



# Possible prophylactic or preventive role of topical povidone iodine during accidental ocular exposure to 2019-nCoV

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Dear Editor,

Ocular tropism of respiratory viruses is a well-known fact and is reported in cases of a wide range of viruses, e.g., adenovirus, respiratory syncytial virus, influenza virus, rhino virus, and corona viruses [1, 2]. Conjunctivitis is present in 3.175% of patients with COVID-19; however, only 0.703% of patients present with conjunctivitis as the first presenting feature [2–4] and 1.949% of patients demonstrate the virus in tear/conjunctival specimen [2]. These findings indicate ocular tropism of SARS-CoV-2. However, there is also a possibility of local replication of the virus followed by systemic involvement, especially in cases of droplet or aerosol transmission through the ocular route [4–7].

The anatomical and molecular link between the ocular system and the respiratory tract is already well-established [2]. The nasolacrimal duct (NLD) serves as an anatomical link between ocular system and respiratory tract [1]. Regarding molecular link, various cellular proteins such as  $\alpha$ 2-3-linked sialic acid (expressed in lower respiratory tract and ocular tissue) serves as an interaction site for diverse range of influenza viruses [2]. CD46, GD1a glycans act as cellular receptor for adeno virus, desmoglein-2/adenovirus receptor for adenovirus, or the coxsackievirus, ACE2 for SARS-CoV and ACE2 and CD147 for SARS-CoV-2 [1]. In case of SARS-CoV-2,

initial interactions between the spike protein S1 domain and its host receptor (either ACE2 or CD147) are the initiating event in establishment of human host infection [8, 9].

Presence of an ocular renin angiotensin system (RAS) and ACE (angiotensin converting enzyme) activity is already demonstrated in retinal tissue, choroid, and sclera as early as 1988 [10, 11]. This was followed by the demonstration of ACE and Ang-II receptor expression in ciliary body (non-pigmented epithelium), cornea (epithelium and endothelium), conjunctiva (epithelium), trabecular meshwork cells, retinal ganglion cells, photoreceptor cells, nuclear layer of retina, and endothelial cell layer of chorioretinal vessels [12]. In vitro studies demonstrate corneal and conjunctival expression of ACE2, thus suggesting a link between the ocular system and respiratory system in case of COVID-19 [13]. Another route of entry of SARS-CoV-2 to human host is through its interactions with CD147 [14], which is present in tear and human ocular tissues, e.g., corneal epithelium, endothelium, keratocytes, conjunctiva, and retinal pigment epithelium [15]. Thus, the conjunctival route may play a major route in establishment of infection [5].

## Accidental exposure to SARS-CoV-2 through ocular route

Though the face is covered with a mask by health care professionals, police, and frontline workers during their interaction with suspected or confirmed COVID-19 patients, the ocular route usually remain uncovered. Though protective goggles are available as a part of personal protection equipment (PPE) kits, however, their scarce availability is a concern even in the developed countries [16]. Thus, ocular route remains unprotected and unattended. Accidental ocular exposure to SARS-CoV-2 can occur in many conditions:

1. Accidental hand-eye contact among persons working in COVID-19 environment.

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2. This issue becomes complicated when news of some incidences like intentional spitting on doctors [17–19] and police personals [20–22] by suspected or confirmed COVID-19 patients, which also can result in accidental ocular exposure.

However, until date, no post-exposure prophylaxis is available in case of accidental ocular exposure with SARS-CoV-2.

## Povidone iodine 1% eye drop as post-exposure prophylaxis: can it have some role?

Povidone iodine is a broad spectrum antiviral agent covering both enveloped and non-enveloped viruses with established virucidal activity (adenovirus, mumps, rota virus, polio, coxsackie, rhino virus, herpes virus, rubella, measles, influenza, and human immunodeficiency virus) [23]. In rabbit model of adenoviral conjunctivitis, topical povidone iodine along with dexamethasone was found to be very effective [24]. In clinical settings, povidone iodine (5% and 1%) already showed clinical benefit in cases of adenoviral conjunctivitis [25–27].

Now, coming to the efficacy of povidone iodine treatment in SARS-CoV, treatment with povidone iodine for 2 min reduces viral infectivity to below detectable level and the efficiency of povidone iodine was similar to 70% ethanol in terms of reducing viral infectivity [28]. There are reports citing efficacy of povidone iodine gargle/mouth wash against SARS-CoV and MERS-CoV [29, 30], and on the basis of these findings, povidone iodine mouth wash/gargle is being recommended in cases of SARS-CoV-2 also [31, 32] by various authors.

In *in vitro* studies, povidone iodine (1%) was successful in reducing the infectivity of the virus (both SARS-CoV and MARS-CoV, 1-min time contact period for SARS-CoV and 15-second contact time for MERS-CoV, were associated with significant loss of viral infectivity) [33]. Occurrence of resistance is not an issue with povidone iodine. So, here comes a theoretically potential role of using povidone iodine 1% locally (eye drop) in case of accidental ocular exposure or in case of 2019-nCoV-associated conjunctivitis. However, toxicity profile of povidone iodine is to be considered and we need more clinical data for further validation.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Abbreviations** 2019-nCoV, 2019 novel corona virus; SARS-CoV, Severe acute respiratory syndrome coronavirus; MERS-CoV, Middle East respiratory Syndrome Coronavirus; ACE2, Angiotensin converting enzyme 2; COVID-19, Coronavirus disease 2019; PPE, Personal protective equipment

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