Epidemiological and Microbiological Profile of Infectious Keratitis in Rural West Bengal

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ABSTRACT

Keratitis, the inflammation of the cornea, remains a global healthcare challenge, particularly in regions with limited medical infrastructure. This study aimed to document the incidence, aetiology, clinical presentations, and treatment outcomes of various infectious and non-infectious keratitis types.

A clinical investigation was conducted between October 2025 and January 2026 across optometry clinics in the North 24 Parganas district, West Bengal. From an initial screening of 237 patients, 71 participants meeting the inclusion criteria were enrolled. Detailed ocular histories and risk factors were analysed, excluding patients with ectatic disorders, dystrophies, or degenerations.

Results revealed that 74.65% (n=53) of cases were infectious, while 25.35% (n=18) were non-infectious. Fungal keratitis was the most prevalent infectious subtype (29.58%), with filamentary keratitis leading the non-infectious group (11.27%). Notably, 60.56% of fungal keratitis patients were agricultural workers, frequently citing vegetative trauma as a primary risk factor.

The study underscores that early; accurate diagnosis is critical to preventing permanent vision loss. Implementing large-scale public awareness programs, particularly targeting rural agricultural populations in West Bengal, is essential to encourage prompt treatment-seeking behaviour and reduce the burden of corneal blindness.

Keywords: *Keratitis, Fungal Keratitis, North 24 Parganas, Agricultural Risk Factors, Blindness Prevention.*

INTRODUCTION

Keratitis is the inflammation of the cornea caused by infectious pathogens or non-infectious stimuli. Essentially, keratitis refers to corneal inflammation. Distinguishing infectious keratitis from non-infectious keratitis is an extremely difficult task. Accurate diagnosis and differentiation are critically important for its treatment.[1] The cornea serves as the primary refractive surface of the eye. Therefore, maintaining its normal transparency is crucial for preserving its overall function.[2] Diseases that cause permanent corneal opacity are a major cause of visual impairment and can sometimes lead to a complete loss of vision.[3] Traumatized, diseased, or immunocompromised corneas increase the risk of fungal keratitis, which typically has an insidious onset and progresses gradually.[4] It can result from trauma, hypersensitivity, post-infectious factors, and post-surgical injury, as well as other immune-mediated reactions. Non-infectious keratitis can also impair vision. Common clinical symptoms of keratitis include vision loss, foreign body sensation, pain, and photophobia. In cases of bacterial keratitis, the virulence of the pathogen and the duration of infection significantly influence the clinical presentation.[5] Infectious keratitis can be caused by bacteria, fungi, viruses, and parasites, and it is a leading cause of corneal blindness. Non-infectious keratitis encompasses various conditions that share some common clinical features but have no known infectious etiology.[6] The clinical manifestations of viral herpetic keratitis can vary depending on which layer of the cornea is affected. Diseases categorized under non-infectious keratitis are often associated with an underlying systemic condition and typically present as chronic conditions with frequent recurrences.[6] The pre-existing health of the cornea and the ocular surface also plays a critical role in its pathogenesis.[7] The aetiology of keratitis varies across different geographical and climatic regions and is largely influenced by the occupations of the local inhabitants.[8] Trauma, contact lens use, chronic ocular surface disorders, and systemic diseases are some of the common risk factors for keratitis.[9] A Northern California-based study estimated the annual incidence of ulcerative keratitis in the United States to be approximately 71,000 to 79,000 cases.[10] In the case of keratitis, having a thorough knowledge of the risk factors and etiological agents is essential for diagnosis, management, and

the prevention of complications.[8] It is estimated that approximately 1.5 to 2 million people in India suffer from corneal ulcers every year.[11] Globally, corneal diseases account for bilateral blindness in 6 to 8 million individuals, the majority of which occur due to secondary complications of infectious keratitis.[12] Complications arising from keratitis account for 5 percent of all cases of blindness-related eye diseases.[8] In developing countries, 48–65% of corneal ulcers are caused by ocular trauma, marking it as a silent epidemic.[13]

That's why, this study was conducted in the rural areas of North 24 parganas, West Bengal, from October 2025 to January 2026, to evaluate and manage various types of keratitis.

