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Investigating microbial keratitis: A comprehensive clinical and laboratory approach in a tertiary care setting

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Abstract
Introduction: Microbial keratitis is a serious ocular condition that can lead to significant visual impairment. This study aims to analyze the epidemiology, clinical features, microbiological profiles, and treatment outcomes of microbial keratitis in a tertiary care setting.
Material and Methods: A retrospective observational study was conducted at the Ophthalmology Department of Mamata Medical College, Khammam, involving 50 patients with clinically diagnosed microbial keratitis. Data on demographics, clinical presentation, history of contact lens use, associated ocular and systemic conditions, and visual acuity were collected. Microbiological analyses included Gram staining, KOH wet mount, and cultures on blood agar, chocolate agar, and Sabouraud dextrose agar. Treatment efficacy and patient outcomes were also evaluated.
Results: The study included 50 patients, with a mean age of 45.3 years and a male predominance (60%). Contact lens use was reported in 30% of cases. The most common presenting symptoms were pain, redness, and blurred vision. Microbiological analysis revealed bacterial growth in 44% on blood agar and 40% on chocolate agar, predominantly with *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Fungal elements were identified in 30% of cases on Sabouraud dextrose agar, primarily *Candida* spp. and *Fusarium* spp. Treatment outcomes varied based on the causative organism and initial visual acuity.
Conclusions: This study highlights the diverse etiology and complex clinical presentation of microbial keratitis in a tertiary care setting. The findings emphasize the importance of comprehensive diagnostic approaches and targeted treatment strategies. Improved understanding of microbial keratitis can lead to better management and outcomes for affected patients.

Keywords: Microbial keratitis, epidemiology, clinical features, microbiological profile, tertiary care

Introduction

Microbial keratitis, a severe infection of the cornea, presents a significant public health challenge due to its potential to cause rapid corneal destruction and consequent loss of vision. The incidence of microbial keratitis varies globally, with a higher prevalence in certain geographic regions, particularly in developing countries and in areas with warmer climates. Earlier studies have [1, 2] have extensively documented these variations and the associated risk factors, including socioeconomic status, healthcare access, and environmental conditions. Additionally, lifestyle factors such as the use of contact lenses have been implicated in the increased risk of developing microbial keratitis, as explored in studies by Dart *et al.* [3].

The pathogens responsible for microbial keratitis are diverse, encompassing a wide range of bacteria, fungi, viruses, and protozoa. This diversity poses significant diagnostic and therapeutic challenges, as the clinical presentation can vary greatly depending on the causative agent [4]. As Dahlgren *et al.* noted, the overlapping symptoms and signs of microbial keratitis necessitate a detailed and methodical approach to diagnosis and treatment. Traditional diagnostic methods, such as culture and sensitivity testing, have limitations in terms of time, sensitivity, and specificity [5].

Recent advancements in diagnostic technologies have opened new avenues for the rapid and accurate identification of pathogens in cases of microbial keratitis. Techniques like polymerase chain reaction (PCR), *in-vivo* confocal microscopy, and next-generation sequencing have revolutionized the field, offering greater diagnostic precision and faster turnaround times.

Several studies have demonstrated the efficacy of these advanced techniques in identifying elusive and atypical pathogens, thereby facilitating timely and appropriate treatment interventions [6]. Despite these advancements, there remains a gap in the comprehensive understanding of microbial keratitis, particularly in the context of a tertiary care setting where the most severe and complex cases are often seen. This study aims to fill this gap by conducting a thorough clinical and laboratory investigation of microbial keratitis cases in such a setting. We intend to examine the epidemiology, clinical manifestations, microbiological profiles, and treatment outcomes of this condition. By doing so, we intend to employ advanced diagnostic methods to identify the causative pathogens accurately and evaluate the effectiveness of various treatment strategies. This study aims to enhance diagnostic accuracy, optimize treatment approaches, and ultimately improve patient outcomes in managing this potentially sight-threatening condition.

Materials and Methods

Study Design and Setting: This is a retrospective observational study conducted at the Ophthalmology Department of Mamata Medical College, Khammam. The study period spans one year, during which data from 50 patients diagnosed with microbial keratitis were analyzed.

Sample Size: A total of 50 patients with clinically suspected microbial keratitis were included in the study. The sample size was determined based on the average number of cases presenting to the department within a year, ensuring a sufficient number of cases to achieve statistical significance.

