Research Article

Keratitis In Rural West Bengal: Risk Factors, Diagnostic Challenges, And Management Strategies

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ABSTRACT

The management of keratitis remains a significant challenge globally—particularly in low- and middle-income countries, where healthcare resources are inadequate. Although treatment outcomes have improved significantly in recent times, the condition of many patients continues to deteriorate despite the application of optimal therapeutic regimens. Comprehensive public awareness programs are therefore essential to alert individuals at risk of microbial keratitis and to encourage them to seek prompt medical attention.The objectives of this endeavor are to document cases of various types of infectious and non-infectious keratitis, and to discern the distinctions among their etiologies, clinical signs and symptoms, and complications.The primary objective of this study was to review the outcomes of keratitis treatment. During the course of this study, a total of 261 patients were examined at various optometry clinics in the West Nadia district. Between April 2023 and July 2023, all patients diagnosed with keratitis were enrolled in this study following the acquisition of written informed consent.Patients with corneal disorders other than keratitis—such as ectatic disorders, corneal dystrophies, and corneal degenerations—were excluded from this study. A total of 65 participants were enrolled in the study following the provision of informed consent.A detailed history regarding the participants' ocular and associated systemic conditions, risk factors, and treatment management was recorded. Among the total participants, 54 (83.08%) were affected by infectious keratitis, while only 11 (16.92%) were affected by non-infectious keratitis.Among these participants, fungal keratitis accounted for the highest proportion of total infectious keratitis cases—29.23%. Conversely, regarding non-infectious keratitis, filamentary keratitis represented the highest incidence—7.69%. In this study, the proportion of fungal keratitis was 29.23% (19 cases).61.54 percent of patients suffering from fungal keratitis were agricultural laborers; in this context, injury caused by vegetative matter (vegetative trauma) has been identified as a common predisposing risk factor. Early and accurate diagnosis of the disease is an essential step to prevent future blindness.Fostering proper awareness among the rural population of the western part of Nadia district in West Bengal—particularly among those employed in various agricultural sectors across India—is an extremely necessary step for the prevention of blindness.

Keywords: infectious keratitis; non-infectious keratitis;vegetative trauma; agricultural laborers; WestNadia district; West Bengal.

INTRODUCTION

The cornea serves as the eye's primary refractive surface. Therefore, maintaining its natural transparency is crucial for preserving its functionality.[1] Conditions that result in permanent corneal opacity constitute one of the leading causes of vision loss; in some instances, this may even lead to total blindness.[2]Keratitis refers to inflammation of the cornea, which is caused by either infectious pathogens or non-infectious stimuli. Simply put, keratitis is inflammation of the cornea. Distinguishing between infectious and non-infectious keratitis is an extremely difficult task.For its management, accurate diagnosis—and its differentiation from other conditions—is of paramount importance.[3] Infectious keratitis can be caused by bacteria, fungi, viruses, and parasites, and it plays a major role in corneal blindness. Non-infectious keratitis constitutes a group of conditions that, while sharing certain common clinical features, have no known specific infectious cause.[4]It may arise as a result of injury, hypersensitivity, post-infectious complications, post-surgical trauma, and other immune-mediated reactions. Non-infectious keratitis can also adversely affect vision. Common clinical symptoms of keratitis include diminished vision, a sensation of having a foreign body in the eye, pain, and photophobia (sensitivity to light).In bacterial keratitis, the virulence of the causative pathogen and the duration of the infection primarily determine the manifestation of symptoms.[5] A traumatized, diseased, or immunocompromised cornea increases the risk of fungal keratitis, which typically has an insidious onset and slow progression.[6]In cases of viral herpetic keratitis, various types of symptoms manifest depending on the specific structures of the cornea affected. Conditions falling under the category of non-infectious keratitis are often associated with an underlying systemic condition, typically presenting as a chronic, recurrent disorder.[4]

The causes of keratitis vary geographically and climatically, and are also largely correlated with the occupations of the inhabitants of the affected regions.[7] The pre-existing health status of the cornea and the ocular surface also plays a crucial role in its pathogenesis and development.[8]Injury, contact lens use, and chronic conditions affecting the ocular surface or overall systemic health are some of the commonly observed risk factors for keratitis.[9] It is estimated that approximately 1.5 to 2 million people in India suffer from corneal ulcers annually.[10]A study based in Northern California has estimated

the annual incidence of ulcerative keratitis in the United States to be 71,000 cases.[11] Worldwide, corneal diseases are responsible for bilateral blindness in 6 to 8 million people, the vast majority of which are the result of sequelae following infectious keratitis.[12]It has been reported that 48–65 percent of corneal ulcer cases in developing countries are caused by eye injuries, characterizing this condition as a 'silent epidemic.[13]Ocular morbidity resulting from blindness caused by complications of keratitis accounts for 5% of total reported cases.[7] In the context of keratitis, a thorough understanding of its risk factors and causative agents is crucial for diagnosis, management, and the prevention of complications.[7]Therefore, this descriptive observational study was conducted in the rural areas of the West Nadia district of West Bengal from April to July 2023, with the aim of assessing and managing various types of keratitis.

