

# Infectious rate of ocular discharges in patients with approved COVID-19 respiratory infection

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## ABSTRACT

**Background:** Since the relation between ocular manifestation and coronavirus disease 2019 (COVID-19) has been not elucidated well, thus this study was performed to assess the transmission to patients and healthcare providers via ocular secretions, and to decide if there is a link between ocular symptoms and COVID-19. **Methods:** A total of 101 patients who have been diagnosed with COVID-19 based on the clinical symptoms, radiological studies and confirmed by reverse transcriptase-polymerase chain reaction (RT-PCR), and hospitalized in Corona ward of Imam Khomeini Hospital in Ardabil from April 15, 2020 to September 15, 2020. Ocular examination was done and patients' demographical data and ocular symptoms were recorded. Also, ocular secretion specimens were obtained to evaluate the COVID-19 RT-PCR test to detect the virus in ocular secretion specimen. **Results:** In this study, we observed that 15.8% of patients had positive RT-PCR test for COVID-19 in their ocular secretion specimens. In addition, we showed that there is no difference between male and female as well as age in patients with positive RT-PCR and negative tests obtained from ocular secretion. In addition, we observed that 27 patients (26.7%) were symptomatic patients for ocular manifestations including conjunctivitis, epiphora, injection, discharge, etc., but only 2 patients (1.98%) had follicular conjunctivitis during examination. Besides, nonsymptomatic patients (for ocular manifestations) had significant lower rate of positive RT-PCR test from their ocular secretion. **Conclusion:** This study showed that ocular secretion might be a source of COVID-19 infection even in nonsymptomatic patients. Thus, self-protection from ocular secretion should be observed by ophthalmologists from all patients (even nonsymptomatic patients).

**Keywords:** COVID-19, ocular manifestation, ophthalmologist, pandemic

## Introduction

Coronavirus disease 2019 (COVID-19) began in Wuhan, China, in December 2019 and spread quickly worldwide. It

was proclaimed a public health emergency of international importance on January 30, 2020 and was named a pandemic by the World Health Organization (WHO) in March 2020.<sup>[1]</sup> More than 58 million recorded cases of COVID-19 and almost 1.4 million deaths worldwide have been documented as of November 23, 2020.<sup>[1,2]</sup> The causative pathogen of this potentially lethal disease has been referred to as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a novel enveloped Beta coronavirus, a member of the Coronaviridae family with a positive sensory single-stranded RNA genome.<sup>[3,4]</sup> Typical clinical symptoms include fever, cough, nausea, sore throat, headache,

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and in extreme cases can evolve into acute respiratory distress syndrome, cytokine storm, multiple organ failure, and death.<sup>[3,5-8]</sup>

SARS-CoV-2 is known to induce manifestations in organ systems, including gastrointestinal and ocular tissues.<sup>[9,10]</sup> Although the key route of transmission is through respiratory droplets,<sup>[11,12]</sup> experiments conducted during the SARS-CoV pandemic triggered by a virus that is phylogenetically close to SARS-CoV-2 showed the existence of viral RNA in tear samples.<sup>[13,14]</sup> During the 2003 SARS-associated coronavirus epidemic, one analysis showed that the most predictive predictor for transfer of infection from infected patients to healthcare workers was whether healthcare personnel used safe eyewear.<sup>[7]</sup> This posed concerns regarding possible alternate forms of transmission. During the current pandemic, numerous cases of ocular involvement, including features of follicular conjunctivitis, have been documented in patients infected with SARS-CoV-2, and others have shown the existence of viral RNA in conjunctival or tear specimens obtained from these patients.<sup>[13-16]</sup> However, the effects of ocular activity in the progression and prognosis of systemic disease are not understood.

Data collection is required to evaluate the frequency and type of ocular manifestations correlated with COVID-19 and the percentage of cases of reverse transcriptase-polymerase chain reaction (RT-PCR) positivity of viral RNA in ocular fluids. We performed an examination to assess the transmission to patients and healthcare providers via ocular secretions, and to decide if there is a link between ocular activity and COVID-19.

## Methods

In this study, patients with viral respiratory infection have been enrolled for further analysis. A total of 101 cases who have been diagnosed with COVID-19 based on the clinical symptoms, radiological studies and confirmed by RT-PCR, and hospitalized in Corona ward of Imam Khomeini Hospital in Ardabil from April 15, 2020 to September 15, 2020 on the basis of the 5<sup>th</sup> version of the National Guideline for the Prevention and Management of Novel Coronavirus Pneumonia issued by the National Health Commission of Iran. Patient signs, ocular manifestations, chest computed tomographic scans, and resuscitation. This research was accepted by the ethics committee of Ardabil University of Medical Sciences (IR.ARUMS.REC.1399.285), and all patients provided informed written consent. In this study, we recorded the patients' demographical data including age and genders ophthalmologic ant segment examination done by an ophthalmologist and new ocular symptoms after COVID-19 infection asked and recorded. In addition, the ocular secretion specimens were obtained to evaluate the COVID-19 RT-PCR test to detect the virus in ocular secretion specimen. Both statistical analyzes were conducted using SPSS version 25.0 (SPSS Inc). Means for continuous variables were compared using an independent group t-test while the data were usually distributed; otherwise, the Mann-Whitney test was used. Proportions for categorical variables were compared using the  $\chi^2$  and Fisher exact

test as appropriate. For unadjusted comparisons, a two-sided  $\alpha$  of less than. 05 was considered statistically significant.

