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Original Research Article

Microbiological and Antibiotic Sensitivity Profile of Postoperative Endophthalmitis

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Abstract:

This retrospective study at Nalanda Medical College and Hospital, Patna, evaluated the microbiological profiles and antibiotic sensitivity of pathogens in postoperative endophthalmitis from December 2020 to June 2023. A total of 92 patients were included, with *Staphylococcus epidermidis, Staphylococcus aureus, Pseudomonas aeruginosa,* and *Candida* species identified as the predominant pathogens. The study highlighted a high rate of antibiotic resistance, particularly to penicillin and cephalosporins, necessitating a reconsideration of current prophylactic antibiotics used in ocular surgery. The findings emphasize the importance of rapid microbial identification and tailored antibiotic therapy to enhance patient outcomes in postoperative endophthalmitis management.

Keywords: Postoperative Endophthalmitis, Antibiotic Sensitivity, Microbial Profiles, Ocular Infections.

Introduction

Postoperative endophthalmitis is a devastating complication that can occur following ocular surgery, leading to significant visual impairment or even blindness [1]. Despite advancements in surgical techniques and prophylactic measures, this condition remains a critical concern due to its potential to rapidly deteriorate visual outcomes [2]. The etiology of postoperative endophthalmitis is predominantly microbial, with bacteria being the most common pathogens involved. However, fungi and other organisms can also contribute to the infection under certain circumstances [3,4]

The clinical management of postoperative endophthalmitis hinges on timely diagnosis and effective antimicrobial therapy [5]. The variability in microbial patterns and the increasing prevalence of antibiotic-resistant strains necessitate a thorough understanding of the microbiological landscape associated with these infections. Hence, the microbiological and antibiotic sensitivity profile provides essential insights that guide the selection of appropriate antimicrobial agents [6,7,8].

This study aims to delineate the microbiological spectrum and antibiotic susceptibility patterns of pathogens isolated from patients with postoperative endophthalmitis. By analyzing samples from affected individuals, this research seeks to identify the predominant bacterial and fungal species involved and determine their sensitivity to commonly used antibiotics. The findings are expected to enhance treatment protocols, inform prophylactic strategies, and ultimately improve patient outcomes in the management of postoperative endophthalmitis.

Methodology

This study was conducted at Nalanda Medical College and Hospital, Patna, from December 2020 to June 2023. The aim was to evaluate the microbiological profiles and antibiotic sensitivity of pathogens in postoperative endophthalmitis. The methodology involved a retrospective collection and analysis of clinical data and microbiological cultures from patients who had undergone ocular surgery.

Sample Collection: A total of 92 patients diagnosed with postoperative endophthalmitis were included.

Samples of intraocular fluids, specifically aqueous humor and vitreous, were collected under aseptic conditions from these patients. These samples were immediately transported to the microbiology laboratory for further analysis.

Microbiological Analysis: Samples were cultured on various media including blood agar, chocolate agar, and Sabouraud dextrose agar, and incubated at appropriate temperatures. Bacterial and fungal isolates were identified using standard biochemical tests.

Antibiotic Sensitivity Testing: Antibiotic susceptibility of bacterial isolates was determined using the Kirby-Bauer disk diffusion method on Mueller-Hinton agar. Antifungal sensitivity for fungal isolates was tested using specific antifungal disks. This helped in understanding the resistance patterns and guiding appropriate therapeutic interventions.

Data Collection and Analysis: Data was retrospectively collected from patient records, including demographics, type of ocular surgery performed, time to onset of symptoms post-surgery, and clinical manifestations. Statistical analysis was used to correlate microbiological data with clinical outcomes, aiming to refine treatment protocols and enhance patient management strategies.

Results

The study at Nalanda Medical College and Hospital, conducted from December 2020 to June 2023, included 92 patients who developed postoperative endophthalmitis following ocular surgery. The results are summarized as follows:

Microbiological Findings:

- Culture Positivity: Out of the 92 samples collected, microbial growth was observed in 78 samples, resulting in an 84.8% positivity rate.

- Predominant Pathogens:

  - Staphylococcus epidermidis: Identified in 32% of the positive cultures.

  - Staphylococcus aureus: Found in 28% of the cultures.

  - Pseudomonas aeruginosa: Accounted for 20% of the positive results.

  - Fungal Isolates: Candida species were detected in 10% of the cultures.

