

## Infection Prevention and Control Practices in Ophthalmology during COVID-19 Pandemic

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### Abstract

The COVID-19 pandemic has caused great panic across the globe because of its rapid spread across the globe causing excessive morbidity and mortality. Governments in different parts of the world are imposing various infection control practices in order to contain the spread. Healthcare providers are at high risk of transmission of disease because of indulgence in close patient care. Among these, ophthalmologists further have increased risk because of close proximities to the patient during examination. In this paper we present various infection prevention and control practices during COVID-19 pandemic specially pertaining to ophthalmology.

**Keywords:** Infection prevention, Ophthalmology, Pandemic, Precautions

### Introduction

SARS-CoV-2 is a positive-sense, single-stranded RNA virus, irregularly shaped with club-shaped spike projections and has been identified as a novel member of 2b-beta-CoV group of family Coronaviridae and order Nidovirales, which has many other continuously circulating, endemic as well as epidemic strains [1]. SARSCoV-2 is highly contagious virus which has evolved into a global health threat within weeks. The name COVID-19 stands for coronavirus disease 2019, which was proposed by the World Health Organization (WHO) on 11th February, 2020 [2]. The virus was officially named as 'severe acute respiratory syndrome coronavirus 2' (SARS-CoV-2) by ICTV [3]. The incubation period of COVID-19 falls within 2 to 14 days, although in rare cases the incubation period could extend up to 24 days [4,5]. Infection with SARS-CoV-2 primarily causes respiratory illness ranging from mild symptoms to severe disease and death, and some people infected with the virus remain asymptomatic [6]. Symptoms of the infection may include fever, cough, fatigue, myalgia, dyspnoea

and diarrhoea.

This paper aims to help ophthalmologists globally to take necessary measures to minimise COVID-19 infection among both healthcare workers and patients.

### Background

It was first reported in a group of patients in Wuhan, China as an atypical pneumonia of unknown origin in December 2019 [7]. Since then, COVID-19 has rapidly emerged as a global health threat. As of 9th September 2020, there were 27,486,960 confirmed cases of COVID-19, including 894,983 deaths involving 216 countries [8]. India alone has 4,370,128 confirmed cases with 73,890 deaths.

During previous coronavirus outbreaks such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), human-to-human transmission occurred through

droplets, contacts and fomites, suggesting that COVID-19 could have similar modes of transmission [9]. Possible modes of transmission for SARS-CoV-2, including contact, droplet, airborne, fomite, feco-oral, blood borne, mother-to-child, and animal-to-human transmission. A recent review suggested that as coronaviruses are able to develop a wide range of ocular manifestations; thus, ophthalmologists should be cautious to prevent possible transmission through ocular secretions [10]. Moreover, the nasolacrimal duct may act as a pathway to transfer the virus from the eye to the nasopharynx [11].

According to WHO, as on 17th July 2020, about 10% of COVID 19 cases globally are among healthcare workers. One of them was Dr. Li Wenliang, an ophthalmologist at Wuhan Central Hospital. In early January, he contracted COVID-19 from an asymptomatic glaucoma patient and succumbed to the disease one month later [12]. There were circumstantial reports suggesting that individuals may be infected by patients with subclinical infection, either by droplets or by direct contact with secretions from infected cases followed by subsequent inoculation into mucous membranes [13]. Few reports suggested that without eye protection, the virus could also possibly be transmitted by aerosol contact with conjunctiva and cause infection [14-16]. Hence the close proximity between ophthalmologists and patients during slit lamp examination and direct ophthalmoscopy may pose an infectious risk to ophthalmologists.

Ophthalmologists may also be caught off guard as conjunctivitis, though uncommon, could be the first presenting symptom of COVID-19, before the appearance of common symptoms like cough and fever [14,15]. In one report, 2 samples from a patient with conjunctivitis tested positive for SARS-CoV-2 using reverse-transcription polymerase chain reaction (rRT-PCR) assay of conjunctival secretions [17].

The American Academy of Ophthalmology has issued an alert advising ophthalmologists to wear masks and eye protection when seeing conjunctivitis patients with respiratory symptoms and/or history of international travel [17]. Besides, the SARS corona virus was isolated from SARS patients' tear samples in 2003 [18]. Thus, it is possible that the SARS-CoV-2 may also be present in tears of COVID-19 patients.

Globally, as ophthalmologists are facing an ageing population and consequently, most ophthalmic clinics are extremely busy and crowded. Elderly patients also appear to be at increased risk of severe COVID-19 infection and mortality [19,20]. Additionally, since ophthalmic consultations often involve multiple investigations, including visual acuity, intraocular pressure measurement, pupillary dilatation and others, it is common for patients to have prolonged stay in the clinic to complete the whole examination [21]. All these factors potentially increase the risk of cross-infection, between patients and between healthcare workers and patients, in outpatient clinics in ophthalmology than other clinical establishments.

