

## Online survey on practice patterns in the treatment of corneal ulcer during COVID-19 pandemic

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**Purpose:** To evaluate practice patterns in the treatment of corneal ulcer by ophthalmologists during COVID-19 pandemic in the Indian subcontinent. **Methods:** This was an online questionnaire-based survey circulated via google form to reach ophthalmologists practising cornea as a subspecialty between January 4, 2021 and February 3, 2021. The survey comprised of 21 questions to evaluate the prevailing practice patterns in corneal ulcer management during pandemic. **Results:** In total, 39.3% of government ophthalmology clinics and 41.5% of private ophthalmology clinics reported an average delay of 2 weeks in presenting to the hospital after the onset of symptoms. Totally, 60.5% of participants reported that the clinical outcomes of infectious keratitis cases during the COVID-19 pandemic were worse than before. In total, 61.3 and 41.1% of ophthalmologists in private and government sectors, respectively, were routinely performing corneal scrapings for corneal ulcer patients. The procedures were performed with adequate protective measures. In total, 68.5% participants mentioned decreased availability of donor cornea during the pandemic, and 44.4% reported compromised cornea practice due to the limited availability of essentials (tissue adhesives, BCLs, medications, etc.). A statistically significant difference of effect of pandemic on cost of services was noted between government and private hospitals. In total, 51% participants from private hospitals reported hike in outpatient department services and surgical charges, and 78.6% from government hospitals mentioned no hike in the charges ( $P$  value  $<0.001$ ). **Conclusion:** This study provides an overview on modified strategies in corneal ulcer management during pandemic without compromising patient safety and quality care.

**Key words:** Corneal ulcer, online survey, practice pattern

The COVID-19 pandemic has resulted in a drastic change in the life styles with extensive and far reaching consequences.<sup>[1,2]</sup> Initially, people did not know how to react immediately and in long run. Public gatherings have been discouraged to prevent spread and also break the chain.<sup>[3,4]</sup> In an attempt to device combating mechanisms, immediate worldwide lockdown was imposed. The lockdown gave enough time to understand the disease course and the measures to be adopted to mitigate its long-term effects. The health sector unlike any other sector suffered the maximum immediate losses incurred by COVID-19 pandemic.<sup>[5]</sup> The clinicians worldwide are trying their best to establish a balance between the optimal care for their patients and the necessary measures to avoid disease transmission. Currently, we have many guidelines put forth by various existing national and international organizations explaining necessary measures to be taken to ameliorate the patients' symptoms (non- COVID-19 related) without compromising their safety.<sup>[6,7]</sup> The purpose of putting these guidelines was to first identify the disease entities which need immediate attention and care, and these patients should not suffer in view of the ongoing lockdown. As per this, priority lists were made and corneal ulcer was kept under the "emergency category."

Corneal ulcer is a sight-threatening condition and needs targeted and timely treatment for its resolution. However,

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with the current COVID-19 pandemic, the approach to a patient with corneal ulcer has been modified and customized by individual clinicians keeping the basic essence intact. The purpose of the current study is to know the practice pattern in the treatment of corneal ulcer by ophthalmologists during the COVID-19 pandemic.

### Methods

This was an online survey on practice patterns in the treatment of corneal ulcer during the COVID-19 pandemic. The questionnaire was prepared using Google form (docs.google.com). The questionnaire was prepared after extensive review of previous surveys on corneal ulcers. Following validation of the survey questionnaire, it was circulated via email to reach ophthalmologists practicing cornea as a subspecialty. The sample size was based on nonprobability convenience sampling. The survey questionnaire comprised of 21 questions with multiple choices. It evaluated briefly the background, training, and current experience in cornea practice of the respondents. The questionnaire was circulated after clearance from the IRB and ethics committee (Ref.no. AIIMS/Pat/IEC/2010/619). This survey was available for response for 1 month. Reminders were sent periodically (weekly) to encourage response.

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Unanswered responses were excluded from the study. This study adheres strictly to the Declaration of Helsinki. The information was collected and automatically connected to a spreadsheet. The spreadsheet was populated with the survey and quiz responses. The categorical data has been expressed as percentages/proportions. Ethics committee approval was obtained from the ethics committee of the institute on 05/12/2020.

### Statistical analysis

The collected data was cleaned and coded in Excel Sheet which was further imported in STATA VERSION 13 software for statistical analysis. Results were presented as frequency and percentages. Chi-square test was used to determine an association between the variables. Statistical significance was set at  $P$  value  $<0.05$ .

