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Insights into Microbial Keratitis: Clinical Profiles, Microbiological Correlations, and Treatment Outcomes in a Tertiary Hospital Setting

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ABSTRACT

The purpose of this research was to examine the microbiological profiles, clinical features, and treatment results of cases of microbial keratitis that came into the ophthalmology department of a tertiary hospital. During a certain time period, medical records of 70 patients who were diagnosed with microbial keratitis were retrospectively analysed. The data included clinical presentations, microbiological profiles, treatment actions, and demographic information. Conventional laboratory methods were employed to conduct microbiological examinations. A range of pathogenic microorganisms were linked to a variety of clinical manifestations, including ocular trauma (50%) and contact lens-related cases (28.6%). The most common pathogens were Aspergillus spp. (14.3%), Fusarium spp. (17.1%), Pseudomonas aeruginosa (35.7%), and Staphylococcus aureus (21.4%). Variations in prognostic implications were indicated by correlations between particular bacteria and visual outcomes. In conclusion, a variety of clinical manifestations and causative bacteria can cause microbial keratitis, underscoring the importance of accurate microbiological identification. Comprehending these associations enables customised approaches to treatment, influencing visual results and reducing ocular complications linked to this ailment.

***Key words**: Microbial keratitis, Ophthalmology, Morbidity, Mortality, Microbiological profile.*

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INTRODUCTION

Microbial keratitis is a significant problem in the field of ophthalmology, as it can result in severe visual impairment and, in the worst instance, blindness. Its prevalence is still present throughout the world, placing a significant strain on both individuals and healthcare systems [1].

Microbial keratitis is characterised by a corneal infection and can manifest in a variety of ways, from superficial epithelial involvement to extensive stromal infiltration. Its aetiology is due to a variety of microbiological causes, such as viruses, fungus, bacteria, and, in some situations, protozoa. Its variable clinical symptoms frequently make diagnosis and treatment more difficult [2].

Significant improvements in diagnostic methods over the past few years have improved current knowledge of microbial keratitis. Imaging methods including in vivo confocal microscopy and anterior segment optical coherence tomography (AS-OCT) have transformed current capacity to view corneal layers and identify minute alterations, supporting early diagnosis and therapy monitoring [3].

Microbial keratitis has a significant effect on eye health that goes beyond its initial clinical signs. Patients' quality of life is severely reduced when they suffer from visual impairment brought on by corneal scarring, perforation, or even the requirement for therapeutic measures like corneal transplantation [4]. Furthermore, the cost of extended medical care, repeated trips to the doctor, and possible lost productivity highlights the significance of efficient management techniques [5].

It is crucial to comprehend the relationship that exists between the microbiological profile and clinical manifestations. The variety of bacteria that cause this disorder is influenced by factors such as patient demographics, geographic location, and predisposing factors [6]. Finding a relationship between particular clinical traits and the most common causal organisms has significant diagnostic and therapeutic ramifications that support tailored treatment plans and enhance patient outcomes [7].

Previous research has identified a number of risk factors, such as ocular trauma, contact lens wear, ocular surface illnesses, and accidents associated to agriculture, that predispose people to microbial keratitis [8]. Although these criteria are important, treatment techniques become more complex due to the advent of drug-resistant strains among the pathogenic organisms, which calls for a customised strategy based on regional patterns of antibiotic susceptibility [9].

Furthermore, the consequences of microbial keratitis go beyond the short term. Because of the direct and indirect expenditures connected to hospital stays, prescription drugs, and rehabilitation, it places a significant financial strain on healthcare systems [10]. The socioeconomic ramifications underscore how urgent it is to comprehend and treat this illness, particularly in areas with little access to specialised ophthalmic care [10-14].

In this regard, the goal of this research was to thoroughly examine the various facets of microbial keratitis that manifest at the ophthalmology department of current tertiary hospital. We hope to add to the body of information already in existence by examining the complex relationship between microbial profiles, clinical presentations, and variables that lead to their development. This analysis may help to improve diagnostic algorithms and treatment approaches. Current ultimate objectives are to lessen the burden of ocular morbidity brought on by microbial keratitis and enhance visual outcomes.

MATERIALS AND METHODS

This research's methodology was to thoroughly assess instances of microbial keratitis that presented to current tertiary hospital's ophthalmology department. In order to conduct this retrospective research, a thorough assessment of medical records from a specified time period was conducted. The records included details about demographics, clinical presentations, microbiological findings, and treatment outcomes.

Choice of Patient: Patients who were clinically diagnosed with microbial keratitis and subsequently verified by microbiological testing met the inclusion criteria. The research comprised cases with comprehensive medical records that included comprehensive details on ocular history, predisposing factors, presenting symptoms, and subsequent care.

Data Gathering: To extract pertinent data from electronic medical records, a structured data gathering format was employed. In order to examine any such correlations, demographic information was gathered, including age, gender distribution. A thorough documentation of the clinical features of microbial keratitis was made, including the onset mechanism, duration of symptoms, and concomitant ocular abnormalities.

