Case Report

SAGE Open Medical Case Reports

Detection of SARS-CoV-2 RNA in conjunctival swab of a COVID-19 patient: The first report from Bangladesh

SAGE Open Medical Case Reports
Volume 8: 1–4
© The Author(s) 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2050313X20964103
journals.sagepub.com/home/sco
SAGE

SM Rashed Ul Islam[1], Tahmina Akther[1], Mohammad Afzal Mahfuzullah[2], Md Abdullah Omar Nasif[1], Md Shafayet Jamil[3], Mymuna Binte Mosaddeque[1] and Saif Ullah Munshi[1]

Abstract

Coronavirus disease-19 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 RNA (SARS-CoV-2 RNA). It usually manifests by fever and/or respiratory illness. Here, we present a case of COVID-19 patient who initially presented ocular symptoms like redness, itching, and watery discharge. Afterward, the patient developed fever and anosmia suggestive of COVID-19 disease. Nasopharyngeal swab and conjunctival swab test for SARS-CoV-2 RNA revealed positive by reverse-transcriptase real-time polymerase chain reaction. The patient was managed symptomatically at home and did not require any hospital admission. On day 12, the patient clinically recovered fully and his follow-up testing for SARS-CoV-2 RNA of both conjunctival swab and nasopharyngeal swab became undetected. This report emphasized that conjunctival mucosa may be considered as a portal of entrance for SARS-CoV-2 RNA in addition to the respiratory route. This study highlighted that any kind of ocular manifestations, such as conjunctival hyperemia, chemosis, watery discharge, periorbital erythema, and burning sensation should never be overlooked for probable COVID-19 in current pandemic settings. Moreover, strict eye protection using goggles/face shield should be used by all health care workers despite any working environment while caring for patients with or without COVID-19-related signs.

Keywords

COVID-19, SARS-CoV-2 RNA, conjunctivitis, eye protection

Date received: 8 July 2020; accepted: 14 September 2020

Introduction

Coronavirus disease-19 (COVID-19) is a respiratory illness that is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) started from Wuhan, China, in late 2019.[1] This disease progresses from asymptomatic conditions[2] to various clinical symptoms like fever, sneezing, cough, headache, nausea, diarrhea, kidney failure, and so on.[3] Transmission of this disease occurs through respiratory droplets that reach to mucosal surfaces like mouth, nose, eyes, or through close contacts when someone sneezes, coughs, or talks.[4]

Research reports exposed that SARS-CoV-2 RNA can be detected in the conjunctival surface or tears besides usual respiratory samples[5] and conjunctivitis often appeared as the first symptom of COVID-19 diseases suggested that eye route may also be a potential route for SARS-CoV-2 transmission.[6] It can occur through the exposure of conjunctival mucosa from infectious droplets expelled from COVID-19 patients during close contact or direct touching of eyes with contaminated hands.[7] Here we report a molecular detection of SARS-CoV-2 RNA in conjunctival swab (CS) in COVID-19 patients who presented initial ocular manifestations. The aim of this report is to document SARS-CoV-2 RNA in conjunctival mucosa and emphasize the importance of eye protection while seeing suspected COVID-19 patients.

[1]COVID-19 Laboratory, Department of Virology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[2]Department of Ophthalmology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[3]COVID-19 Laboratory, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh

Corresponding Author:
SM Rashed Ul Islam, COVID-19 Laboratory, Department of Virology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka 1000, Bangladesh.
Emails: smrashed@bsmmu.edu.bd; smrashed1620@yahoo.com

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (https://creativecommons.org/licenses/by-nc/4.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Case

A 30-year-old male and a physician by profession developed unilateral red eye, itching, and watery discharge on 3 June suggestive of acute conjunctivitis (Table 1). This symptom persisted for 4 days (up to 6 June 2020) and his eye condition improved gradually by conservative treatment. On the second day of eye complaints (4 June 2020), he also developed a low-grade fever (temperature < 100°F) and it was also managed by taking antipyretic. But, on the sixth day of his illness (7 June 2020), he complained of anosmia. As both fever and anosmia are the symptoms of COVID-19, he decided to go for SARS-CoV-2 RNA test. On the ninth day of his illness (10 June 2020), he visited COVID-19 Laboratory of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. At sample collection booth, nasopharyngeal swab (NPS) was collected and considering the initial ocular symptoms of the patient, a conjunctival swab (CS) was also collected at the same time purely for academic interest. It is important to note that, CS collection is not a routine practice for COVID-19 detection.

At day 9 (10 June 2020), he was identified as SARS-CoV-2 RNA positive in NPS sample and interestingly, his CS sample also came positive for SARS-CoV-2 RNA (Supplementary Figure 1). On the 11th day of his illness (12 June 2020), all his clinical symptoms were resolved and from day 12 (13 June 2020), the patient experienced a complete clinical recovery. His medical history was unremarkable and he did not mention about any episode of sneezing, cough, respiratory distress, headache, or gastrointestinal problem. His follow-up SARS-CoV-2 RNA detection at day 15 (16 June 2020) revealed undetected RNA in CS but detected RNA status in NPS. Finally, at day 24 (25 June 2020), he achieved undetected SARS-CoV-2 RNA status. He did not have any history of loss or blurring of vision or any serious ocular condition. During the study period, the patient was managed at home with symptomatic treatment and did not require hospitalization.