## Results

A response rate of 35.2% was achieved as the survey questionnaire was circulated to 460 ophthalmologists during the study period; out of which 162 responses were received. Fig. 1 shows that maximum responses were obtained from Northern India (33%) followed by Eastern India and Southern India, i.e., 24 and 20%, respectively. Table 1 depicts that majority of the ophthalmologists who consented to take part in the study were working in private hospitals, i.e., 106 (65.4%), whereas only 34.6% participants represented the government hospital.

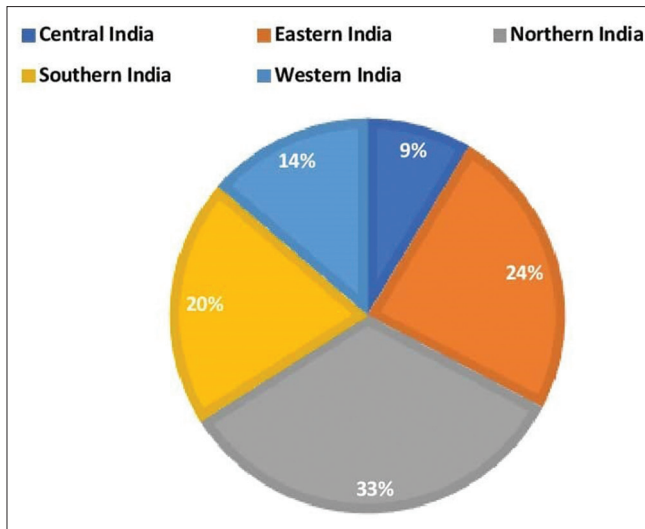
Maximum ophthalmologists in both government (19 (34%)) and private hospitals (34 (32.1%)) were attending approximately 5–10 corneal ulcer patients per month before the COVID-19 pandemic. However, during the pandemic, a statistically significant decline of more than 50% was reported from maximum participants in government hospitals, i.e., 25 (44.7%). On the contrary, approximately one-third participants from private hospitals documented less than 25% decrease, i.e., 34 (32.1%) in the corneal ulcer patients attending the outpatient department (OPD) [ $P$  value = 0.001]. Table 2 depicts that maximum participants from both government and private hospitals, i.e., 22 (39.3%) and 44 (41.5%), respectively, reported that patients had an average delay of 2 weeks in presenting to the hospital after the onset of symptoms. Also, more than half of the ophthalmologists, i.e., 98 (60.5%) reported that the clinical outcomes of infectious keratitis cases during the COVID-19 pandemic were worse than before [Table 3]. Despite the potential risk of disease transmission, 61.3 and 41.1% of ophthalmologists in private and government sectors, respectively, were routinely performing corneal scrapings for corneal ulcer patients to establish the diagnosis and to provide targeted treatment. The procedures were performed with adequate protective measures. Furthermore Table 4 displays that majority participants, i.e., 111 (68.5%) mentioned decreased availability of donor cornea during the pandemic. Also, Table 5 reveals that maximum participants, i.e., 72 (44.4%) reported corneal practices were compromised due to the

**Table 1: Distribution of participants according to OPD attendance of corneal ulcer patients (n=162)**

Characteristics	Type of institution		P (Chi-square test)
	Government hospital	Private hospital	
Number of corneal ulcer patients seen per month before the COVID-19 pandemic			
<5	16 (28.6)	23 (21.7)	0.43
5-10	19 (34)	34 (32.1)	
11-15	4 (7.1)	18 (17)	
16-20	3 (5.4)	8 (7.6)	
>20	14 (25)	23 (21.7)	
Percentage decrease in corneal ulcer patients visiting the hospital during the pandemic			
<25%	13 (23.2)	34 (32.1)	0.001
25-50%	11 (19.6)	28 (26.4)	
>50%	25 (44.7)	17 (16)	
Not affected	7 (12.5)	27 (25.5)	
Total	56 (100)	106 (100)	

**Table 2: Distribution of patients according to the duration between the symptom onset and reporting to hospital (n=162)**

Characteristics	Type of institution		P (Chi-square test)
	Government hospital	Private hospital	
Average duration between the symptom onset and reporting to hospital			
1 week	15 (26.7)	41 (38.6)	0.339
2 weeks	22 (39.3)	44 (41.5)	
3 weeks	10 (17)	11 (10.4)	
4 weeks	3 (5.3)	3 (2.9)	
>4 weeks	6 (10.7)	7 (6.6)	
Total	56 (100)	106 (100)	



**Figure 1:** Regional distribution of participants (N = 162)

**Table 3: Distribution of participants according to the clinical outcomes of infectious keratitis cases during the COVID-19 pandemic (n=162)**

Clinical outcomes of infectious keratitis cases	n (%)
Same as before	38 (23.5)
Worse than before	98 (60.5)
Better than before	3 (1.9)
Cannot comment	23 (14.2)