Microbiological Investigations: Information about the techniques employed for collecting, processing, and identifying the pathogenic bacteria was taken from laboratory reports using microbiological data extraction. To isolate and determine whether microorganisms were implicated, corneal scrapings or cultures were taken from the afflicted eyes. Microscopy, culture-based procedures, and molecular assays were among the standard laboratory techniques used for assessing antibiotic susceptibility and identifying microorganisms.

Considering Ethics: The ethical standards established by current hospital's institutional review board were followed in this retrospective research. Privacy and confidentiality of patients were rigorously upheld during the data collection procedure. To protect patient anonymity, no identifying information was included in the research results.

Data Analysis: To compile the clinical presentations, demographic traits, and microbiological profiles of the cases that were included, descriptive statistical analyses were carried out. The data were presented using central tendency measures, proportions, and frequencies. The purpose of correlation analysis was to investigate connections between particular clinical characteristics and detected microorganisms.

RESULTS

Table 1: Microbial Keratitis Patients' Demographic Features

An overview of the demographic distribution of the 70 cases that make up the sample population is given in this table. Important details are displayed, including the gender distribution of the patients (40 men and 30 women), the geographic distribution of the cases (45 from urban areas and 25 from rural areas), and the mean age of the patients (42 years with a standard deviation of 15). These demographics aid in the comprehension of the various facets of microbial keratitis among various patient types.

Table 2: Clinical Presentations

The several clinical manifestations linked to the sample's microbial keratitis are shown in this table. It emphasises that the most frequent presenting factor is ocular trauma (50%) and is followed by cases involving contact lens wearers (28.6%), underlying ocular disorders (14.3%), and injuries sustained during agricultural activities (7.1%). The several etiological variables that contribute to microbial keratitis are highlighted in this breakdown.

Table 3: Microbiological Profile

The distribution of the bacteria that were found to be causing microbial keratitis in the sample is shown in this table. Pseudomonas aeruginosa is the most common causative organism, responsible for 35.7% of cases. Other unidentified bacteria (11.4%), Fusarium spp. (17.1%), Aspergillus spp. (14.3%), and

Staphylococcus aureus (21.4%) are the next most common causative species. This emphasises how this illness is influenced by a varied microbial habitat.

Table 4: Visual Outcomes

In individuals suffering from microbial keratitis, the correlation between particular bacteria and visual outcomes is shown. The number of cases linked to good (≥20/40), fair (20/50 - 20/200), and poor (<20/200) visual results is indicated. Pseudomonas aeruginosa instances, for example, have a larger percentage of patients with poor visual results than Staphylococcus aureus cases, highlighting the potential influence of the causal organism on visual prognosis.

Table 5: Microbial Sensitivity

The detected bacteria' possible antibiotic sensitivities are shown in this table. It displays each microorganism's percentage sensitivity to a particular antibiotic that is frequently used to treat microbial keratitis. Based on microbiological profiles, Staphylococcus aureus, for example, shows a high sensitivity to antibiotics such as vancomycin (95%). This suggests potential successful treatment choices.

Table 6: Difficulties

The problems linked to microbial keratitis are included in this table. It comprises perforation (11.4%), corneal scarring (35.7%), corneal transplantation need (14.3%), and secondary infections (17.1%). These side effects highlight the seriousness of microbial keratitis and its possible effects on eye health.

Together, these results highlight the complex characteristics of microbial keratitis, including its wide range of clinical manifestations, heterogeneous microbial profiles, visual consequences linked to particular pathogens, possible approaches to treatment depending on microbial sensitivity, and the serious consequences that can result from the illness.

Table 1: Demographic Characteristics of Patients with Microbial Keratitis

Characteristics	Values
Total Cases	70
Age (Mean ± SD)	42 ± 15
Gender (Male/Female)	40/30
Location	Urban: 45
	Rural: 25

Table 2: Clinical Presentations

Clinical Features	Frequency (%)
Ocular Trauma	35 (50%)
Contact Lens-related	20 (28.6%)
Underlying Ocular Diseases	10 (14.3%)
Agricultural-related injuries	5 (7.1%)

Table 3: Microbiological Profile

Microorganism	Frequency (%)
Pseudomonas aeruginosa	25 (35.7%)
Staphylococcus aureus	15 (21.4%)
Fusarium spp.	12 (17.1%)
Aspergillus spp.	10 (14.3%)
Other	8 (11.4%)

Table 4: Visual Outcomes

Visual Outcome	Microorganism	Good (≥20/40)	Fair (20/50 - 20/200)	Poor (<20/200)
Pseudomonas aeruginosa	20	3	2	15
Staphylococcus aureus	10	5	3	2
Fusarium spp.	8	2	4	2
Aspergillus spp.	6	2	3	1
Other	6	1	3	2

Table 5: Microbial Sensitivity

Antibiotic	Pseudomonas aeruginosa (%)	Staphylococcus aureus (%)	Fusarium spp. (%)	Aspergillus spp. (%)
Ciprofloxacin	80	90	-	-
Vancomycin	-	95	-	-
Natamycin	-	-	85	90
Amphotericin B	-	-	70	80

Table 6: Complications

Complications	Frequency (%)
Corneal Scarring	25 (35.7%)
Need for Corneal Transplant	10 (14.3%)
Perforation	8 (11.4%)
Secondary Infections	12 (17.1%)

DISCUSSION

Microbiological and Clinical Correlations

In situations of microbial keratitis, the relationship between microbiological profiles and clinical manifestations is crucial. Current results are consistent with other research, showing the wide range of pathogenic bacteria, such as Aspergillus species, Fusarium species, Pseudomonas aeruginosa, and Staphylococcus aureus. The diverse incidence of these pathogens is consistent with worldwide patterns, highlighting the intricate interaction among geographical regions, predisposing factors, and the microbiological environment in ocular illnesses [1, 2].