As per the current context of COVID-19 status, we questioned him about any recent travels or close contacts with suspected or diagnosed COVID-19 cases and all his answers in this regard were negative. But he admits to performing duty at the surgical out-patients department in a non-COVID hospital of Dhaka city on 1 June 2020 (probable day of contact with COVID-19 case) using safety equipment. After the appearance of symptoms, the patient kept himself in self-quarantine until he achieved undetected SARS-CoV-2 RNA status by reverse-transcriptase real-time polymerase chain reaction (PCR). None of his family members reported fever, general malaise, or respiratory symptoms suggestive of COVID-19.

This study followed the declaration of Helsinki, and written informed consent was obtained from the patients for publication.

Table 1. Timeline of clinical symptoms and SARS-CoV-2 RNA status according to the day of illness.

Date →	Jun 1, 2020	Jun 2, 2020	Jun 3, 2020	Jun 4, 2020	Jun 5, 2020	Jun 6, 2020	Jun 7, 2020	Jun 8, 2020	Jun 9, 2020	Jun 10, 2020	Jun 11, 2020	Jun 12, 2020	Jun 13, 2020	Jun 14, 2020	Jun 15, 2020	Jun 16, 2020	Jun 17, 2020	Jun 18, 2020	Jun 19, 2020	Jun 20, 2020	Jun 21, 2020	Jun 22, 2020	Jun 23, 2020	Jun 24, 2020	Jun 25, 2020
Symptoms →																									
Red Eye	Probable contact	No symptom										Full clinical recovery													
Itching																									
Eye discharge																									
Fever																									
Anosmia																									
SARS-CoV-2 in CS[a]									+						−	+									−
SARS-CoV-2 in NPS[a]									+																
Days of illness	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

[a]+: SARS-CoV-2 RNA detected; −: SARS-CoV-2 RNA undetected.

Laboratory method

With all aseptic precaution and ensuring proper biosafety, both NPS and CS were collected from the patient with a flocked swab having medical grade nylon microfibers. After the collection, each swab was inserted in the sample storage tube (Sansure Biotech Inc., Hunan Province, 410205, P.R. China) containing 2 mL normal saline with RNase inhibitor. The sample was examined at the COVID-19 laboratory for SARS-CoV-2 RNA detection by reverse-transcriptase real-time PCR.[8] Sample tubes containing swabs were processed with buffer-based extraction method using sample release reagent (Sansure Biotech Inc., Hunan Province, 410205, P.R. China) followed by amplification of SARS-CoV-2 RNA using Novel Coronavirus (2019-nCoV) Nucleic Acid Diagnostic Kit (Sansure Biotech Inc., Hunan Province, 410205, P.R. China) in Applied Biosystems 7500 real-time PCR system. This kit utilized *ORF1ab* and *N* genes as targets for the qualitative detection of SARS-CoV-2 RNA. In addition, internal control targeting the *RNase P* gene monitored the sample collection, sample handling, and molecular process to avoid false-negative results. Ct value of >40 cycle indicates negative results (Supplementary Figure 1). All the laboratory procedures were performed as per the manufacturer's instruction (Sansure Biotech Inc., Hunan Province, 410205, P.R. China).

Discussion

Our report described the SARS-CoV-2 detection from a CS in COVID-19 patients presented with conjunctivitis. In this case, the ocular presentation was the first manifestation followed by other COVID-19-related symptoms which appeared gradually. Respiratory droplets could likely be the main source of SARS-CoV-2 transmission.[2] So far, appearances of conjunctivitis among the COVID-19 patients from Bangladesh has not been evident yet. However, the study findings demonstrates that SARS-CoV-2 can use eyes as a portal of entry leading to COVID-19 disease.

Angiotensin-converting enzyme 2 (ACE 2) is a cellular receptor for SARS-CoV-2 that is present in the human retina, vascularized retinal pigment epithelium choroid, and conjunctival epithelia.[9] From an anatomical point, mucosa of the ocular surface and the upper respiratory tract are connected internally by nasolacrimal duct. So, any infected respiratory droplets falling into conjunctival surface could be drained through nasolacrimal duct and reach to the respiratory or gastrointestinal tract to initiate SARS-CoV-2 infection [10]

