

Content available at: <https://www.ipinnovative.com/open-access-journals>

Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: [www.ijceo.org](http://www.ijceo.org)

## Original Research Article

## Study of demographic profile, risk factor, clinical profile and microbiological profile of corneal ulcer

Chandraprabha Siddaiah<sup>1</sup>, Anupriya Appandairaju<sup>2</sup>, Raghu Gangadharappa<sup>3\*</sup><sup>1</sup>General Hospital, Tiptur, Karnataka, India<sup>2</sup>Dept. of Ophthalmology, St. Peters Medical College Hospital and Research Institute, Hosur, Tamil Nadu, India<sup>3</sup>Dept. of General Medicine, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

## ARTICLE INFO

## Article history:

Received 09-07-2023

Accepted 02-11-2023

Available online 30-03-2024

## Keywords:

Corneal ulcer

Aspergillus species

Staphylococcus aureus

## ABSTRACT

**Aim:** To study the demographic factors, risk factors, microbiological profile and clinical course of patients with corneal ulcer presenting to Minto Regional institute of ophthalmology Bangalore.**Materials and Methods:** A total of 876 patients diagnosed with infective corneal ulcer from January 2018 to January 2020 were retrospectively reviewed and analyzed for demographic profile, risk factors, clinico-microbiological profile at Minto Regional institute of ophthalmology Bengaluru.**Results:** Among the 876 patients, 596 (68.04%) were male and 280 (31.96%) were females. 613(69.97%) were in the age group of 51-60 years. 85.04% belonged to low socioeconomic class. History of injury from vegetative matter was the leading cause and was seen in 264(30.14%) patients. Among the 613 (69.98%) culture positive patients, 410 (46.81%) were positive for fungi, while 203 (23.17%) were positive for bacteria. 674(76.94%) out of 876 responded to conservative management alone, while 202 (23.06%) patients required therapeutic penetrating keratoplasty.**Conclusion:** Fungal corneal ulcers caused by Aspergillus were the most common type, followed by bacterial corneal ulcers due to Staphylococcus aureus. Incidence of fungal corneal ulcer is very high among agricultural and industrial workers. Lack of awareness and delayed treatment leads to corneal blindness. This emphasizes the need for awareness among at risk population and also shall guide clinicians in decision making regarding empirical treatment.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

## 1. Introduction

Every Year 1.5 to 2 million patients are losing the vision due corneal blindness making it second leading cause of blindness after cataract.<sup>1</sup> Infectious keratitis is a serious concern attributing to ocular morbidity in developing countries like India and majority of the complications can be prevented, if intervened early.<sup>2</sup> As the treatment requires topical medications for prolonged periods, the cost factor and socioeconomic status play a huge role in management and recovery.

The Microbial agent responsible for infective corneal ulcer varies from region to region. Thus, ophthalmologists need to be aware of local etiological profile of corneal ulcer endemic to the region.

## 2. Materials and Methods

A retrospective study was conducted at Minto Regional institute of ophthalmology Bengaluru, from January 2018 to January 2020. Outpatient, ward and theatre records of 876 patients in the age group between 18 to 70 years with infective corneal ulcer were retrieved, reviewed and analyzed for demographic details, risk factors, clinical and

\* Corresponding author.

E-mail address: [raghugangadar6@gmail.com](mailto:raghugangadar6@gmail.com) (R. Gangadharappa).

microbiological profile. Exclusion criteria includes Cases with non-infectious keratitis due to systemic autoimmune diseases, Mooren's ulcer, phlyctenular keratitis, and vernal keratoconjunctivitis associated shield ulcer, typical viral corneal ulcers were excluded.<sup>3</sup>

After applying the inclusion and exclusion criteria, patient data including age, sex, occupation, socioeconomic status, locality, risk factors, seasonal variation and associated conditions were collected. Slit-lamp examination findings, corneal sensitivity and fluorescein staining of the cornea noted. Microbiological results obtained from corneal scrapings specimen after subjecting to Gram staining and potassium hydroxide (KOH) wet mount preparation for microscopy and culture and sensitivity testing were noted. Empirical treatment was administered to all patients, while awaiting microbiological results and was later modified according to the results and patient response. For those who failed to respond to conservative management and progressively deteriorated, therapeutic penetrating keratoplasty was considered.

