cleaned with alcohol wipes in between patients or every 2 hourly
3. Maintenance of hand hygiene with alcohol based hand sanitizer
4. All equipment like A Scan, B Scan, Perimetry machine, keratometry, gonioscopes and prisms,

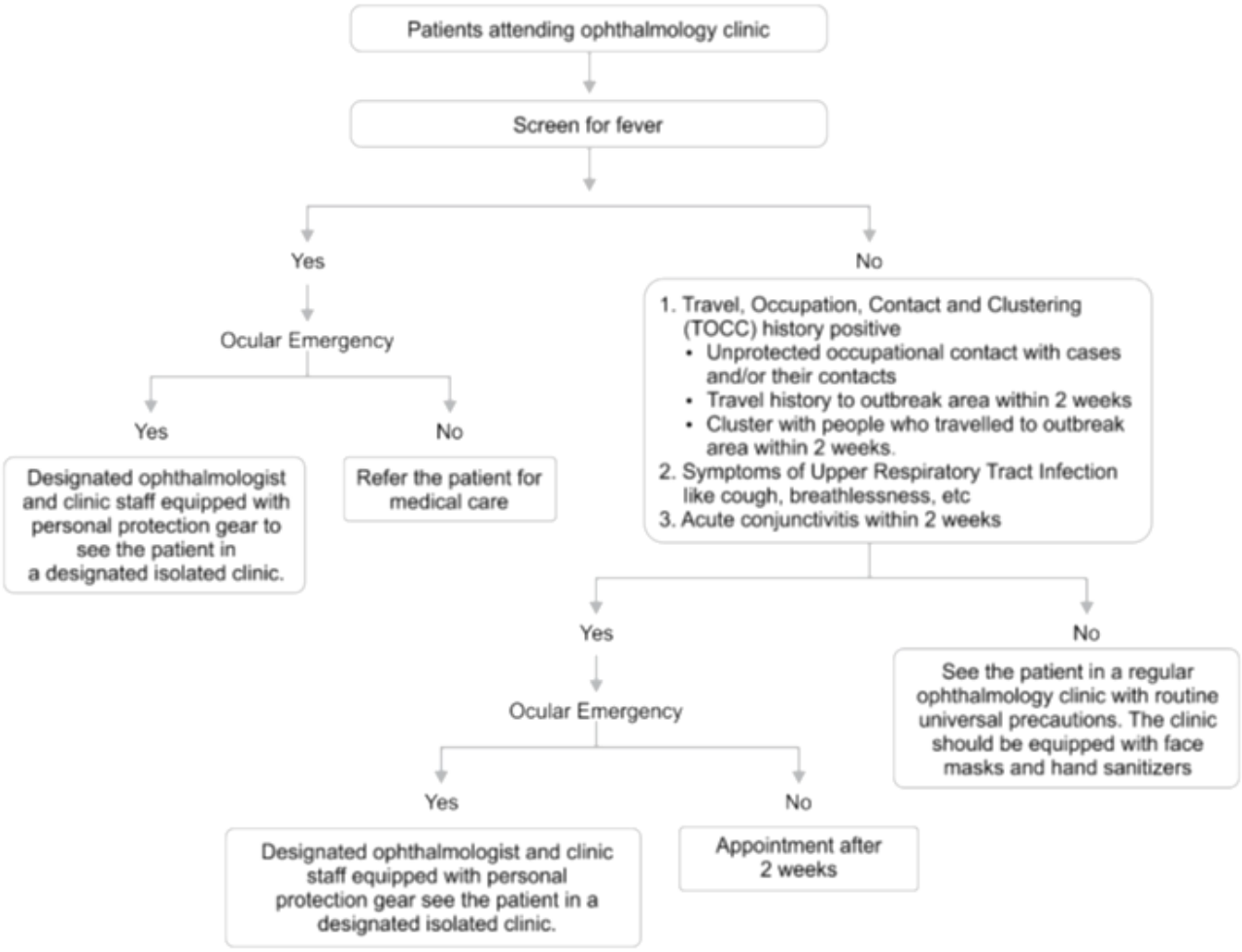

Fig. 2: Flowchart for patients attending ophthalmic clinic [15]

tonometer, trial frame are cleaned properly before and after procedure.

5. The patients of conjunctivitis should be handled with proper precautionary measures like using gloves, cotton buds or needle caps for examination.
6. Ample air flow should maintain in OPDs and waiting areas.

A complete meticulous history taking including the recent history of fever with dry cough and a travel history to highly prevalent countries of COVID-19 is very important in regards. This can be assessed in terms of TOCC (Travel to affected areas during the incubation period, Occupation, Contact of a suspected or confirmed case, Cluster of cases). The social distancing practice of keeping minimum distance of 6 feet (1 meter) should be followed by patients in waiting and consulting room. An ophthalmologist should practice to talk minimum with the patients within less than 10 minute timespan to avoid the cross contamination with patient. The ophthalmologist across the globe are allowed to use virtual meetings, telemedicine, internet based consultations and telephonic consultations with necessary documentation. The elective surgical procedures should be delayed and postponed with due recommendations and rescheduling. A diluted household bleach/ sodium hypochlorite solution can be used to disinfect the waiting and consulting area, 70% concentration alcohol based sanitizers should be used for hand hygiene.[16] Alcohol based rapid disinfectant like Bacillocid can be used to disinfect the equipment's in outpatient and inpatient department in the form of sprays and wipes [Figure 3].[17] So it is important to understand the ocular symptoms and pathophysiology of the disease to facilitate the diagnosis and prevention of transmission of the disease.

Fig. 3: Surface disinfectants

3. Conclusion

The SARS-CoV-2 transmission is a serious health condition leading to acute respiratory failure with pneumonia and causing the disease COVID-19. The world is still in the phase to understand the transmission factors of the coronavirus, its viability and treatment options along with vaccine development. In this global health crisis the frontline warriors like doctors and healthcare workers should keep themselves aware in pandemic situation by considering the individual and social circumstances. The ophthalmologist are the healthcare professionals to work in close contact with the patients. So the infection control measures and various guidelines issued by the various associations across the globe can help them to combat the contagious natured COVID-19 disease. This review can help the ophthalmic clinicians to understand the measures to keep themselves safe in the uprising wave of COVID-19 and start taking the necessary precautions including wearing personal protective gear. The across the globe experiences will definitely going to help to prepare the ophthalmologist in pandemic situation.

4. Source of Funding

None.

5. Conflict of Interest

None.

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Cite this article: Bhat PM, Kewat SS. COVID-19 and ophthalmology-Challenges and mitigation of disease. *Indian J Clin Exp Ophthalmol* 2021;7(2):284-288.