AIMS AND OBJECTIVES

1. To document the incidence of various types of infectious and non-infectious keratitis within the study population.
2. To compare the aetiology, clinical signs, and complications between infectious and non-infectious keratitis.
3. To evaluate the treatment outcomes and visual prognosis of patients with keratitis.
4. To implement public awareness programs to educate high-risk individuals on the prevention and timely management of microbial keratitis.

MATERIALS AND METHODS

Following approval from the Ethics Committee, this descriptive observational study was conducted in the rural areas of North 24 Parganas district, West Bengal. During the study, a total of 237 patients were examined across various optometry clinics in the district. From October 2025 to January 2026, all patients diagnosed with keratitis were enrolled in the study after obtaining written informed consent. Patients with other corneal conditions, such as ectatic disorders, corneal dystrophy, and corneal degeneration, were excluded.

Following informed consent, seventy-one (71) participants were enrolled in the study. A detailed history was recorded, including relevant ocular and physical conditions, risk factors, and treatments. Visual acuity was recorded both uncorrected (UCVA) and best-corrected (BCVA) using a Snellen chart. An anterior segment examination was performed using a slit-lamp biomicroscope. Fluorescein staining was conducted to determine the extent of corneal epithelial involvement. Anterior segment findings were documented using frontal and transverse corneal diagrams. Pupil reactions were observed. Whenever possible, fundus examination was performed using 78D/90D lenses and both direct and indirect ophthalmoscopy. Intraocular pressure (IOP) was measured digitally. Lacrimal sac syringing was performed for participants with infectious keratitis. In cases of suspected bacterial and fungal keratitis, corneal scrapings were collected from the leading edge and base of the ulcer using a sterile blade in a sterile environment by the clinic's ophthalmologist, Dr. Pradip Kumar Das. This procedure was carried out under topical anaesthesia using lignocaine-4%.

Infectious and non-infectious keratitis were diagnosed based on clinical and microbiological findings. Herpetic keratitis was diagnosed based on clinical findings and fluorescein staining. Fungal keratitis was identified based on patient history and clinical findings. Depending on the clinical features and microbiological diagnosis, treatment was initiated with topical and systemic antibiotics or anti-viral medications, along with lubricating eye drops or ointments as directed. Moxifloxacin 0.5% eye drops were prescribed for suspected bacterial ulcers. In cases where there was no response to medication, it was used in combination with Tobramycin (0.3%). The dosage of the medication depended on the clinical condition. The primary treatment for fungal corneal ulcers was Natamycin 5% eye drops. For ulcers where mixed infection was clinically suspected or indicated through scraping, a combined treatment of both antibacterial and antifungal medications was administered. The patient's response was re-evaluated based on the signs of inflammation and relief of the patient's symptoms.

Information regarding the use of medications such as Acyclovir 3% eye ointment for viral keratitis, Acyclovir 3% topical eye ointment and oral Acyclovir for Herpes Zoster, topical steroids (Prednisolone 1%) for stromal and endothelial complications, and Atropine Sulphate 1% eye ointment as supportive therapy for bacterial and fungal keratitis has been presented.

In the presence of hypopyon, patients were administered systemic carbonic anhydrase inhibitors to prevent and treat secondary glaucoma. For filamentary keratitis, lubricating eye ointments were provided alongside the diagnosis and management of the underlying cause. In cases of infectious crystalline keratopathy, patients were treated with Ofloxacin 0.3% eye drops four times daily. For vernal keratoconjunctivitis, topical Olopatadine 0.1% was administered three times daily throughout the allergy season, and Fluorometholone 0.1% or Dexamethasone 0.1% eye drops were used for 1–2 weeks to relieve acute symptoms, depending on the severity of the inflammation.

In the case of adenoviral keratoconjunctivitis, lubricating eye drops such as Carboxymethylcellulose 1% were administered. For the treatment of Mooren's ulcer, a combination eye drop containing Dexamethasone 1 mg, Polymyxin B 5000 IU, and Chloramphenicol 4 mg was used until the condition improved. Lubricating eye ointments, such as Hydroxypropyl Methylcellulose 2%, were prescribed for nighttime use.