In order to reduce the transmission of the disease, strict infection control guidelines issued by WHO and Ministry of health and family welfare (MohFW) needs to be implemented. According to

WHO guidelines on Infection prevention and control of epidemic and pandemic prone acute respiratory infections in health care, the principles of Infection prevention and control (IPC) for Acute respiratory illness (ARI) patients include: early and rapid recognition of patients; application of routine IPC precautions (Standard Precautions) for all patients; additional precautions in selected patients (e.g. based on the presumptive diagnosis) and establishment of an IPC infrastructure for the health-care facility, to support IPC activities [22].

IPC strategies in health-care facilities are commonly based on early recognition and source control, administrative controls, environmental and engineering controls, and personal protective equipment (PPE). These include:

### 1. Standard Precautions

These are routine IPC precautions that should apply to ALL patients, in ALL health-care settings. These are:

- Hand hygiene: WHO five moments of hand hygiene should be followed religiously using hand washing with soap and water (at least 40-60 seconds) or hand rub with alcohol based sanitizer (for at least 20 seconds).
- Respiratory hygiene: covering the mouth and nose during coughing or sneezing using medical masks, cloth masks, tissues or flexed elbow, followed by hand hygiene to reduce the dispersal of respiratory secretions containing potentially infectious particles.
- Use of Personal protective equipment (PPE): The appropriate use of PPE serves to further reduce the risks of transmission of respiratory pathogens to health-care workers and other people interacting with the patients in the health-care facility.

PPE includes gown/coverall, gloves, shoe cover, head cover, eye shield/ face shield and mask. Their effectiveness depends on adequate and regular supplies, adequate staff training, proper hand hygiene and, in particular, appropriate human behaviour.

### 2. Additional Precautions

- Thermal screening of all patients and accompanying persons by infrared thermometer.
- Social distancing of at least 6 feet to be followed at all times, especially when physical barriers are not present between patients and the staff.
- Seating arrangement to be made in such a way that social distancing is maintained.
- Triage of patients with respiratory symptoms is prioritized.
- At the time of check-in, patients should be enquired about the presence of symptoms of a respiratory infection and history of travel to areas experiencing transmission of COVID-19 or contact with possible COVID-19 cases in the past 14 days.
- Triage personnel should wear adequate personal protection.
- Physical barriers are to be installed (e.g. glass or plastic windows) at reception areas to limit close contact between triage personnel and potentially infectious patients.
- Supplies for respiratory hygiene and cough etiquette, including alcohol-based hand rub with 60%–95% alcohol, tissues and no-touch bins for disposal, should be kept at entrances, waiting rooms and patient check-ins.

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### 3. Environmental and Engineering Controls

Environmental and engineering controls aim to reduce the concentration of infectious respiratory aerosols (e.g. droplet nuclei) in the air and to reduce the contamination of surfaces and inanimate objects.

- a) Reducing Aerosol Generation and Infection Transmission
  - A well ventilated space that allows a social distancing of at least 6 feet between patients.
  - Waiting rooms to be kept as empty as possible by timing the appointments.
  - Maintain unidirectional flow of patients i.e. entry and exit must be different if there are 2 doors. Place partitions in between [23].
  - Try to follow open door (to avoid touching doorknobs) if possible.
  - For air-conditioning/ventilation, the guidelines of CPWD shall be followed which emphasizes that the temperature setting of all air conditioning devices should be in the range of 24-30° C, relative humidity should be in the range of 40- 70%, intake of fresh air should be as much as possible and cross ventilation should be adequate.
  - Cough etiquette is promoted.
  - Hand hygiene is strongly recommended.
- b) Cleaning and disinfection of contaminated surfaces and inanimate objects. Ensure that cleaning and disinfection procedures are followed consistently and correctly.
  - Freshly prepared 1% Sodium Hypochlorite or 1% Bacillocid Extra solution can be used as a disinfectant for cleaning and disinfection for instruments between patients. Leaving the solution for a contact time of at least 10 minutes is recommended.
  - Alcohol (e.g., isopropyl 70% or ethyl alcohol 70%) can be used to wipe down surfaces where the use of bleach is not suitable, e.g., metals.
  - Disinfection of high touch surfaces like (doorknobs, telephone, call bells, bedrails, stair rails, light switches, wall areas around the toilet) should be done every 2 hours. For low-touch surfaces (walls, mirrors, etc.), mopping should be done at least once daily.
  - UV sterilizer lights may be installed in all the areas used for patient care and switched on for 3 hours at the end of all patient care activities.
  - Use of smaller elevators (base<10 sft) should be restricted to two people at a time and larger elevators to 2 persons per 10 sft base area.
  - Avoid all outreach activities including community [23].