Inclusion Criteria: Patients diagnosed with microbial keratitis based on clinical symptoms and signs (such as corneal stromal infiltration, epithelial defect, and ocular pain) were included. Both inpatients and outpatients of any age and gender were eligible.

Exclusion Criteria: Patients with a history of keratitis due to non-infectious causes, such as autoimmune disorders, were excluded. Additionally, cases lacking complete medical records or those who did not consent to participate in the study were excluded.

Data Collection: Clinical data, including patient demographics, presenting symptoms, history of contact lens use, and any associated ocular or systemic conditions, were collected from medical records. The duration of symptoms before presentation and visual acuity at presentation were also noted.

Diagnostic Procedures: All patients underwent a detailed ophthalmic examination. Corneal scrapings were collected from the affected eye using a sterile blade under a slit-lamp microscope. Samples were subjected to microbiological analysis, including Gram staining, potassium hydroxide (KOH) wet mount, culture on blood agar, chocolate agar, and Sabouraud dextrose agar.

Treatment and Follow-Up: Patients were treated based on the initial clinical diagnosis and modified according to culture and sensitivity results. Treatment regimens included topical and systemic antimicrobials. The choice of antimicrobials was based on the severity of the infection, suspected causative organisms, and local resistance patterns. Patients were followed up at regular intervals to monitor the response to treatment and document any complications.

Statistical Analysis: Data were analyzed using appropriate statistical methods. Descriptive statistics were used to summarize patient demographics, clinical characteristics, and microbiological findings. The effectiveness of various treatment regimens was evaluated by comparing the initial and follow-up visual acuities and healing times.

Ethical Considerations: The study was conducted in accordance with the ethical guidelines of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of Mamata Medical College, Khammam. Informed consent was obtained from all participants or their guardians in the case of minors.

Results

Table 1: Demographic Characteristics of Patients with Microbial Keratitis

Demographic Parameter	Total Patients (N=50)	Mean ± SD	P-value
Age (years)		45.3±15.6	<0.05
Gender			
- Male	30 (60%)		
- Female	20 (40%)		
History of Contact Lens Use			
- Yes	15 (30%)		
- No	35 (70%)		
Visual Acuity at Presentation			
- ≤20/40	25 (50%)		
- >20/40 to ≤20/200	15 (30%)		
- >20/200	10 (20%)		

This table summarizes the demographic data of 50 patients with microbial keratitis. It includes age (mean 45.3 years, SD 15.6, p-value <0.05), indicating a wide age range and statistical significance of age in the condition. Gender distribution shows a higher prevalence in males (60%) compared to females (40%). The history of contact lens use is reported by 30% of the patients, highlighting its potential role as a risk factor. Visual acuity at presentation is categorized into three groups, with 50% having moderate visual impairment (≤20/40). These demographics provide insights into the characteristics of patients affected by microbial keratitis and the significance of these factors in the study.

Table 2: Presenting Symptoms of Patients with Microbial Keratitis

Presenting Symptom	Total Patients (N=50)	Mean Duration (days) ± SD	P-value
Pain	45 (90%)	3.2±1.5	<0.01
Redness	40 (80%)	3.0±1.2	<0.01
Discharge	25 (50%)	2.8±1.4	<0.05
Photophobia	30 (60%)	2.5±1.3	<0.05
Blurred Vision	35 (70%)	3.5±1.6	<0.01
Foreign Body Sensation	20 (40%)	2.7±1.1	<0.05

This table displays the presenting symptoms and their duration among the 50 patients diagnosed with microbial keratitis. Pain was the most common symptom, reported by 90% of patients, with a mean duration of 3.2 days (SD: 1.5

days, p-value <0.01), indicating its significance as an early indicator of the condition. Redness and blurred vision were also frequently reported (80% and 70% respectively), with both symptoms showing statistically significant mean durations (p-value <0.01). Discharge, photophobia, and foreign body sensation were present in 50%, 60%, and 40% of the patients respectively, with their durations also being statistically significant (p-value <0.05). These findings highlight the common symptoms and their durations in microbial keratitis, providing valuable information for early diagnosis and management.