### 3. Results

The demographic profile of 876 patients with infective corneal ulcer has been tabulated in Table 1. Among the 876 patients, 596 (68.04%) were males and 280 (31.96%) were females. Majority of patients, 613 (70%) belonged to age group 51-60 years and a significant number i.e., 745 (85.04%) patients belonged to low socioeconomic group and hailed from surrounding rural areas (803, 91.66%) had poor access to health care.

Majority, 526(60.04%) were involved in farming and agricultural activities and thus predisposition for vegetative injury was higher. And there was a seasonal variation with majority of cases (n = 394; 44.98%) reported from the month of July to September.

Among the predisposing factors ocular injuries was the major factor leading to infective corneal ulcer accounting for 614 (70.09%) out of 876 patients. Injury with Vegetative matter 264 (30.14%) during harvesting season was the most common cause followed by wooden material 140 (15.98%), stone particles 114 (13.01%) and animal matter 96 (10.96%) respectively.

The risk factors predisposing to corneal ulceration have been summarised in Table 2.

At the time of presentation to the hospital 620 (70.77%) patients had visual acuity of <3/60 and 256 (29.22%) patients had visual acuity of >3/60 in the affected eye. Also, 657 (75%) had central corneal ulcer, 105 (11.99%) patients had peripheral ulcers while 114 (13.01%) patients had paracentral corneal ulcer.

Upon microbiological investigation 613 (69.98%) out of 876 patients were found to be culture positive. In those culture positive patients fungal organism was isolated in 410 (46.81%) and bacterial organism in 203 (23.17%).

**Table 1:** Demographic profile of corneal ulcer at a tertiary care center in South India (n=876 patients)

S. No.	Demographic characters	Total number of cases (%)
1	<b>Gender</b>	
	Male	596 (68.04%)
	Female	280 (31.96%)
2	<b>Age in years</b>	
	18 - 30	15 (1.71%)
	31 -40	28 (3.19%)
	41 - 50	132 (15%)
	51 - 60	613 (69.97%)
	61 - 70	88 (10%)
3	<b>Socio economic status</b>	
	Lower middle	43 (4.90%)
	Upper lower	88 (10.04%)
	Lower class	745 (85.04%)
	<b>Residence</b>	
	Rural	803 (91.66%)
	Urban	73 (8.33%)
	<b>Occupation</b>	
	Farmer	526 (60.04%)
	Labourer/Industrial worker	219 (25%)
	No Outdoor Work	131 (14.95%)
6	<b>Month of presentation</b>	
	January –March	104 (11.87%)
	April –June	130 (14.84%)
	July –September	394 (44.98%)
	October -December	248 (28.31%)

**Table 2:** Predisposing risk factors for corneal ulcer (n= 876 patients)

S. No.	Risk factors	Number of patients (%)
1	<b>Trauma</b>	614 (70.09%)
	Vegetative trauma (leaf/ grass/ thorn)	264 (30.14%)
	Wooden material	140 (15.98%)
	Animal matter (cow dung/ tail of animal)	96 (10.96%)
	Stone or sand particles	114 (13.01%)
2	<b>Chronic dacryocystitis</b>	88(10.05%)
3	<b>Topical steroids</b>	43 (4.91%)
4	<b>Diabetes Mellitus</b>	87 (9.93%)
5	<b>Lid abnormalities</b>	35 (4%)
6	<b>Pre-existing corneal opacity or degeneration</b>	9 (1.02%)

Most common fungal organism was *Aspergillus* species 211 (24.09%) followed by *Fusarium* species in 199 (22.72%). Out of 203 patients tested positive for bacteria *Staphylococcus aureus* was isolated in 132 (15.07%), *Streptococcus pneumoniae* in 45 (5.14%), and *Pseudomonas* species in 26 (2.97%) patients (Table 3).