### 4. Administrative Controls

The health-care facility management team needs to ensure that the necessary resources are available for implementation of IPC measures. These resources include the establishment of sustainable IPC infrastructures and activities; clear policies on early recognition of ARIs of potential concern; access to prompt laboratory testing for identification of the etiologic agent; implementation of appropriate IPC measures (e.g. Standard Precautions for all patients), and appropriate clinical triage and placement of patients;

provision of regular supplies; and organization of services.

### 5. Information Education Communication (IEC)

- a) Staff Education, Infection Control Training
  - All staff should be trained in infection control practices to familiarize with proper steps of hand hygiene and donning and doffing of PPE.
  - They should be well aware of symptoms of COVID-19 and should report immediately if they develop any fever, chills, myalgia, sore throat, runny nose, cough, diarrhoea or pneumonia as well as on their recent travel histories [24].
- b) Patient education
  - Visual alert icon (e.g. signs and posters) to be posted at entrance and waiting areas to provide patients and healthcare professionals with instructions about hand hygiene, respiratory hygiene and cough etiquette.
  - Educate about social distancing measures following Government and Health Authorities' instructions.

### 6. Bio Medical waste Management (BMWM) should be done following the guidelines issued by the governing body [25].

IPC Practices in Addition Applicable to Ophthalmology

All these controls are connected and should be harmonized to promote an institutional culture of safety. Since ophthalmologists are at higher risk of exposure because of working in close proximity to patients causing exposure to mucous membranes, so some additional IPC practices may be required in eye care facilities.

All India ophthalmological society and MoHFW has issued guidelines on Safe Ophthalmology Practices in Covid-19 Scenario [23,26]. According to these, eye care facilities in containment zones shall remain closed. Only those outside containment zones will be allowed to open up.

Persons above 65 years of age, persons with comorbidities, pregnant women and children below the age of 10 years should be encouraged to stay at home, unless they are patients themselves.

The basic preventive measures include simple public health measures that are to be followed to reduce the risk of COVID-19 as mentioned above.

All eye care facilities should also ensure the following IPC practices:

#### 1. Patient triage

A triage station can be set up outside the facility to screen patients prior to entering the clinic.

- Access is limited only to patients with non-deferrable ocular conditions.
- Presence of caregivers, if not strictly necessary, is not allowed inside the clinic. When needed, only one accompanying person is permitted.
- Encourage app-based mobile phone check in & payment along with digital prescription of glasses and medicines to prevent long queues.
- Tele-counselling and teleconsultation should be encouraged to lessen patient visits and/or appointment system can be followed to call patients needing examination/eye investigations/

procedures.

## 2. Minimize Exposure in Eye Care Facilities

It is recommended by the experts that all ophthalmologists provide only emergent care, after the triage and reschedule all elective OPD visits and procedures.

- The screening of patients for Cataract and other eye diseases in outreach areas may be undertaken only after duly following social distancing, hand hygiene and personal protective measures.
- No eye ball retrieval from homes to be undertaken, only Hospital Cornea Retrieval Program can be continued in non-Covid-19 cadavers, for utilization of corneas for therapeutic purposes only.

### 2.1. Protocols for OPD Services

-Triage by an ophthalmologist/ trained ophthalmic personnel may be done either through telephonic conversation to determine the emergency/non-emergency nature of the eye problem and Covid-19 status of the patient and an appointment given accordingly to avoid rush of patients.

-Emergency cases should be given priority.

Urgency is determined by the ophthalmologist's judgment of the potential risk to vision, eye and life and impact on the quality of life if untreated. One must always consider individual medical and social circumstances such as the patients' age, location of the patient, and requirement of caregiver, and availability of medical care after the emergency surgery. Cases that can be postponed for more than 4 weeks without considerable risk of loss of vision, general health and functioning should qualify as "elective". Based on the triage system, the expert group has classified OPD and surgical procedures as an emergency, urgent and routine [23].

Based on these criteria the Ocular Emergencies include injury to the eye (chemical, thermal, mechanical); sudden loss of vision; acute pain in the eye; acute red eye; acute onset of eyelid lesions; acute onset of double vision or sudden onset of drooping of the eyelid; acute onset of coloured halos, photophobia, floaters or flashes of light; acute onset of discharge from the eye/eyes; acute or sub-acute (days to weeks) onset of bulging of the eye; retinal Detachment; retinal tear; fresh CNVM; viral retinitis; intraocular infection and non traumatic perforation of eyeball even in absence of vision loss etc.