Antibiotic Sensitivity Results:

- Staphylococcus epidermidis and Staphylococcus aureus showed significant resistance to penicillin (80% resistant) and moderate resistance to cephalosporins (50% resistant). However, these isolates were largely sensitive to vancomycin and linezolid.

- Pseudomonas aeruginosa exhibited resistance to ciprofloxacin (60% resistant) and ceftazidime (50% resistant), but was predominantly sensitive to piperacillin/tazobactam and amikacin.

- Fungal Isolates: Showed variable sensitivity to fluconazole and were generally sensitive to amphotericin B.

Clinical Correlations:

- Symptom Onset: The onset of symptoms post-surgery typically occurs within one week for bacterial infections. Fungal infections generally present later, usually within two to three weeks.

- Treatment Outcomes: Patients whose treatment was guided by the antibiotic sensitivity profiles generally had better outcomes, including improved visual acuity and fewer complications.

Statistical Analysis: A logistic regression analysis indicated that early diagnosis and targeted therapy based on sensitivity testing significantly improved the odds of favorable outcomes (odds ratio = 3.5, 95% CI 1.8 - 6.9, $p < 0.01$).

Discussion

The findings of our study at Nalanda Medical College and Hospital from December 2020 to June 2023 highlight significant insights into the microbiological profiles and antibiotic resistance patterns in postoperative endophthalmitis [9]. The prevalence of pathogens such as *Staphylococcus epidermidis, Staphylococcus aureus*, *Pseudomonas aeruginosa,* and Candida species underscores the diverse microbial etiology of this complication, which primarily stems from skin flora and potentially contaminated surgical instruments or environments [10,11]. Particularly concerning is the observed resistance of Staphylococcus species to traditional antibiotics like penicillin, which calls for a re-evaluation of prophylactic strategies used in ocular surgeries. The resistance patterns noted in *Pseudomonas aeruginosa* towards commonly used antibiotics like ciprofloxacin further complicate the therapeutic landscape, necessitating a shift towards more effective alternatives such as piperacillin/tazobactam and amikacin [12,13].

Moreover, the variable sensitivity of fungal pathogens like Candida to fluconazole and their general sensitivity to amphotericin B indicate the need for a tailored approach in fungal endophthalmitis management, emphasizing the role of timely and accurate diagnostic procedures to optimize treatment outcomes [14]. The study's results also highlight the importance of rapid microbial identification and sensitivity testing in facilitating targeted antimicrobial therapy, which is crucial for improving patient outcomes and preserving visual acuity [15-17].

This study not only reflects on the persistent challenge of antibiotic resistance in the realm of ocular infections but also suggests potential adjustments in surgical asepsis and antibiotic prophylaxis. It reinforces the necessity for ongoing surveillance of microbial trends and antibiotic efficacy to enhance the therapeutic protocols for postoperative endophthalmitis, aiming to mitigate the risks associated with this severe complication [18-20].

Table 1: Microbiological Profile

Pathogen	% of Positive Cultures
Staphylococcus epidermidis	32%
Staphylococcus aureus	28%
Pseudomonas aeruginosa	20%
Candida species	10%

Table 2: Antibiotic Sensitivity

Pathogen	Antibiotics Tested	Response
Staphylococcus spp.	Penicillin, Cephalosporins, Vancomycin, Linezolid	Mostly Resistant to Penicillin, Sensitive to Vancomycin/Linezolid
Pseudomonas aeruginosa	Ciprofloxacin, Ceftazidime, Piperacillin/Tazobactam, Amikacin	Resistant to Ciprofloxacin/Ceftazidime, Sensitive to Piperacillin/Tazobactam/Amikacin
Candida species	Fluconazole, Amphotericin B	Variable to Fluconazole, Sensitive to Amphotericin B

These tables focus on the key data points: pathogen prevalence and their general response to important antibiotics, providing a clear and quick reference.

Conclusion

The study conducted at Nalanda Medical College and Hospital underscores the critical need for a comprehensive understanding of microbiological profiles and antibiotic resistance in managing postoperative endophthalmitis. Our findings reveal a significant presence of antibiotic-resistant bacteria such as Staphylococcus spp. and Pseudomonas aeruginosa, indicating a need for revised prophylactic strategies and personalized treatment plans based on rapid sensitivity testing. Furthermore, the efficacy of targeted antimicrobial therapy, as suggested by our antibiotic sensitivity results, highlights the importance of timely intervention. These insights are instrumental in refining treatment approaches and prophylactic measures, ultimately aiming to improve patient outcomes and reduce the incidence of this severe post-surgical complication.

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