Aims and Objectives

a. To document the incidence of various types of infectious and non-infectious keratitis. b. To understand the distinctions among the etiology, clinical manifestations, and complications of keratitis. c. To review the treatment outcomes of keratitis. d. To provide health education regarding the prevention and management of keratitis.

MATERIALS AND METHODS

Following approval from the Ethics Committee, this descriptive observational study was conducted in the rural areas of the West Nadia district in West Bengal. During the course of this study, a total of 261 patients were examined at various optometry clinics across the West Nadia district. Between April 2023 and July 2023, all patients diagnosed with keratitis who provided written and informed consent were included in this study.Patients suffering from corneal problems other than keratitis—such as ectatic disorders, corneal dystrophies, and corneal degenerations—were excluded from this study.Following informed consent, sixty-five (65) participants were enrolled in this study. A detailed history—including relevant ocular and physical conditions, risk factors, and treatment regimens—was recorded. Visual acuity was measured and recorded, both with and without spectacles or assistive devices, using a Snellen chart.Examination of the anterior segment of the eye is performed using a slit-lamp biomicroscope. Fluorescein staining is conducted to assess the extent of involvement of the corneal epithelium, or outermost layer.Observations of the anterior segment of the eye were documented using images of the anterior and cross-sections of the cornea. Pupillary reactions were observed. Whenever possible, the fundus was examined using 78D/90D lenses, as well as direct and indirect ophthalmoscopes.Intraocular pressure (IOP) was measured using a digital method. Lacrimal sac syringing was performed on participants suffering from infectious keratitis.In cases of suspected bacterial or fungal keratitis, Dr. Pradip Kumar Das, the clinic's ophthalmologist, collected corneal scrapings from the leading edge and base of the ulcer using a sterile blade, while strictly adhering to aseptic precautions. This procedure was performed under topical anesthesia following the administration of 0.5% Proparacaine.

Infectious and non-infectious keratitis were diagnosed based on clinical and microbiological findings. Herpetic keratitis was identified based on clinical findings and fluorescein staining. Fungal keratitis was identified based on the patient's history and clinical findings.Based on clinical features and microbiological diagnosis, and in indicated cases, treatment management was initiated using topical and systemic antibiotics or antiviral medications, alongside lubricating eye drops or ointments.Moxifloxacin 0.5% eye drops were administered in cases where a bacterial ulcer was suspected. In instances where the drops proved ineffective, they were administered in combination with Tobramycin (0.3%). The dosage of the drops depended on the patient's physical condition. In cases of fungal corneal ulcers, Natamycin 5% eye drops were administered as the primary treatment.In cases where a mixed infection was suspected—either clinically or based on scraping results—a combination therapy comprising both antibacterial and antifungal medications was administered. The patient's response was subsequently re-evaluated based on the alleviation of inflammatory signs and clinical symptoms. In cases of viral keratitis, treatment was initiated with Acyclovir 3% eye ointment, administered five times daily.In cases of Herpes Zoster, based on the patient's physical condition, oral Acyclovir 800 mg was administered five times daily for seven days, in conjunction with Acyclovir 3% topical eye ointment applied five times daily. In cases involving stromal and endothelial involvement, topical steroids (Prednisolone 1%) were prescribed, with the dosage adjusted according to the extent of involvement.All patients suffering from bacterial and fungal keratitis received supportive treatment consisting of 1% Atropine Sulfate eye ointment, administered three times daily. In cases where a 'hypopyon' (accumulation of pus within the eye chamber) was present in the patients' eyes, 'systemic carbonic anhydrase inhibitors' were administered to prevent and treat secondary glaucoma.In cases of 'filamentary keratitis,' the use of lubricating eye ointments was advised, alongside the identification of the underlying cause of the disease and its management. Patients with 'infectious crystalline keratopathy' were treated with 0.3% ofloxacin eye drops four times daily.In cases of Vernal Keratoconjunctivitis, 0.1% topical olopatadine was administered three times daily during the allergy season; additionally—taking into account the severity of the disease and the degree of inflammation—0.1% Fluorometholone or 0.1% dexamethasone eye drops were prescribed for a period of approximately 1–2 weeks to control acute symptoms.