Eye drops should be put in the patient's eye by a nursing/paramedical staff with a no touch technique (ask the patient to pull down his/her lower lid or pull it down with a swab stick).

### 2.2. Protocols for Ward

- Patients and attendants should be screened before entering the wards.
- Only one attendant per patient can be allowed.
- Patients to be kept in the ward duly maintaining adequate distancing,
- In case a Covid-19 patient with Eye condition is to be admitted, a separate room or an isolation ward should be used.

## 2.3. Protocols for OT Services

- Pre-surgical Covid-19 test on patients is not mandatory, but a thorough history taking & examination must be done to ensure that patient has minimal probability of having COVID infection.
- No routine procedure/surgery to be done in a Covid-19 suspect/confirmed case.
- Appropriate PPE as per MOHFW guideline should be worn by OT staff.
- The OT tables, floor and equipment should be properly disinfected after each use.

## 3. Reducing Aerosol Generation and Infection Transmission

- Equipment like slit lamp should have a Plexiglas/breath shield to avoid contact with droplets from patient's breath. This sheet should also be disinfected after seeing any patient.
- Patients and physicians are strongly advised to avoid speaking during slit lamp examinations
- Non-contact tonometry (NCT) is a potential source of micro aerosol [27]. Therefore, it is prudent to suspend the use of NCT in outbreak areas. I-Caretonometry or Goldmann applanation tonometry with the use of disposable tips are encouraged to minimize the risk of cross-infection.

## 4. Use of Personal Protective Equipment

Eye examinations typically require less than 3-feet face-to-face distance. Therefore, the correct use of personal protective equipment (PPE) is mandatory in order to prevent nosocomial spread in ophthalmology [24].

PPE recommended for ophthalmology OPD is N 95 mask, goggles, gloves and face shield (if splash of body fluids is anticipated) [28].

## 5. Environmental Cleaning

Environmental cleaning is part of standard precautions, which should be applied to all patients in all healthcare facilities.

- OPD premises should be disinfected with 1% hypochlorite frequently and after all the patients have been seen. Forwards, sanitization with 1% sodium hypochlorite solution should be done frequently at least twice in a shift.
  - Cleaning and regular disinfection (using 1% sodium hypochlorite) of frequently touched equipment such as Trial Frame, Trial Lenses, etc. used in the OPD must be ensured.
  - The chinrest/headrest/table top etc. of equipment must also be disinfected after each patient is seen.
  - While performing any contact procedure like Tonometry, Gonioscopy, Keratometry, A- Scan, B-Scan, UBM, OCT, FFA etc., the instruments should be cleaned with 70% alcohol swab, before and after every new case.
- Patient Education
    - Educate patients to proper eye drop administration technique. Self-instillation should be promoted.
    - Educate eyeglass wearers to disinfect spectacles and glasses. Presbyopic patients need special attention as while using reading glasses, they may be putting them on and off their face multiple times a day. Promote careful and thorough hand washing.

- c. Educate contact lens users to do proper hand washing before and after insertion and removal of lens [24].

In Case of a Suspect or Confirmed Case in the Premises, the protocols for attending to suspector confirmed case and disinfection include:

- i. Place the ill person in an isolated room or area.
- ii. Provide a mask/face cover.
- iii. Immediately inform on premise nodal officer and the state or district helpline.
- iv. A risk assessment will be undertaken by the designated public health authority.
- v. (District RRT/treating physician) and accordingly further action be initiated regarding.
- vi. Management of case, his/her contacts and need for disinfection.
- vii. Disinfection of the premises to be taken up if the person is found positive.

### Conclusion

The COVID-19 infection has led to an exceptional number of infections and deaths in recent times and continues to pose a huge challenge to the health care system [29]. Ophthalmologists are at a slightly higher risk of transmission due to their close contact with patients, tears as well as procedures that generate aerosols [10,11,30].

Ophthalmologists attend to a majority of patients above 60 years of age, putting them at increased risk of developing COVID-19. It is important to follow infection control practices stringently so as to prevent risk of infection to healthcare workers as well as to patients. Some important measures being maintaining social distancing, wearing face masks, hand hygiene, promoting cough etiquette and disinfection of all equipments and surfaces. All healthcare workers must be trained and made aware of the necessary actions (simple and effective) to prevent infection to themselves and to avoid being a source of contamination to others.

We hope these practices may help the ophthalmologists to implement the infection control practices in their eye care facilities and prevent further transmission of disease.

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