**Table 3:** Microbiological profile of organisms causing keratitis

Organism	Number of patients (%)
<i>Staphylococcus aureus</i>	132(15.07%)
<i>Streptococcus</i> species	45(5.14%)
<i>Pseudomonas</i>	26(2.97%)
<i>Aspergillus</i> species	211(24.09%)
<i>Fusarium</i> species	199(22.72%)
No organism	263(30.02%)

#### 4. Discussion

Corneal ulcer is a major predicament haunting developing countries like India due to its prolonged ocular morbidity and consequent visual impairment. Prevalence of different microbial organisms varies based on geographical area and occupation population. So the awareness of microbial organisms prevalent in the local region is important for clinicians to start appropriate empirical treatment. In our study 596 (68.04%) patients were male and females accounted for 280 (31.96%) patients. In the study by Titiyal et al. also there was male preponderance with 75% patients being males.<sup>4</sup> Of the 876 patients, 613 (69.97%) patients belong to age group of the 51-60 years, which is in concord with the findings of Li et al., where 83.21% patients were male.<sup>5</sup>

In the study done by Gupta et al., 65% of the patients were from rural area, similarly a high proportion of patients (91.66%) were from rural background in our study.<sup>6</sup> Fungal keratitis cases were reported more between June to September in a study by Bharathi MJ et al., somewhat uniformly most of the cases (44.98%) in this study were also clustered between July and September. This higher incidence maybe attributed to the harvesting season.<sup>7</sup>

In our study 745 (85.04%) belonged to low socioeconomic group which was in accordance with Bhushan et al. study conducted at Uttar Pradesh and Bihar. People belonging to low socio economic status are mostly engaged in agriculture and manual labor. So these population has higher occupational risk of ocular injury. Moreover, 526 (60.04%) patients were involved in farming activities. This was comparable to studies by Jatoi et al. and Gopinathan et al.<sup>8,9</sup>

History of ocular trauma was seen in 614(70.09%) patients, in our study which was on similar scale to the studies conducted by Assudani et al., Sethi et al., as well as Ranjini and Waddepally.<sup>2,10,11</sup>

Injury by vegetative material was seen in as many as 264 (30.14%) patients in our study group, Similarly in the study conducted at Uttarakhand by Chhange et al had a higher incidence of (23.7%) injury by vegetative material. Visual acuity at the time of presentation was <3/60 in 460 (70.77%) patients which was comparable to the findings of Keshav et al.<sup>12</sup> The culture positivity of 69.98% in our study was on similar lines to that reported by Basak et al<sup>13</sup> and Gopinathan et al.<sup>9</sup>

Upon microbiological studies culture was positive in 613 patients, out of which majority were fungi (410) and 203 were positive for bacteria. This was similar to study by Nath et al, where 60.6% of cases had fungal etiology.<sup>14</sup> This high incidence of fungal ulcer was due to injury by vegetative material in farmer and manual labors. However, in study by Suwal et al bacterial ulcers caused by were more common than fungal ulcers.<sup>15</sup>

In our study, the most common bacterial pathogen detected was *S aureus* (15.07%). Among the 410(46.81%) fungal infections, *Aspergillus* species accounted for 211(24.09%) and *Fusarium* species accounted for 199 (22.72%) of all the cases. Thus, the microbiological etiology has a geographical variation and also determined by the occupational exposure of the study population to different microbes.

**Table 4:** Comparison of causative organisms in different studies

	Our study	Study by Nath et al	Study by Suwal et al
Fungal isolates	46.81%	60.6%	44%
Bacterial isolates	23.17%	-	56%

In a study by Prakash and Kemisetty,<sup>16</sup> 86(64%) out of 134 patients underwent keratoplasty which is significantly higher compared to our study where only 202(23.06%) out of 876 patients underwent therapeutic keratoplasty following a no response or progression in spite of conservative management.

#### 5. Conclusion

Fungal corneal ulcers, especially due to *Aspergillus* species, were the most common type, followed by bacterial corneal ulcers due to Gram-positive bacteria, mainly *Staphylococcus aureus*. Incidence of fungal corneal ulcer is very high among agricultural and industrial workers. Lack of awareness and delayed treatment leads to corneal blindness. This emphasizes the need for awareness among the at-risk population to seek urgent care. Knowledge of the local etiological profile shall guide clinicians in decision making regarding empirical treatment of patients with corneal ulcer.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.


