

INVESTIGATING THE EFFICACY OF CONTACT LENS CULTURES IN IDENTIFYING PATHOGENS IN KERATITIS CASES: A RETROSPECTIVE COHORT STUDY.

Bhawna Kumari¹, Shreshth Shanker^{2*}, Khushdeep Kaur³, Antaryami Sharma³

¹ Assistant Professor, Department of Microbiology, MGM Medical College & LSK Hospital, Kishanganj, Bihar, India

^{2*} Associate Professor, Department of Ophthalmology, MGM Medical College & LSK Hospital, Kishanganj, Bihar, India

³ Junior Resident, Department of Ophthalmology, MGM Medical College & LSK Hospital, Kishanganj, Bihar, India

ABSTRACT

Background

The incidence of microbial keratitis, a severe corneal infection, is increasingly prevalent among contact lens users. This study investigates the efficacy of different culture methods in identifying causative pathogens, a critical step for effective treatment, particularly when traditional corneal cultures are inconclusive or unavailable.

Methods

A retrospective analysis was conducted and involved 60 patients diagnosed with contact lens-related microbial keratitis. The methodology centered on the examination of cultures obtained from corneal scrapings, contact lenses, and lens cases. Additionally, demographic data, clinical treatment, outcomes, and antibiotic susceptibility patterns were analyzed. The data was also analyzed accordingly.

Results

Findings highlighted a higher rate of pathogen detection in contact lens and lens case cultures (43% and 36.7%, respectively) compared to corneal cultures (20%). The majority of infections were bacterial, with *Pseudomonas* spp. being the most prevalent. Antibiotic susceptibility testing revealed a high effectiveness of fluoroquinolones and aminoglycosides. Notably, the study observed a post-treatment preference shift from contact lenses to glasses in 60% of patients, indicating the significant impact of the infection on patient lifestyle choices.

Conclusion

This study underlines the importance of including contact lens and lens case cultures in the diagnostic process for microbial keratitis. The higher yield of pathogens in these cultures suggests their critical role in accurate pathogen identification.

Recommendations

Early clinical intervention and a comprehensive diagnostic approach are recommended for the effective management of contact lens-related microbial keratitis. Emphasizing patient education on lens hygiene and regular ophthalmological check-ups could also be crucial in prevention strategies.

Keywords: Microbial Keratitis, Contact Lenses, Pathogen Identification, Antibiotic Susceptibility.

Submitted: 2024-03-12 **Accepted:** 2024-03-12

Corresponding Author: Shreshth Shanker*

Email: shreshth84@gmail.com

Associate Professor, Department of Ophthalmology, MGM Medical College & LSK Hospital, Kishanganj, Bihar, India

INTRODUCTION

In the realm of ophthalmology, microbial keratitis stands as a formidable challenge, particularly among contact lens wearers. This corneal infection, characterized by its rapid onset and potential to cause severe ocular morbidity, has been a topic of extensive research and clinical concern. The

role of contact lenses as a medium for microbial colonization and the subsequent development of keratitis is well-documented [1]. However, the detection and identification of causative microorganisms remains a critical area that demands more focused investigation, especially

when traditional corneal cultures fail to yield conclusive results or are unavailable.

The prevalence of contact lens use for vision correction has seen a consistent rise, making the understanding of associated infections crucial. Microbial keratitis, a sight-threatening condition, can be instigated by various microorganisms, including bacteria, fungi, and amoebae. The complexity of its microbial etiology underscores the importance of precise identification of the causative pathogen for effective treatment [2]. Traditional diagnostic methods, primarily corneal scraping followed by culture, have been the cornerstone in the management of microbial keratitis. However, these methods are not without limitations. In some cases, they fail to identify the pathogen due to low microbial load, prior antibiotic treatment, or technical challenges in sample collection and processing [3]. Against this backdrop, the hypothesis that contact lens cultures could provide a supplementary or alternative means for pathogen detection in keratitis cases gains significance. Contact lenses, being in direct and prolonged contact with the cornea, are likely to harbor the causative microorganisms. Analyzing these lenses could offer insights into the microbial flora involved in the infection process. Moreover, in situations where corneal cultures are not feasible or yield negative results, contact lens cultures might hold the key to identifying the elusive pathogens. This report aims to critically evaluate the effectiveness of contact lens cultures in identifying causative microorganisms in cases of microbial keratitis among contact lens wearers.

METHODOLOGY

Study Design

A retrospective cohort study.

Study setting

The study was conducted at Mata Gujari Memorial Medical College and Lions Seva Kendra Hospital, Kishanganj spanning from September 2021 to December 2023.

Participants

A total of 60 individuals participated in the study. The focus was on patients who were identified with microbial keratitis linked to the use of contact lenses during the specified period.

Inclusion and Exclusion Criteria

The study includes patients with a history of wearing contact lenses and diagnosed with microbial keratitis, excluding

those who used bandage contact lenses or had peripheral ulcers or infiltrative keratitis due to contact lens use.

Bias

Given the retrospective design, potential biases such as selection and recall bias are acknowledged.