The first follow-up of the study was conducted one week after the initiation of therapy, and the second follow-up took place after 2–3 weeks. The response to treatment was evaluated. Visual acuity was recorded, and any changes in vision were documented. Whenever possible, patients were followed up until the complete healing of the ulcer. To prevent recurrence, topical antimicrobial use was continued for one week following complete healing in cases of bacterial corneal ulcers, and for two weeks in cases of fungal corneal ulcers. Participants who required surgical intervention were referred to a tertiary care hospital. The collected data were used for statistical analysis.

RESULTS

A total of 71 participants were included in this study. Among them, 53 (74.65%) were affected by infectious keratitis, while only 18 (25.35%) had non-infectious keratitis. Among these participants, fungal keratitis accounted for the highest proportion of infectious keratitis cases at 29.58%. In the category of non-infectious keratitis, the incidence of filamentary keratitis was the highest, at 11.27%. [Table: 1]

Diagnosis	Infectious keratitis							Total
	Bacterial	Fungal	Herpes Zoster	Herpes Simplex	Adenoviral	Crystalline Keratopathy	Bacterial + Fungal	
Total	10	21	8	7	3	2	2	53
Percentage	14.08%	29.58%	11.27%	9.86%	4.23%	2.82%	2.82%	74.65%
Diagnosis	Non-infectious keratitis							Total
	Filamentary keratopathy		Punctate keratitis		Vernal keratoconjunctivitis		Mooren's ulcer	
Total	8		4		3		3	18
Percentage	11.27%		5.63%		4.23%		4.23%	25.35%

Table 1: Etiological distribution of keratitis

The study revealed that in the majority of keratitis cases—both infectious and non-infectious—the prevalence was higher in males (47 cases; 66.19%) compared to females (24 cases; 33.81%). [Table: 2]

	Male	Percentage	Female	Percentage	Total	Percentage
Infectious Keratitis	36	50.70%	17	23.95%	53	74.65%
Non-Infectious Keratitis	11	15.49%	7	9.86%	18	25.35%
Total	47	66.19%	24	33.81%	71	100%

Table 2: Sex wise distribution of keratitis

A total of 71 participants in this study suffered from various types of keratitis, including both infectious and non-infectious forms. **Farmers** were the most frequently affected group compared to other professions, accounting for approximately **43 cases (60.56%)**. [Table 3]

Occupations	House Wife	Farmer	Gardener	Other Workers	Total
Keratitis	7	43	13	8	71
Percentage	9.86%	60.56%	18.31%	11.27%	100%

Table 3: Occupation wise keratitis sufferer

Bilateral involvement was observed in 12 participants (16.90%), with non-infectious keratitis being significantly more prevalent among these cases. Unilateral involvement was found in 59 participants (83.10%), where infectious keratitis was significantly more common. In this study, 37 participants (52.11%) presented with right-eye involvement, while 22 participants (30.99%) presented with left-eye involvement. [Table 4]

	Bilateral	Percentage	Unilateral	Percentage	Total	Percentage
Infectious keratitis	**5**	**7.04%**	**48**	**67.61%**	**53**	**74.65%**
Non-infectious keratitis	**7**	**9.86%**	**11**	**15.49%**	**18**	**25.35%**
Total	**12**	**16.90%**	**59**	**83.10%**	**71**	**100%**

Table 4: Ocular involvement by keratitis

In this study, 53 patients with infectious keratitis were treated with Ofloxacin 0.3% eye drops four times daily, or administered topical Olopatadine 0.1% three times daily throughout the allergy season. Additionally, to control acute inflammation, Fluorometholone 0.1% or Dexamethasone 0.1% eye drops were prescribed for approximately 1–2 weeks, depending on the severity of the condition. For nighttime use, lubricating eye ointments such as Hydroxypropyl Methylcellulose 2% were also provided before sleep.

