



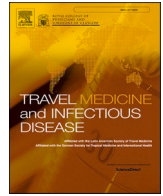
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An Ophthalmological update for air-travellers during COVID-19



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Considering the Coronavirus disease 2019 (COVID-19) pandemic, we wish to update the increased risk of ocular transmission of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in air-travellers. Evidences of in-flight transmission of SARS-CoV-2 have been reported [1]. Air-travelling has been considered as a major conduit of in-flight transmission of various respiratory viruses. SARS-CoV-2 is primarily transmitted via close contact with infected individuals producing respiratory droplets while sneezing, coughing or contact transmission via fomites. Besides conventional routes of transmission, eyes represent potential routes and source of SARS-CoV-2 infection. SARS-CoV-2 exhibits tropism for ocular tissues including conjunctiva, cornea, lacrimal sac, and tears [2,3]. Ophthalmic manifestations during SARS-CoV-2 infection have been reported as follicular conjunctivitis, epiphora, dry eyes and blurred vision [4]. We have observed similar ophthalmic manifestations in India with the presence of SARS-CoV-2 RNA in ocular secretions [5]. There is an increased risk of ocular transmission via ocular surface and recently, evidence of ocular manifestation in COVID-19 patients has been reported [6]. Therefore, even in the absence of ophthalmic manifestations, risk of ocular transmission of SARS-CoV-2 should not be ignored by air-travellers.

Besides the increased proximity of occupants, the closed chamber of an aircraft adversely affects the ocular surface. In addition, relatively low humidity conditions while travelling at high altitude in flights increases the tear film evaporation that may disrupt the apical corneal and conjunctival epithelial barrier making eyes susceptible for SARS-CoV-2 infection. Systemic comorbidities like thyroid disorders and diabetes mellitus may result in compromised ocular surfaces. Air-travellers must, therefore, refrain from touching any mucous membrane of eyes, nose and mouth prior to hand sanitization to prevent contact transmission of SARS-CoV-2.

SARS-CoV-2 containing droplets generated from a COVID-19 patient may fall on the ocular surface of a susceptible fellow passenger or the passenger may rub- their itchy eyes with contaminated hands, that may result- in the priming of S-glycoprotein of SARS-CoV-2 due to presence

of transmembrane serine protease 2 (TMPRSS2) in cornea, or conjunctival epithelial cells leading to binding with Angiotensin-converting enzyme 2 (ACE2) receptor and subsequent internalization via the ocular surface epithelium. SARS-CoV-2 may further shed into the tear and be transmitted to the nasal cavity via nasolacrimal duct. Unlike previous coronaviruses, respiratory droplets generated by COVID-19 patients contain higher viral load due to higher shedding in the upper respiratory tract. This may further increase the risk of in-flight ocular transmission of SARS-CoV-2.

It is advisable that air-travellers avoid using contact lenses and use sleep masks, protective goggles and face shields besides the use of preservative free ocular lubricants to keep their eyes moist thereby reducing the risk of infection. Frequent sanitization, hand hygiene, maintenance of adequate hydration and avoidance of caffeine or alcohol is advised. A pre-travel ocular evaluation will help guide the traveller regarding additional precautions, if any. Self medication is discouraged in case any individual develops ocular symptoms post travel. Additionally, considering the contagious nature of SARS-CoV-2, an average safe distance needs to be maintained within two rows and two seats apart while air travelling.

Authors' contribution

SKS and AK conceived the idea and collected the data. NP, SK, and SKS devised the initial draft, reviewed the final draft and contributed equally as first author. NP, SK, SDK, HRD, A, VKM, AK, and SKS finalized the draft for submission.

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Abbreviations: Coronavirus disease 2019 (COVID-19), Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2); Angiotensin-converting enzyme 2 (ACE2), transmembrane serine protease 2 (TMPRSS2).

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Declaration of competing interest

Authors have no conflict of interest.

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