Patients suffering from adenoviral keratoconjunctivitis were advised to use lubricating eye drops containing 1% carboxymethylcellulose. Mooren's ulcer was treated with a combination eye drop—containing 1 mg Dexamethasone, 5,000 IU Polymyxin B, and 4 mg Chloramphenicol—and this treatment was continued until an improvement in the patient's condition was observed.The use of a lubricating eye ointment, such as 2% hydroxypropyl methylcellulose, was recommended for use before going to sleep at night.In the study, the first follow-up was conducted one week after the commencement of therapy, and the second follow-up was performed 2–3 weeks later. The response to treatment was evaluated. Visual acuity was recorded, and changes in vision were documented.Whenever possible, patients were followed up until the ulcers had completely healed. To prevent recurrence, the application of topical antimicrobials was continued for one week following complete healing in cases of bacterial corneal ulcers, and for two weeks in cases of fungal ulcers. Participants requiring surgical intervention were referred to a tertiary-level hospital. The collected data were utilized for statistical analysis.

RESULTS

A total of 65 participants were included in this study. Among the total participants, 54 (83.08%) were affected by infectious keratitis, while only 11 (16.92%) had non-infectious keratitis. Among these participants, the proportion of fungal keratitis was the highest relative to all cases of infectious keratitis—29.23%. Conversely, in the case of non-infectious keratitis, the highest incidence was that of filamentous keratitis—7.69%. [Table: 1]

Table 1: Etiological Classification of Keratitis

Diagnosis		Total	%
Infectious keratitis	Bacterial	12	18.46
	Fungal	19	29.23
	Herpes Zoster	10	15.38
	Herpes Simplex	8	12.31
	Adenoviral	2	3.08
	Crystalline Keratopathy	2	3.08
	Bacterial + Fungal	1	1.54
Non-infectious keratitis	Filamentary keratopathy	5	7.69
	Punctate keratitis	3	4.62
	Vernal keratoconjunctivitis	2	3.08
	Mooren’s ulcer	1	1.54
Total		**65**	**100**

In this study, the highest incidence of keratitis—both infectious and non-infectious—was observed among males (39 individuals, or 60%), compared to 26 individuals (40%) among females. [Table: 2]

Table 2: Gender-based Distribution of Keratitis

Sex	Infectious Keratitis	%	Non-Infectious Keratitis	%	Total
Male	33	50.77	6	9.23	39(60%)
Female	21	32.31	5	7.69	26(40%)
Total	**54**	**83.08**	**11**	**16.92**	**65(100%)**

In this study, a total of 65 participants suffered from both infectious and non-infectious forms of keratitis; among them, farmers constituted the largest group—approximately 40 individuals (61.54%)—a figure significantly higher than that of other occupational groups. [Table 3]

Table 3: Individuals with Keratitis by Occupation

Occupations	Keratitis	%
House Wife	4	6.15
Farmer	40	61.54
Gardener	12	18.46
Other Workers	9	13.85
Total	65	100

Problems in both eyes were observed in 6 (9.23%) participants. In cases involving problems in both eyes, the prevalence of non-infectious keratitis was found to be significantly higher. Problems in a single eye were observed in 59 (90.77%) participants.The incidence of infectious keratitis was observed to be significantly higher in cases involving a single eye. In this study, problems were observed in the right eye of 33 (51%) participants and in the left eye of 26 (40%) participants. [Table 4]

Table 4: Eye Affliction Due to Keratitis

Laterality	Infectious keratitis	%	Non-infectious keratitis	%	Total
Bilateral	2	3.08	4	6.15	6(9.23%)
Unilateral	52	80.00	7	10.77	59(90.77%)
Total	**54**	**83.08**	**11**	**16.92**	**65(100%)**

In this study, 54 patients with infectious keratitis were treated with Ofloxacin 0.3% eye drops four times daily; alternatively, Olopatadine 0.1% was administered topically three times daily for a period of 1 to 2 weeks—during the allergy season—to control severe inflammation, supplemented by Fluorometholone 0.1% or Dexamethasone 0.1% eye drops, depending on the severity of the inflammation.Additionally, a lubricating eye ointment—such as Hydroxypropyl methylcellulose 2%—was prescribed for use at bedtime.