Variables

The study examines demographic information, the treatment provided, patient outcomes, and microbiological findings from corneal scrapings, contact lenses, and lens cases.

Data Collection

Information was gathered retrospectively from the patient's medical records and the microbiology department's records.

Methodological Details

The microbiological examination involved culturing samples from corneal scrapings, contact lenses, and lens cases using various media like blood agar, chocolate agar, and Sabouraud dextrose agar, among others. The methodology for culturing contact lenses and lens cases was carefully executed to avoid contamination.

Testing Process

Antibiotic susceptibility testing is performed for all bacterial isolates identified in the cultures. This includes standard methods like the Kirby-Bauer disk diffusion method.

Antibiotics Tested

A range of antibiotics is tested, including broad-spectrum agents like amikacin, cefazolin, chloramphenicol, ciprofloxacin, gatifloxacin, gentamicin, moxifloxacin, ofloxacin, tobramycin, and imipenem.

Statistical Analysis

Descriptive data was summarized and the analysis was calculated using mean, standard deviation, frequency, and percentages.

Ethical Considerations

The study was conducted following ethical approval from the Institutional Review Board, ensuring compliance with ethical standards. Written consent was taken from the participants before the study.

RESULTS

Demographics

The patient pool comprised 31 males (51.7%) and 29 females (48.3%). The average age was 25.1 years (± 7.3) for males and 27.3 years (± 9.6) for females, highlighting a young demographic primarily affected by contact lens-related microbial keratitis.

Table 1: Demographic characteristics of the participants

Category	Frequency	Percentages
Total Patients	60	100%
Gender Distribution		
Males	31	51.7%
Females	29	48.3%
Mean Age		
Males	25.1 years	SD=7.3
Females	27.3 years	SD= 9.6

Table 2: Clinical characteristics of the participants

Category	Frequency	Percentages
Positive Corneal Cultures	12	20%
Positive Contact Lens Cultures	26	43%
Positive Lens Case Cultures	22	36.7%
Pathogen Type		
Bacteria		
<i>Pseudomonas</i> spp.	25	41.7%
<i>Staphylococcus epidermidis</i>	5	8.3%
<i>Serratia</i> spp.	4	6.7%
Other Bacteria	8	13.3%
Fungi	3	5%
Acanthamoeba	1	1.7%
Mixed Microorganisms	2	3.3%
No Growth	12	20%

Microbiological Findings

Among the smaller sample sizes, corneal cultures were positive in 12 (20%) cases. In contrast, contact lens and lens case cultures showed a higher rate of positivity, with 26 (43%) and 22 (36.7%) cases, respectively. This indicates a significant presence of pathogens on contact lenses and their cases, even when corneal cultures were negative.

Association with Clinical Variables

The data revealed a higher likelihood of obtaining positive corneal culture results when patients presented with prolonged symptoms, particularly beyond two weeks, underscoring the importance of early clinical intervention.

Pathogens and Antibiotic Susceptibility

Bacterial infections were predominant, with 42 (70%) cases being bacterial, led by *Pseudomonas* spp. The antibiotic sensitivity pattern showed high effectiveness of

fluoroquinolones and aminoglycosides, essential for guiding treatment choices.

Treatment Outcomes

Post-treatment, a significant shift was observed in the choice of vision correction, with 60% (36 patients) opting for glasses, suggesting a change in preference due to the keratitis episode. Contact lens usage continued in 23.3% (14 patients), with surgical interventions, including keratoplasty, required in a few severe cases.

DISCUSSION

The current study revealed significant insights into its demographics, microbiological profile, and treatment outcomes. Predominantly affecting a young adult population with a balanced gender distribution, the study found that pathogens were more frequently detected in cultures from contact lenses and their cases than in corneal cultures. This

emphasizes the importance of including these items in diagnostic processes. The data also highlighted a higher likelihood of positive corneal cultures with prolonged symptoms, underscoring the necessity of early intervention. Predominantly bacterial infections, particularly *Pseudomonas* spp., responded well to fluoroquinolones and aminoglycosides. Post-treatment, a notable shift from contact lenses to glasses was observed in patients, reflecting the significant impact of CL-MK on lifestyle and vision correction preferences.

Martins *et al.* [4] highlighted the potential of positive contact lens cultures in cases where corneal cultures are negative, emphasizing the diagnostic value of additional material cultures. Das *et al.* provided crucial insights into the significant association between corneal and contact lens cultures. Supporting these findings, Lam *et al.* [5] and Bennett *et al.* [6] discussed the correlation between the size of the corneal infiltrate and the likelihood of positive culture results. Contrarily, Rattanatham, and Mah-Sarorra *et al.* [7] observed no significant difference in culture results across different sizes and locations of corneal lesions. Lastly, the work of Sharma *et al.*, [8] Mah-Sarorra *et al.*, [9] and Rattanatham *et al.* [7] contributed to understanding the microbiological profile of contact lens-MK, particularly the predominance of *P. aeruginosa* in such infections. These studies collectively enrich the understanding of microbial keratitis associated with contact lens use, offering diverse perspectives on diagnosis and microbial trends.