**Table 4: Effect of pandemic on availability of donor cornea (n=162)**

Availability of donor cornea	n (%)
Same as before	3 (1.9)
Decreased availability	111 (68.5)
Cannot comment	48 (29.6)

**Table 5: Effect of pandemic on cost of services and limited availability of essentials (tissue adhesives, BCLs, medications, etc.) on the cornea practice (n=162)**

Effect on cost of services	Type of institution		P (Chi-square test)
	Government hospital	Private hospital	
No hike in outpatient services and surgical charges	44 (78.6)	24 (22.6)	<0.001
Outpatient services and surgical charges increased	5 (8.9)	54 (51)	
Outpatient Department charges same as before, surgical charges increased	6 (10.7)	15 (14.2)	
Outpatient Department charges increased, surgical charges same as before	1 (1.8)	13 (12.2)	
Total	56 (100)	106 (100)	
<b>Effect of limited availability of essentials (tissue adhesives, BCLs, medications, etc.) on the cornea practice</b>			<b>n (%)</b>
Yes			72 (44.4)
No			56 (34.6)
Maybe			34 (21)
Total			162 (100)

limited availability of essentials (tissue adhesives, BCLs, medications, etc.). However, a statistically significant difference of effect of pandemic on cost of services was noted between government and private hospitals. As approximately half of the participants, i.e., 54 (51%) from private hospitals reported hike in OPD services and surgical charges, while majority, i.e., 44 (78.6%) from government hospitals mentioned no hike in the charges (P value <0.001).

### Discussion

Online surveys have been carried out for various diseases in the past. The purpose of these surveys was to understand the prevailing practice patterns among clinicians for the management of the specified clinical entity. However, with the current COVID-19 pandemic, the approaches to diseases have been modified and customized by the clinicians keeping the basic essence intact. There are predefined preferred practice patterns for corneal ulcer management also; however, most of these guidelines were proposed in the pre-COVID-19 era.<sup>[8,9]</sup> These preferred practice patterns are largely for community acquired bacterial keratitis that advocates empirical therapy without smears and cultures and has been put forth taking western epidemiological data into consideration. The purpose of the current study is to understand the practice patterns in the management of corneal ulcer among the ophthalmologists in India, during the pandemic. The responses were received from the ophthalmologists from all over India. The maximum (33%) respondents were from northern India, while Eastern, Western, Central, and Southern India contributed 24, 14, 9, and 20%, respectively. Of the total responses, 74% responses were received from ophthalmologists working in the urban areas and rest 26% were from ophthalmologists working in the semiurban settings. Our corneal ulcer survey had general ophthalmologists and cornea specialists managing corneal ulcer disease in their routine practice. In total, 43% were fellowship trained cornea specialists, 20% had done senior residency in cornea and anterior segment, and rest 37% were general ophthalmologists. Totally, 51% of the participants were young ophthalmologists with 1–5 years of clinical experience in the concerned area, 11% were having an experience of >20 years, and rest were having experience between 6 and 20 years. In

total, 65% participants were from private eye hospitals and 35% were from the government sector.

During the pandemic, almost all ophthalmologists used masks, sanitizers, gloves, and face-shield/slit-lamp shield.

The survey revealed a significant decline in the number of patients attending both government and private eye hospitals; however, the decline was more marked in the government hospitals. The most obvious reason for this trend was probably the government's initiative to convert government hospitals into COVID-19 care facilities. The fear of contracting the disease prevented patients from attending the clinics. The survey also revealed significant delay in the first presentation to the ophthalmic OPDs from the onset of symptoms. The patients probably avoided the OPD visits until the severity increased and were unmanageable with the local measures. Empirical therapy has always been the key to the management of microbial keratitis in community practice.<sup>[9]</sup> However, the role of corneal scraping in the diagnosis and management of corneal ulcer is vital. The direct microscopy and culture-sensitivity results facilitate targeted treatment. From literature, we have known that SARS-CoV-2 virus enter our body through ACE-2 receptors, and these receptors are abundantly localized in corneal epithelium.<sup>[10]</sup> Corneal scraping is associated with generation of aerosols and risk of transmission of COVID-19. Despite the potential risk of disease transmission, 61.3 and 41.1% of ophthalmologists in private and government sectors, respectively, were routinely performing corneal scrapings for corneal ulcer patients to establish the diagnosis and to provide targeted treatment. The procedures were performed with adequate protective measures. In total, 20.7 and 32.1% of ophthalmologists in private and government sectors, respectively, were not performing corneal scrapings in view of potential risks of aerosol generation and disease transmission. Considering the overwhelmed microbiology facilities at government sectors, engaged in testing RT-PCR for COVID-19 and COVID-19 antigen testing, other routine services were suspended. This was probably the reason for lesser number of corneal scrapings performed at government sectors. Among the ophthalmologists who were performing corneal scrapings routinely during the pandemic, most of them had a microbiology facility (including a microbiologist) for reporting. Fungi were the most commonly identified organism overall during the pandemic, and this is consistent with the previous reports.<sup>[11]</sup> In total, 38.3% of the ophthalmologists initially started the patients on empirical therapy and modified the treatment later based on direct microscopy and culture reports. Totally, 22% of the ophthalmologists treated patients empirically based on the clinical features. As per the results, 60.5% of the ophthalmologists noted a significant worsening of corneal ulcer cases compared to previous experience, during the pandemic. The worsening has been attributed to the delayed presentation and lack of follow-up due to imposition of nation-wide lockdown. During the pandemic, teleophthalmology has emerged as an effective tool to bridge the gap between a patient and a doctor.<sup>[12]</sup> Almost 53.7% of the ophthalmologists used topical antifungal empirically, with natamycin as the drug of choice.

