



Conjunctival epithelium: Could it be a source for SARS-CoV-2 transmission

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Abstract

Introduction

COVID-19 since 2019 has created a lot of havoc in this world. The most important aspect for its control has been to prevent the transmission, respiratory route being the most common mode. The SARS-CoV-2 virus binds to the ACE-2 receptors in the respiratory epithelium. As the conjunctival epithelium also has the same receptors, this study was carried out to determine if conjunctiva could be a potential source of transmission.

Methods

51 COVID-19 patients with positive RTPCR on nasopharyngeal and oropharyngeal swabs were included in the study. Conjunctival swabs were collected from both the eyes of these patients and subjected to RTPCR for COVID-19. Demographic data, underlying conditions and any ocular and systemic symptoms were noted.

Results

Out of the 51 COVID-19 patients, 6 (11.7%) came positive for SARS-CoV-2 on RTPCR of conjunctival swabs. None of the patients had any ocular symptoms. Most of the patients (5, 83.3%) were older than 60 yrs of age with 4 males (66.6%) and 2 females (33.3%) and M:F ratio of 3:1. Two (33.3%) out of 6 had severe disease and were admitted in ICU, 2 (33.3%) had diabetes, 1 (16.6%) hypertension and 1 (16.6%) had bronchial asthma. P-value was not significant for any of these factors.

Conclusion

Conjunctiva, though in lesser numbers, can still be a source for transmitting the SARS-CoV-2 infection. Goggles or head gears should be worn by the healthcare worker while handling suspected COVID-19 patients. Also, proper infection control measures should be taken during ophthalmologic examination of COVID-19 patients.

Keywords: SARS-CoV-2, Conjunctiva, Transmission, RT-PCR, COVID-19

Introduction

Since the emergence of COVID-19 in 2019, the world has been grappling with the unprecedented challenges posed by the pandemic.(1) One of the most critical aspects in controlling the spread of the virus has been the prevention of transmission, with the respiratory route identified as the primary mode.(2) The SARS-CoV-2 virus, responsible for COVID-19, is known to bind to ACE-2 receptors in the respiratory epithelium. However, it is worth exploring whether other tissues

in the human body might also harbour these receptors and serve as potential sources of transmission.(3)

Understanding the potential alternative routes of transmission is essential for developing comprehensive public health strategies.(2,4) Evidence suggest that SARS-CoV-2 may indeed infect and replicate in ocular tissues, including the conjunctiva.(5–7) The conjunctiva, a thin membrane covering the white part of the eye and the inner eyelid,

contains ACE-2 receptors. This raises the intriguing possibility that the virus could be transmitted through ocular secretions or by touching the eyes.(6,8,9) Investigating the conjunctival epithelium's role in SARS-CoV-2 transmission could have significant implications for preventive measures and reinforce the importance of practices such as hand hygiene and avoiding touching the face.(6,10–12) As we learn more, we can better understand how the virus spreads, which can contribute to the refinement of public health guidelines and further enhance our collective efforts to curb the spread of the virus.(13,14) This study aims to investigate the possibility of the conjunctival epithelium serving as a source for SARS-CoV-2 transmission. Findings from this research can contribute valuable insights into the understanding of ocular involvement in COVID-19, guiding both clinical practices and public health strategies. The primary objective of this study was to determine if the conjunctiva, the mucous membrane that covers the front of the eye and lines the inside of the eyelids, could be a potential source of SARS-CoV-2 transmission.

Methods

The research focused on a cohort of 51 COVID-19 patients who had previously tested positive through RTPCR on nasopharyngeal and oropharyngeal swabs, ensuring a reliable confirmation of their COVID-19 status. As part of the study methodology, conjunctival swabs were meticulously collected from both eyes of each patient. These swabs were then subjected to RTPCR analysis, specifically targeting the presence of the SARS-CoV-2 virus in the ocular tissues. Beyond the virological aspect, the research team also collected and recorded detailed information for each patient such as age, gender, and any relevant socio-economic data and underlying medical conditions. The research was approved by the Ethics Committee of the institute and due consent was taken from the patients before proceeding for conjunctival sample collection.