Generalizability

The study findings on contact lens-related microbial keratitis (CL-MK) have broader implications for the larger population of contact lens users. By highlighting the effectiveness of contact lens and lens case cultures in pathogen detection, the study suggests valuable diagnostic approaches applicable to a wider cohort of individuals at risk of CL-MK. Additionally, the observed shift in patient preference from contact lenses to glasses post-treatment indicates potential trends in patient behavior and treatment outcomes, offering insights that can benefit a larger demographic of contact lens wearers. Overall, these findings contribute to improved clinical management strategies and preventive measures for CL-MK on a broader scale.

CONCLUSION

The study on contact lens-related microbial keratitis (CL-MK) in a young demographic underscores the significance of contact lens and lens case cultures in identifying causative pathogens, especially when corneal cultures are negative.

The higher positivity in these cultures indicates a crucial role of contact lenses in harboring pathogens. The predominance of bacterial infections, particularly *Pseudomonas* spp., and the effective response to fluoroquinolones and aminoglycosides highlight the importance of targeted antibiotic therapy. The post-treatment shift to glasses from contact lenses in a majority of patients signals the impactful nature of CL-MK on lifestyle and vision preferences. This study emphasizes the need for early intervention and comprehensive diagnostic approaches in managing CL-MK.

Limitations

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

Recommendations

For effective management of contact lens-related microbial keratitis (CL-MK), a timely and comprehensive diagnostic approach is crucial. This includes routinely culturing contact lenses and lens cases, in addition to corneal scrapings, particularly when initial corneal cultures are negative. Emphasis should be placed on early clinical intervention upon the onset of symptoms to prevent disease progression. Additionally, educating contact lens wearers on proper lens hygiene and prompt clinical consultation in case of eye discomfort is recommended to reduce the incidence of CL-MK. Regular updates and training for healthcare professionals in the latest diagnostic and treatment strategies are also essential.

Acknowledgment

We are thankful to the patients; without them, the study could not have been done. We are thankful to the supporting staff of our hospital who were involved in the patient care of the study group.

List of abbreviations

MK - Microbial Keratitis
CL-MK - Contact Lens-related Microbial Keratitis
spp. - species

Source of funding

No funding was received.

Conflict of interest

The authors have no competing interests to declare.

REFERENCES

- 1) Masters J, Kocak M, Waite A. Risk for microbial keratitis: Comparative meta-analysis of contact lens wearers and post-laser in situ keratomileusis patients. *J Cataract Refract Surg.* 2017 Jan;43(1):67-73. doi: 10.1016/j.jcrs.2016.10.022. PMID: 28317680.
- 2) Stellwagen A, MacGregor C, Kung R, Konstantopoulos A, Hossain P. Personal hygiene risk factors for contact lens-related microbial keratitis. *BMJ Open Ophthalmol.* 2020 Sep 8;5(1):e000476. doi: 10.1136/bmjophth-2020-000476. PMID: 32953996; PMCID: PMC7481083.
- 3) Sauer A, Meyer N, Bourcier T; French Study Group for Contact Lens-Related Microbial Keratitis. Risk Factors for Contact Lens-Related Microbial Keratitis: A Case-Control Multicenter Study. *Eye Contact Lens.* 2016 May;42(3):158-62. doi: 10.1097/ICL.000000000000180. PMID: 26219076.
- 4) Martins EN, Farah ME, Alvarenga LS, Yu MC, Hoflin-Lima AL. Infectious keratitis: correlation between corneal and contact lens cultures. *CLAO J* 2002;28:146Y8.
- 5) Lam DS, Houang E, Fan DS, Lyon D, Seal D, Wong E. Incidence and risk factors for microbial keratitis in Hong Kong: comparison with Europe and North America. *Eye* 2002;16:608Y18.
- 6) Bennett HG, Hay J, Kirkness CM, Seal DV, Devonshire P. Antimicrobial management of presumed microbial keratitis: guidelines for the treatment of central and peripheral ulcers. *Br J Ophthalmol* 1998;82:137Y45
- 7) Rattanatham T, Heng WJ, Rapuano CJ, Laibson PR, Cohen EJ. Trends in contact lens-related corneal ulcers. *Cornea* 2001;20:290Y4.
- 8) Sharma S, Kunimoto DY, Gopinathan U, Athmanathan S, Garg P, Rao GN. Evaluation of corneal scraping smear examination methods in the diagnosis of bacterial and fungal keratitis: a survey of eight years of laboratory experience. *Cornea* 2002;21:643Y7.
- 9) Mah-Sadorra JH, Yavuz SG, Najjar DM, Laibson PR, Rapuano CJ, Cohen EJ. Trends in contact lens-related corneal ulcers. *Cornea* 2005;24:51Y8.

Publisher details:

SJC PUBLISHERS COMPANY LIMITED



Category: Non-Government & Non-profit Organisation
Contact: +256775434261(WhatsApp)
Email: admin@sjpublisher.org, info@sjpublisher.org or studentsjournal2020@gmail.com
Website: <https://sjpublisher.org>
Location: Wisdom Centre Annex, P.O. BOX. 113407 Wakiso, Uganda, East Africa.