## Results

In the current report, 101 patients diagnosed with COVID-19 based on the clinical, radiological studies, and RT-PCR results, were enrolled in the results section. Of these patients, the mean age was  $57.7 \pm 14.1$ , and 55 patients were male and 46 cases were female. The mean age in male group was  $58.8 \pm 15.1$  and the mean age in female group was  $56.41 \pm 12.86$ . Analysis showed that age was not significantly different in male and female groups ( $P > 0.05$ ). All patients were diagnosed with mild to moderate COVID-19. Twenty-seven patients (26.7%) had a problem with ocular manifestations such as epiphora, chemosis, itching, injection, and discharge but during examination only 2 patients (1.98%) had follicular conjunctivitis.

In this article, we observed that the RT-PCR tests obtained from ocular secretion specimens were positive in 16 cases and negative in 87 cases (15.8%). In patients with positive RT-PCR obtained from ocular secretion specimens, eight patients were male and eight patients were female. In addition, the mean age in patients with positive ocular specimens was  $56.1 \pm 18.8$  and was  $57.9 \pm 13.3$  in negative cases. Our results showed that there are no significant differences among male and female as well as age among patients with negative and positive RT-PCR obtained from ocular secretion specimens [ $P > 0.05$ , Table 1]. In addition, in 27 patients, who represent the ocular manifestation, 2 cases (7.4%) had positive RT-PCR test from ocular secretion. In 74 nonsymptomatic patients (for ocular manifestations), 14 cases (18.9%) had positive RT-PCR tests from ocular secretion. Our results showed that the rate of positive RT-PCR test from ocular secretion was significantly higher in nonsymptomatic patients (for ocular manifestations) ( $P < 0.05$ ).

## Discussion

In this study, we observed that 15.8% of patients had positive RT-PCR test for COVID-19 in their ocular secretion specimens. In addition, we showed that there is no difference between male and female as well as age in patients with positive RT-PCR and negative tests obtained from ocular secretion.

Few prior pieces of research have examined ocular signs and symptoms in patients afflicted with SARS-CoV-1 and

**Table 1: Comparison of demographical data in two groups (positive and negative RT-PCR from ocular secretions)**

	General (n=101)	RT-PCR obtained from ocular secretion specimen		P
		Positive (n=16)	Negative (n=85)	
Age	57.7±14.1	56.1±18.8	57.9±13.3	P=0.873
Gender				P=0.691
Male	55 (54.4%)	8 (50%)	47 (55.3%)	
Female	46 (45.6%)	8 (50%)	38 (44.7%)	

SARS-CoV-2. A few studies tested the existence of SARS-CoV-2 in tear fluid.<sup>[10-13]</sup> Previous studies have indicated that the shedding of potentially contagious viruses can occur in individuals who have no fever and mild or missing symptoms of infection. Since unprotected eyes have been correlated with an increased risk of transmission of SARS-CoV-1, in support of our current findings, our results may indicate that SARS-CoV-2 may be transmitted through the eye. In this regard, the guidelines include techniques to avoid disease transmission between ophthalmologists and contact lens professionals and aerosols created by eye procedures such as cataract surgery and noncontact tonometry.<sup>[14-16]</sup> However, there is no direct evidence of this issue in the literature. In this regard, the aim of the current study was to elucidate that the transmission possibility from eye secretion.

Ocular symptoms such as irritation, redness, and conjunctivitis can be seen in subjects with COVID-19.<sup>[10]</sup> The transmission of ocular fluid disease remains unknown and the rates of viral RNA diagnosis from conjunctival swabs/tear fluids utilizing RT-PCR are limited. Such a comprehensive study can enable preparing agencies, ophthalmologists, and intensifiers to treat their patients and to establish recommendations for personal protective equipment, including eye gear. In this regard, Olivia Li *et al.*<sup>[16]</sup> declared that ophthalmologists should take particular care when examining patients, because of both the proximity to patients' nose and mouth, and the potential exposure to tears that may contain the virus. Research into if COVID-19 can be found in tears and conjunctival scrapings would be valuable and inform ongoing disease prevention strategies. In addition, Hu *et al.*<sup>[17]</sup> showed that conjunctivitis might be the first ocular manifestation of COVID-19 and might be spread from the ocular secretion. Also, Wu *et al.*<sup>[18]</sup> reported that about 30% of patients had ocular involvement by presenting conjunctivitis, epiphora, etc., In line with previous studies, this study showed that ocular secretions might have coronavirus in about 16% of patients. Thus, ocular secretion could be a potent transmission pathway. On the other hand, since the rate of positive RT-PCR test obtained from ocular secretion was higher in nonsymptomatic patients (for ocular manifestations), therefore, it could be concluded that ophthalmologists should observe self-protection from all patients (even nonsymptomatic cases) during the pandemic.

The shortcomings and limitations of this analysis involve a comparatively limited sample size and lack of comprehensive eye exam to determine intraocular problems such as retinal involvement due to the practical difficulties of treating these patients at this period. In comparison, we only sampled once from the eye of each patient, which could decrease prevalence due to false negatives. However, these early findings are shared in an attempt to educate ophthalmologists and others around the world about the eye signs of COVID-19. In addition, other clinical ocular features and manifestations might be helpful to elucidate the role of positive ocular RT-PCR tests in symptoms such as chemosis, epiphora, conjunctival hyperemia, corneal abrasion, etc.

## Conclusion

Results of this study showed that ocular secretion might be a source of COVID-19 infection even in nonsymptomatic patients. Thus, self-protection from ocular secretion should be observed by ophthalmologists from all patients (even nonsymptomatic patients).

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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