Results

Of the 51 COVID-19 patients included in the study, 6 (11.7%) tested positive for SARS-CoV-2 on RTPCR of conjunctival swabs. It is noteworthy that none of these patients reported, experiencing any ocular symptoms. Most of these patients (5 out of 6, or 83.3%) were over 60 years of age, with 4 being male (66.6%) and 2 females (33.3%), resulting in a male-to-

female ratio of 3:1. Among the 6 positive cases, 2 (33.3%) had severe COVID-19 disease and required admission to the intensive care unit, 2 (33.3%) had diabetes, 1 (16.6%) had hypertension, and 1 (16.6%) had bronchial asthma. Statistical analysis revealed that the p-value was not significant for any of these factors. Details of the 6 positive cases are given in **Table 1**

Discussion

The findings of this study shed light on the intriguing possibility of ocular involvement in the transmission of SARS-CoV-2, expanding our understanding of potential routes beyond the well-established respiratory pathway.(2,15) Studies have explored the presence of SARS-CoV-2 in ocular tissues, aligning with the current study's premise.(7,16–19) A study by Chawhan et al. observed viral RNA in conjunctival swabs of COVID-19 patients, supporting the notion that ocular tissues could serve as potential sites for viral replication. This observation emphasizes the necessity for healthcare professionals to exercise additional precautions when dealing with suspected or confirmed COVID-19 cases. Utilizing protective goggles or headgear can act as an effective barrier, preventing the virus from reaching the conjunctiva and potentially causing infection. Additionally, ophthalmologic examinations of COVID-19 patients should strictly adhere to infection control measures to ensure the safety of both patients and healthcare providers.

The authors of Chawhan et al. study have not mentioned any ocular symptoms of the patients with positive conjunctival swabs. (19) Similar observation has been made in our study. Conjunctival epithelium harbours the virus but does not produce symptoms but can be a potential source of transmission. Contrastingly, research by Wu et al. reported a higher incidence of ocular symptoms in COVID-19 patients with detectable SARS-CoV-2 in conjunctival samples. The discrepancy in symptomatology highlights the variability in ocular manifestations across different patient cohorts. Understanding these variations is crucial for tailoring preventive measures and clinical management.(20)

The demographic distribution of positive cases in the current study, with a higher prevalence in individuals over 60, aligns with findings from studies like Zhang et al. and Wu et al., suggesting a potential age-related vulnerability to ocular involvement. However, the

limited sample size in the current study emphasizes the need for larger research to establish association between age and ocular susceptibility.(20,21) The absence of statistical significance in factors such as comorbidities and disease severity echoes the findings of studies like Li et al.(22)

While the present study provides valuable insights into the potential role of the conjunctiva in SARS-CoV-2 transmission, it is essential to acknowledge the variability in findings across different research endeavours. The complex nature of how the eyes are affected by COVID-19, along with the inconsistent links to factors like age and health status, shows the importance of continuous research and collaborative efforts. Bringing together information from various studies can help us better grasp the eye-related aspects of COVID-19, guiding both clinical practices and public health strategies.

Despite the relatively low number of positive cases in conjunctival swabs, this research offers valuable insights into the potential transmission of SARS-CoV-2 through the conjunctiva. While the primary mode of SARS-CoV-2 transmission remains respiratory, this study underscores the importance of comprehensive safety measures, particularly for healthcare workers in close contact with COVID-19 patients. It highlights the need to consider alternative transmission routes, such as the ocular route, as part of a holistic strategy in managing the COVID-19 pandemic.

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Table 1: Details of 6 patients who came positive for SARS-CoV-2 on RTPCR of conjunctival swabs

S. No	Age	Sex	Ward	Orf gene	N gene	underlying condition	vaccine	doses	eye symptoms	outcome
1	60	F	ward	29	30	none	covishield	2 doses	no eye symptoms	Recovered from COVID
2	62	M	ward	27	28	Diabeties	covishield	1 dose only	no eye symptoms (diabetic retinopathy)	Recovered from COVID
3	78	M	ward	27	29	hypertention	covishield	2 doses	no eye symptoms	Recovered from COVID
4	85	M	ICU	22	24	none	covishield	1 dose only	no eye symptoms (previously diagnosed)	Recovered from COVID

									Retinal detachment)	
5	18	M	ward	30	31	fracture wrist	not vaccinated	NA	no eye symptoms	Recovered from COVID
6	83	F	ICU	29	31	Diabeties	not vaccinated	NA	no eye symptoms	Recovered from COVID