Table 3: History of Contact Lens Use and Associated Conditions in Patients with Microbial Keratitis

Parameter	Total Patients (N=50)	P-value
History of Contact Lens Use		
- Yes	15 (30%)	<0.05
- No	35 (70%)	
Associated Ocular Conditions		
- Dry Eye Syndrome	10 (20%)	<0.05
- Previous Corneal Trauma	8 (16%)	<0.05
- Ocular Surface Disease	12 (24%)	<0.05
Associated Systemic Conditions		
- Diabetes Mellitus	6 (12%)	<0.05
- Immunocompromised State	5 (10%)	<0.05
- Other Systemic Conditions	4 (8%)	<0.05

This table provides information on the history of contact lens use and the presence of associated ocular or systemic conditions in 50 patients with microbial keratitis. Contact lens use is reported in 30% of the patients, and this factor shows statistical significance (p-value <0.05), suggesting its role as a risk factor in the development of microbial keratitis. Regarding associated ocular conditions, dry eye syndrome is noted in 20%, previous corneal trauma in 16%, and ocular surface disease in 24% of the patients. Each of these conditions has a p-value <0.05, indicating their potential contribution to the susceptibility to microbial keratitis. In terms of systemic conditions, diabetes mellitus is present in 12% of patients, immunocompromised state in 10%, and other systemic conditions in 8%. These too have significant p-values (<0.05), highlighting the influence of systemic health on the risk of developing microbial keratitis.

Table 4: Microbiological Analysis Results in Patients with Microbial Keratitis

Microbiological Test	Positive Results	Total Patients (N=50)	Percentage (%)
Gram Staining			
- Gram-Positive Bacteria	18	36%	<0.01
- Gram-Negative Bacteria	12	24%	<0.05
- No Organisms Detected	20	40%	
Potassium Hydroxide (KOH) Wet Mount			
- Fungal Elements	15	30%	<0.01
- No Fungal Elements	35	70%	

This table presents the results of microbiological analyses (Gram staining and KOH wet mount) performed on 50 patients diagnosed with microbial keratitis. The Gram staining results show that 36% of the samples were positive for gram-positive bacteria, while 24% were positive for gram-negative bacteria, both of which are statistically significant (p-values <0.01 and <0.05, respectively). This suggests a notable presence of bacterial infection in these cases. 40% of the samples showed no organisms detected by Gram staining.

For the KOH wet mount test, 30% of the samples were positive for fungal elements, which is statistically significant (p-value <0.01). This indicates a considerable proportion of fungal involvement in the microbial keratitis cases studied. The remaining 70% of the samples showed no fungal elements detected by the KOH wet mount.

Table 5: Results of Microbial Culture and Common Bacteria in Patients with Microbial Keratitis

Culture Medium	Positive Cultures	Common Bacteria Identified	Total Patients (N=50)	P value
Blood Agar				
Bacterial Growth	22	*Staphylococcus aureus* (8), *Pseudomonas aeruginosa* (6), *Streptococcus pneumoniae* (4)	44%	<0.01
No Growth	28	N/A	56%	
Chocolate Agar				
Bacterial Growth	20	*Haemophilus influenzae* (5), *Moraxella* spp. (4), *Neisseria gonorrhoeae* (3)	40%	<0.05
No Growth	30	N/A	60%	
Sabouraud Dextrose Agar				
Fungal Growth	18	*Candida* spp. (7), *Fusarium* spp. (6), *Aspergillus* spp. (3)	36%	<0.01
No Growth	32	N/A	64%	

This table presents the results of microbial cultures from 50 patients with microbial keratitis, detailing positive cultures and identifying common bacteria and fungi on blood agar, chocolate agar, and Sabouraud dextrose agar.

Blood Agar: Shows bacterial growth in 44% of the cultures, with common bacteria including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Streptococcus pneumoniae*. The presence of these bacteria is statistically significant (p-value <0.01).

Chocolate Agar: Revealed bacterial growth in 40% of the samples, predominantly with *Haemophilus influenzae*, *Moraxella* spp., and *Neisseria gonorrhoeae*, indicating their role in keratitis (p-value <0.05).

Sabouraud Dextrose Agar: Demonstrated fungal growth in 36% of the cases, with fungi such as *Candida* spp., *Fusarium* spp., and *Aspergillus* spp. being commonly identified (p-value <0.01).

Discussion

The results of our study provide a comprehensive understanding of microbial keratitis, echoing and expanding upon findings from previous research while offering new insights into its epidemiology, etiology, and management.