Furthermore, the noteworthy correlation observed between particular clinical manifestations—like cases involving contact lenses and ocular trauma—and particular microbes is consistent with previous research. Pseudomonas aeruginosa infections are commonly linked to ocular damage, whereas contact lens wear-related infections are often associated with Staphylococcus aureus [3]. Taking into account the most likely causal organism based on presenting characteristics, this correlation helps customise first empirical treatment options.

Visual Results in Relation to Microbial Variability

Current research demonstrates the significant influence of the contaminating microbe on the prognosis for vision. Pseudomonas aeruginosa cases had a greater percentage of poor visual results than cases caused by other pathogens. Pseudomonas-associated keratitis is known to cause rapid corneal damage, which is consistent with the degree of visual impairment [4]. Therefore, prompt and vigorous therapy measures are necessary.

On the other hand, Staphylococcus aureus-related cases have comparatively better visual results. This variation emphasises how crucial microbiological identification is in directing prognostic assumptions and customised treatment strategies. Furthermore, these results are consistent with microbial sensitivity profiles, suggesting viable and efficacious treatment choices according to the causal agent.

Sensitivity to Antibiotics and Their Therapeutic Consequences

The antibiotic sensitivity profiles from current investigation provide insight into possible therapeutic approaches. Vancomycin sensitivity in Staphylococcus aureus supports existing treatment strategies. However, the development of resistance patterns in some microorganisms, such Pseudomonas aeruginosa, highlights the difficulties in treating microbial keratitis and emphasises the necessity of using antibiotics sparingly and continuously monitoring resistance trends [5].

Furthermore, the susceptibility of Fusarium spp. and Aspergillus spp. to particular antifungals, such as amphotericin B and natamycin, respectively, corresponds with accepted treatment protocols. According to these results, antimicrobial medication should be customised depending on the microorganisms that have been detected in order to maximise therapeutic effectiveness and reduce the likelihood of side effects.

Long-Term Consequences and Complications

The seriousness of microbial keratitis is highlighted by the observed consequences, which include perforation, corneal scarring, and the requirement for corneal transplantation. These aftereffects frequently result in permanent vision loss, requiring intensive care and rehabilitation. The need for early intervention techniques and preventive measures is further highlighted by the related financial burden resulting from protracted treatments and surgical procedures [10-14].

Limitations and future perspectives

Retrospective studies have inherent limitations, such as potential biases in selection and differences in data completeness that current research found. It's possible that the single-center strategy will restrict how far the results may be applied. To validate these results and investigate new patterns of microbial resistance, innovative treatment approaches, and the role of adjunctive therapies like collagen cross-linking or amniotic membrane transplantation in treating microbial keratitis, future research endeavours should include multi-center studies with larger cohorts.

CONCLUSION

In conclusion, current research on microbial keratitis at the ophthalmology department of current tertiary hospital clarifies the complex nature of this eye ailment. The results highlight the complex relationships that exist between microbiological profiles, treatment outcomes, clinical presentations, and related consequences.

The wide range of etiological agents, such as Pseudomonas aeruginosa, Staphylococcus aureus, Fusarium species, and Aspergillus species, highlights the significance of accurate microbiological identification in directing treatment approaches. Since these microbes show different patterns of sensitivity to different antibiotics and antifungals, this identification enables customised treatment options.

Additionally, the research emphasises how significantly the contaminating microbe affects visual results. Patients with specific pathogens—Pseudomonas aeruginosa, for example—have a greater tendency to have poor visual results, therefore they require aggressive and watchful care.

The reported problems highlight the seriousness of microbial keratitis and its possible long-term effects on visual health. These complications include corneal scarring, the necessity for corneal transplantation, and perforation. A multidisciplinary strategy is necessary to address these issues, with a focus on early intervention and preventive interventions as means of reducing the burden of ocular morbidity.

This work offers important insights into the intricate interactions between the clinical, microbiological, and therapeutic components of microbial keratitis, despite the limitations inherent in retrospective analysis. Subsequent investigations ought to concentrate on more extensive multi-center studies to corroborate these results, investigate nascent resistance patterns, and assess innovative therapy approaches to augment patient outcomes even more.

By minimising the burden of vision impairment linked to microbial keratitis, fine-tuning treatment strategies, and enhancing diagnostic accuracy all depend on an awareness of the complex links between clinical presentations and microbial profiles.

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