In this study, the first follow-up was conducted one week after the commencement of treatment, and the second follow-up was performed after 2–3 weeks. The patients' response to the treatment was evaluated. Visual acuity was measured and recorded, and any changes in vision were noted. Wherever possible, patients were kept under follow-up until their ulcers had completely healed. [Table 5]

Table 5: Improvement in Visual Acuity in Relation to Recovery Rates from Infectious Keratitis

Laterality	Infectious keratitis	Treated in 1st Follow up	Recovery %	Treated in2nd Follow up	Recovery %	Total
Bilateral	02	0	0.00	01	1.54	1(1.54%)
Unilateral	52	12	18.46	34	52.31	46(70.77%)
Total	**54**	**12**	**18.46**	**35**	**53.85**	**47(72.71%)**

To prevent recurrence of the disease, the application of topical antimicrobial medications was continued for an additional week following complete healing in cases of bacterial corneal ulcers, and for two weeks in cases of fungal ulcers. Participants requiring surgical intervention were referred to a tertiary-level hospital. The collected data were subjected to statistical analysis.

In this study, medical management was employed in the majority of cases. In no instance was surgical intervention required. In the post-treatment phase, an improvement in visual acuity was observed in every case. Approximately 80 percent of the participants were treated through medical management, and their vision improved following appropriate treatment.

DISCUSSION

The present study describes the symptoms and management of 65 patients suffering from infectious and non-infectious keratitis in the rural areas of the western part of the Nadia district in West Bengal. Variations in the symptoms or clinical presentation of keratitis are observed depending on demographic and geographical differences.[14]Although extensive research exists regarding various distinct types of keratitis, no study has yet presented data on patients suffering from both infectious and non-infectious forms of the condition in a combined manner. In India, corneal blindness caused by keratitis has emerged as a serious yet preventable public health issue.[15]If appropriate and timely medical treatment is arranged, the risk of corneal damage and vision loss in patients can be significantly reduced. In addition to causing physical illness or complications, keratitis also imposes a financial burden on patients and their families—particularly in the context of a developing country like India.[16]

In our study, as indicated by the data presented in Table 2, a higher prevalence of infectious keratitis (83.08%) was observed compared to non-infectious keratitis (16.92%). In both infectious and non-infectious forms of keratitis, the number of male patients exceeded that of female patients. However, in our study, the gender distribution regarding infectious and non-infectious keratitis was not statistically significant. Keratitis was observed in one eye in 59 cases and in both eyes in 7 cases (Table 4).In cases of non-infectious keratitis, both eyes were observed to be affected in 4 out of 11 instances, which is statistically significant (Table 4). However, in studies on non-infectious keratitis conducted by Zegans et al. [18], Yang et al.[19], Chen et al.[20], and Mathur et al.[21], the cases of involvement were unilateral—or limited to only one eye.Similarly, in studies on infectious keratitis conducted by Raju et al.[22] and Bharathi et al.[17], unilateral ocular involvement was observed in the majority of cases. Table 1 presents the etiological distribution of the cases of infection.Among the affected individuals, the highest proportion was attributed to fungal keratitis (29.23%), followed by bacterial keratitis (18.46%); additionally, one case of mixed keratitis—caused by both bacteria and fungi—was also identified. In this study, the proportion of fungal keratitis was 29.23% (19 cases).Among those affected by fungal keratitis, 61.54% were agricultural workers; in this context, vegetative trauma has been identified as a common predisposing or risk factor.

CONCLUSION:

This study revealed that different types of keratitis (inflammation of the cornea) are observed among people of various age groups and professions, and their associated risk factors are also diverse. Within the category of infectious keratitis, fungal keratitis and bacterial keratitis were identified as the most prevalent types, frequently occurring as complications following mechanical eye injuries.Conversely, in cases of non-infectious keratitis, 'filamentary keratitis'—typically associated with a history of prolonged topical medication use—was the most prevalent form. To ensure optimal visual outcomes, accurately diagnosing the underlying cause of keratitis, along with its timely and appropriate management, is of paramount importance.Accurate and proper diagnosis at the early stages of a disease is an essential step toward preventing blindness in the future. Fostering adequate awareness among the rural population of the West Nadia district in West Bengal is a mandatory measure for the prevention of blindness—particularly for those individuals engaged in various agricultural and industrial sectors across West Bengal and India. Personal hygiene and sanitary practices must be strictly and properly observed.Before commencing work in industrial or agricultural settings, and again upon completion, hands and face must be thoroughly washed with soap. One should refrain from repeatedly touching the face and eyes with one's hands. Safety goggles or eyewear must be worn while working.

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