The demographic patterns observed in our study (Table 1), with a higher prevalence in males and a broad age range, align with the findings of Keay *et al.* [7]. These studies highlight the variable incidence and risk factors of microbial keratitis across different populations. Our study adds to this knowledge by emphasizing the need for demographic-specific strategies in both prevention and treatment.

The significant association of contact lens use with microbial keratitis in our study (Table 3) supports the conclusions drawn by Cheng *et al.* [8]. Their research underlines the importance of contact lens hygiene and the potential risks associated with their use. Our findings further reinforce the need for educating contact lens users about proper care and the risks of developing microbial keratitis, particularly in settings with high contact lens usage.

Our microbiological analysis (Tables 4 and 5) reveals a diverse array of pathogens, with a notable presence of bacteria such as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and fungi like *Candida* spp. This diversity is in line with Hazlett *et al.* [9], who emphasized the varied microbial etiology of keratitis and the challenges it poses for diagnosis and treatment. Our study highlights the critical role of employing both traditional and advanced diagnostic methods, such as PCR and *in-vivo* confocal microscopy, for accurate pathogen identification, as suggested by Shieh. [10]. This approach is essential for guiding appropriate antimicrobial therapy, thereby improving treatment outcomes.

Moreover, the high prevalence of associated ocular and systemic conditions found in our study suggests a multifactorial nature of microbial keratitis. This finding is consistent with the observations by Bourcier *et al.* [11], who discussed the influence of underlying ocular conditions, systemic health, and environmental factors on the risk and severity of microbial keratitis. Our study contributes to this understanding by highlighting the importance of a comprehensive assessment of patients, considering both ocular and systemic health, in managing microbial keratitis.

In conclusion, our study offers valuable insights into the epidemiology, microbiological profile, and risk factors associated with microbial keratitis. By integrating these findings with current literature, we emphasize the need for targeted diagnostic and therapeutic strategies, tailored education and prevention programs, and a holistic approach to patient care. These measures could significantly enhance the management and prognosis of microbial keratitis, ultimately leading to better patient outcomes and a reduction in the global burden of this sight-threatening condition.

Conflict of Interest
Not available

Financial Support
Not available

References

1. Stapleton F, Keay L, Edwards K, Naduvilath T, Dart JK, Brian G, *et al*. The incidence of contact lens-related microbial keratitis in Australia. Ophthalmology. 2008 Oct 1;115(10):1655-62.
2. Green M, Apel A, Stapleton F. Risk factors and causative organisms in microbial keratitis. Cornea. 2008 Jan 1;27(1):22-7.
3. Dart JK, Radford CF, Minassian D, Verma S, Stapleton F. Risk factors for microbial keratitis with contemporary contact lenses: a case-control study. Ophthalmology. 2008 Oct 1;115(10):1647-54.
4. Szczotka-Flynn LB, Pearlman E, Ghannoum M. Microbial contamination of contact lenses, lens care solutions, and their accessories: a literature review. Eye & contact lens. 2010 Mar;36(2):116.
5. Dahlgren MA, Lingappan A, Wilhelmus KR. The clinical diagnosis of microbial keratitis. American journal of ophthalmology. 2007 Jun 1;143(6):940-4.
6. Garg P. Diagnosis of microbial keratitis. British Journal of Ophthalmology. 2010 Aug 1;94(8):961-2.
7. Keay L, Edwards K, Naduvilath T, Taylor HR, Snibson GR, Forde K, *et al*. Microbial keratitis: predisposing factors and morbidity. Ophthalmology. 2006 Jan 1;113(1):109-16.
8. Cheng KH, Leung SL, Hoekman HW, Beekhuis WH, Mulder PG, Geerards AJ, *et al*. Incidence of contact-lens-associated microbial keratitis and its related morbidity. The Lancet. 1999 Jul 17;354(9174):181-5.
9. Hazlett L, Suvas S, McClellan S, Ekanayaka S. Challenges of corneal infections. Expert review of ophthalmology. 2016 Jul 3;11(4):285-97.
10. Shieh WJ. Advanced pathology techniques for detecting emerging infectious disease pathogens. Advanced Techniques in Diagnostic Microbiology: Volume 2: Applications. 2018:543-61.
11. Bourcier T, Thomas F, Borderie V, Chaumeil C, Laroche L. Bacterial keratitis: predisposing factors, clinical and microbiological review of 300 cases. The British journal of ophthalmology. 2003 Jul;87(7):834.

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