The initial follow-up was conducted one week after the start of therapy, followed by a second follow-up at 2–3 weeks. Treatment response was evaluated, and visual acuity was recorded along with any documented changes in vision. Whenever feasible, patients were followed up until the corneal ulcers had completely healed. [Table 5]

	Bilateral	Recovery %	Unilateral	Recovery %	Total
Infectious keratitis	**5**	**–**	**48**	**–**	**53**
Treated in 1st Follow up	**1**	**1.41%**	**29**	**40.85%**	**30(42.25%)**
Treated in 2nd Follow up	**2**	**2.82%**	**12**	**16.90%**	**14(19.72%)**
Total	**3**	**4.23%**	**41**	**57.75%**	**44(61.97%)**

Table 5: Visual acuity improvement with infectious keratitis recovery rate

To prevent recurrence, topical antimicrobial therapy was continued for one week following complete healing in cases of bacterial corneal ulcers, and for two weeks in cases of fungal corneal ulcers. Participants who required surgical intervention were referred to a tertiary care hospital. The collected data were utilized for statistical analysis.

In the majority of cases in this study, the condition was managed medically, and surgical intervention was not required. Following treatment, an improvement in visual acuity was observed in all instances. Approximately 80% of the participants were managed through conservative medical therapy, showing significant visual improvement after receiving the appropriate treatment.

DISCUSSION

The present study describes the clinical presentations and management protocols of 71 cases of infectious and non-infectious keratitis in the rural areas of the North 24 Parganas district of West Bengal. The clinical manifestations of keratitis vary depending on demographic factors and geographical regions.[14]

While numerous studies are available on the various types of keratitis, none have collectively addressed both infectious and non-infectious cases. In India, corneal blindness resulting from keratitis has emerged as a major yet preventable public health concern.[15]

Appropriate and timely intervention can significantly reduce the risk of corneal damage and permanent vision loss in patients. Beyond the clinical morbidity caused by keratitis, the disease also subjects patients and their families to severe financial hardship, particularly within the context of a developing nation like India.[16]

As demonstrated in Table 2 of our study, the incidence of infectious keratitis (74.65%) was observed to be higher than that of non-infectious keratitis (25.35%). In both categories, males were affected more frequently than females. However, the gender distribution between infectious and non-infectious keratitis was not statistically significant in our study. Unilateral involvement was observed in 59 cases, while bilateral involvement was seen in 12 cases (Figure 4).

In cases of non-infectious keratitis, bilateral involvement was observed in 7 out of 12 cases, which was statistically significant (Table 4).

However, studies on non-infectious keratitis conducted by Zegans et al.[18], Yang et al.[19], Chen et al.[20], and Mathur et al.[21]reported a predominance of unilateral involvement. Similarly, studies on infectious keratitis by Raju et al.[22]and Bharathi et al.[17] also observed that the majority of cases involved only one eye.

Table 1 illustrates the etiological distribution of the cases. Fungal keratitis comprised the highest number of patients (29.58%), followed by bacterial keratitis (14.08%); a single case of mixed bacterial and fungal infection was also recorded. In this study, fungal keratitis accounted for a proportion of 29.58% (21 cases). Among those affected by fungal keratitis, 60.56% were agricultural workers, and vegetative trauma was identified as a common predisposing risk factor.

CONCLUSION:

The study demonstrates that various types of keratitis and their associated risk factors differ across age groups and occupations. Among infectious cases, fungal and bacterial keratitis resulting from mechanical trauma were the most prevalent. In non-infectious cases, filamentary keratitis was most frequent among patients with a history of long-term ocular medication use. To achieve favourable visual outcomes, identifying the aetiology and ensuring timely, appropriate management is critical.

Early and accurate diagnosis is an essential step toward preventing future blindness. In the rural populations of North 24 Parganas and other agricultural and industrial sectors of West Bengal and India, raising awareness is a necessary measure for blindness prevention. Personal hygiene must be strictly maintained; hands and face should be washed with soap before and after working in industrial or agricultural fields. Additionally, individuals should refrain from frequently touching their face and eyes and must wear protective eyewear during work.

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