Perforated corneal ulcers are managed by therapeutic penetrating keratoplasty or tissue adhesive and bandage contact lenses application. However, the supply of essentials (tissue adhesive, bandage contact lens, medications etc.) were affected to some extent during the pandemic. In total, 44% of total ophthalmologists faced limited availability of essentials necessary in the management of corneal ulcers. The corneal

transplant services were severely affected with a significant decline in eye donation and retrieval. The fear of disease transmission to the recipient and to the team members involved in corneal harvesting were the major concerns. In total, 68.5% of the ophthalmologists reported decreased availability of donor cornea.

There are various protocols put forth by various national and international organizations to first identify the emergencies and then treat the condition while maintaining the standard of new care. Repeated cleaning of floor, fomites, and use of various protective kits have increased cost significantly, and this is reflected more prominently in private sectors. The study suggests a significant price hike for OPD and surgical services in private hospitals.

## Conclusion

To the best of our knowledge, there are no studies in the literature on the prevailing practice patterns for the management of corneal ulcers. This study provides an overview on modified strategies in corneal ulcer management during pandemic without compromising patient safety and quality care.

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## Conflicts of interest

There are no conflicts of interest.

## References

- Haleem A, Javaid M, Vaishya R. Effects of COVID-19 pandemic in daily life. *Curr Med Res Pract* 2020;10:78-9.
- Tandon PN. COVID-19: Impact on health of people and wealth of nations. *Indian J Med Res* 2020;151:121-3.
- Huang YF, Wang LL. [How to improve the prevention and treatment of ocular chemical burns in China: Important elements]. [*Zhonghua yan ke za zhi*] Chinese J Ophthalmol 2018;54:401-5.
- Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, *et al.* Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) *in vitro*. *Cell Res* 2020;30:269-71.
- Hruza GJ. COVID-19 Pandemic: Impact on Healthcare in Missouri. *Mo Med* 2020;117:168-9.
- Sengupta S, Honavar SG, Sachdev MS, Sharma N, Kumar A, Ram J, *et al.* All India Ophthalmological Society - Indian Journal of Ophthalmology consensus statement on preferred practices during the COVID-19 pandemic. *Indian J Ophthalmol* 2020;68:711-24.
- Essien UR, Eneanya ND, Crews DC. Prioritizing equity in a time of scarcity: The COVID-19 pandemic. *J Gen Intern Med* 2020;35:2760-2.
- Lin A, Rhee MK, Akpek EK, Amescua G, Farid M, Garcia-Ferrer FJ, *et al.* Bacterial keratitis preferred practice pattern®. *Ophthalmology* 2019;126:P1-55.
- Hanet M-S, Jamart J, Chaves AP. Fluoroquinolones or fortified antibiotics for treating bacterial keratitis: Systematic review and meta-analysis of comparative studies. *Can J Ophthalmol* 2012;47:493-9.
- Sungnak W, Huang N, Bécavin C, Berg M, Queen R, Litvinukova M, *et al.* SARS-CoV-2 entry factors are highly expressed in nasal epithelial cells together with innate immune genes. *Nat Med* 2020;26:681-7.
- Leck AK, Thomas PA, Hagan M, Kaliyamurthy J, Ackuaku E, John M, *et al.* Aetiology of suppurative corneal ulcers in Ghana and south India, and epidemiology of fungal keratitis. *Br J Ophthalmol* 2002;86:1211-5.
- Golash V, Athwal S, Khandwala M. Teleophthalmology and COVID-19: The patient perspective. *Future Healthc J* 2021;8:e54-9.