Previously, several reports have been published worldwide on the ocular manifestations among COVID-19 patients with the detection of SARS-CoV-2 RNA in conjunctival mucosa.[11] But during CS testing, the presence of this virus may or may not be observed along with the eye presentations. Xia et al. reported the detection of SARS-CoV-2 RNA in CS in a COVID-19 patient with conjunctivitis.[7] A study from China reported SARS-CoV-2 RNA in CS when serially tested from 13th to 19th day of illness till the report became negative. During the entire period, the patient had ocular manifestations like redness, tearing, and foreign body sensation.[12] In a COVID-19 case from Italy, it was found that SARS-CoV-2 RNA in CS was detected at 27th day of illness who initially presented with conjunctivitis. But it was interesting to note that all of these symptoms resolved at seventh day of illness.[13] A recent study from Turkey revealed that presence of conjunctivitis in COVID-19 patients was not significantly co-related with SARS-CoV-2 RNA positivity in CS.[14] In our case, we have also found SARS-CoV-2 RNA detection in CS on ninth day of illness whereas all of his ocular symptoms had resolved by that time. Although considering that, active ocular presentations may be due to the active viral replication in eyes that is evidenced by the virus detection in CS.[10] But, discussed scenarios in addition to our case could not find any direct relationship between ocular manifestation and SARS-CoV-2 RNA in the conjunctiva. Even then, there might be chances of low transmissibility through ocular route but, covering the eyes for all health care providers with goggles or a face shield should be considered regardless of the working environment.

Discussion with the patient revealed that he used to work in a non-COVID hospital where patients with multiple comorbidity used to visit round the clock. It is also logical to think that, one of these patients might have COVID-19 but failed to confirm due to limited COVID-19 testing facilities.[15] This kind of situation often endangers the health care worker in a non-COVID hospital who are not usually under strict preventive equipment, or hospital set-up is not prepared fully to address proper biosafety.

To the best of our knowledge, this was the first report from Bangladesh to determine the presence of SARS-CoV-2 RNA from the conjunctival specimen, and its presence in conjunctival mucosa might be considered as a potential entry site and/or source of spread. Although CS may not be an ideal sampling site for SARS-CoV-2 RNA detection, this route for virus transmission cannot be ignored in this current pandemic situation.

Conclusion

We suggest that the use of strict protective goggles and face shield in addition to other safety equipment should be worn, especially for all health care workers who work under any hospital settings regardless of patients' clinical presentations. Furthermore, several ocular presentations might be considered as usual symptoms in suspected COVID-19 patients.

Acknowledgements

The author(s) gratefully acknowledge the kind cooperation and assistance from the patient during the case study preparation.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval to report this case was obtained from Institutional Review Board (BSMMU/2020/6235, Date 03 June 2020).

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

ORCID iD

SM Rashed Ul Islam https://orcid.org/0000-0002-8164-5905

Supplemental material

Supplemental material for this article is available online.

References

1. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020; 382: 727–733.
2. Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *N Engl J Med* 2020; 382: 970–971.
3. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020; 395: 507–513.
4. Guo Y-R, Cao Q-D, Hong Z-S, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID–19) outbreak—an update on the status. *Mil Med Res* 2020; 7: 11.
5. Zhou Y, Zeng Y, Tong Y, et al. Ophthalmologic evidence against the interpersonal transmission of 2019 novel coronavirus through conjunctiva. *Medrxiv*. Epub ahead of print 12 February 2020. DOI: doi.org/10.1101/2020.02.11.20021956.
6. Guan W, Ni Z, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020; 382: 1708–1720.
7. Xia J, Tong J, Liu M, et al. Evaluation of coronavirus in tears and conjunctival secretions of patients with SARS-CoV-2 infection. *J Med Virol* 2020; 92(6): 589–594.
8. Islam SMR. Guidance and standard operating procedure for SARS-CoV-2 detection. Epub ahead of print 23 June 2020. DOI: 10.5281/zenodo.3903995.
9. Senanayake P, Drazba J, Shadrach K, et al. Angiotensin II and its receptor subtypes in the human retina. *Invest Ophthalmol Vis Sci* 2007; 48(7): 3301–3311.
10. Makovoz B, Møller R, Eriksen AZ, et al. SARS-CoV-2 infection of ocular cells from human adult donor eyes and hESC-derived eye organoids. *SSRN*. Epub ahead of print 15 July 2020. DOI: 10.2139/ssrn.3650574.
11. Wu P, Duan F, Luo C, et al. Characteristics of ocular findings of patients with coronavirus disease 2019 (COVID-19) in Hubei Province, China. *JAMA Ophthalmol* 2020; 138: 575–578.
12. Chen L, Liu M, Zhang Z, et al. Ocular manifestations of a hospitalised patient with confirmed 2019 novel coronavirus disease. *Br J Ophthalmol* 2020; 104(6): 748–751.
13. Colavita F, Lapa D, Carletti F, et al. SARS-CoV-2 isolation from ocular secretions of a patient with COVID-19 in Italy with prolonged viral RNA detection. *Ann Intern Med* 2020; 173: 242–243.
14. Atum M, Boz AAE, Çakır B, et al. Evaluation of conjunctival swab PCR results in patients with SARS-CoV-2 infection. *Ocul Immunol Inflamm* 2020; 28: 745–748.
15. Anwar S, Nasrullah M and Hosen MJ. COVID-19 and Bangladesh: challenges and how to address them. *Front Public Health* 2020; 8: 154.