## References

- Whitcher JP, Srinivasan M, Upadhyay MP. Corneal blindness: A global perspective. *Bull World Health Organ* 2001;79(3):214-21. 2001;79(3):214–21.
- Assudani HJ, Pandya JM, Sarvan RR, Sapre AA, Gupta AR, Mehta SJ. Etiological diagnosis of microbial keratitis in a tertiary care hospital in Gujarat. *Natl J Med Res*. 2013;3:60–2.
- Parmar P, Salman A, Kalavathy CM, Kaliyamurthy J, Thomas PA, Jesudasan CA. Microbial keratitis at extremes of age. *Cornea*. 2006;25(2):153–8.
- Titiyal JS, Negi S, Anand A, Tandon R, Sharma N, Vajpayee RB. Risk factors for perforation in microbial corneal ulcers in north India. *Br J Ophthalmol*. 2006;90(6):686–9.
- Li X, Wang L, Dustin L, Wei Q. Age distribution of various corneal diseases in China by histopathological examination of 3112 surgical specimens. *Invest Ophthalmol Vis Sci*. 2014;55(5):3022–8.
- Gupta R, Singh C, Mahajan B, Khurana AK. Microbiological regional profile of infective keratitis. *Indian J Clin Exp Clin Ophthalmol*. 2015;1(4):264–72.
- Bharathi MJ, Ramakrishnan R, Meenakshi R, Padmavathy S, Shivakumar C, Srinivasan M. Microbial Keratitis in South India: Influence of Risk Factors, Climate, and Geographical Variation. *Ophthalmic Epidemiol*. 2007;14(2):61–9.
- Jatoi SM, Qureshi MA, Laghari NA, Dahar MY. Etiologic diagnosis of infective ulcerative keratitis. *Pak J Ophthalmol*. 2002;18:40–43.
- Gopinathan U, Sharma S, Garg P, Rao GN. Review of epidemiological factors, microbiological diagnosis and treatment outcome of microbial keratitis: Experience of over a decade. *Indian J Ophthalmol*. 2009;57(4):273–9.
- Sethi S, Sethi MJ, Iqba R. Causes of microbial keratitis in patients attending an eye clinic at Peshawar. *Gomal J Med Sci*. 2010;8(1):20–2.
- Ranjini CY, Waddepally VV. Microbial profile of corneal ulcers in a tertiary care hospital in South India. *J Ophthalmic Vis Res*. 2016;11(4):363–7.
- Keshav BR, Zacheria G, Ideculla T, Bhat V, Joseph M. Epidemiological characteristics of corneal ulcers in South Sharqiya region. *Oman Med J*. 2008;23(1):34–9.
- Basak SK, Basak S, Mohanta A, Bhowmick A. Epidemiological and microbiological diagnosis of suppurative keratitis in Gangetic West Bengal, eastern India. *Indian J Ophthalmol*. 2005;53(1):17–22.
- Nath R, Baruah S, Saikia L, Devi B, Borthakur AK, Mahanta J. Mycotic corneal ulcers in upper Assam. *Indian J Ophthalmol*. 2011;59(5):367–71.
- Suwal S, Bhandari D, Thapa P, Shrestha MK, Amatya J. Microbiological profile of corneal ulcer cases diagnosed in a tertiary care ophthalmological institute in Nepal. *BMC Ophthalmol*. 2016;16:209.
- Prakash S, Kemisetty R. Prospective evaluation of the clinical profile, treatment outcomes and the demand for corneal transplantation in microbial keratitis: A single centre analysis. *J Vis Sci*. 2015;1(1):22–7.

## Author biography

**Chandraprabha Siddaiah**, Senior Medical Officer

**Anupriya Appandairaju**, Assistant Professor

**Raghu Gangadharappa**, Assistant Professor  <https://orcid.org/0000-0001-9709-3909>

**Cite this article:** Siddaiah C, Appandairaju A, Gangadharappa R. Study of demographic profile, risk factor, clinical profile and microbiological profile of corneal ulcer. *Indian J Clin Exp Ophthalmol* 2024;10(1):85-88.