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STUDY OF ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN OPHTHALMIC INFECTION IN A TERTIARY CARE HOSPITAL

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ABSTRACT Ocular infections mainly caused by the bacteria followed by fungi and virus. Many opportunistic pathogenic agents are increasingly encountered in ocular infections which is due to widespread use of topical and systemic immunosuppressive agents. This prospective study aimed to evaluate incidence and prevalence of ocular bacterial and fungal infections, and antimicrobial susceptibility of these ocular bacterial isolates to commonly used antibiotics in a tertiary care hospital in Surat over a 11 months period from October 2020 to August 2021. **Method:** The study included patients with ocular infection, confirmed through direct microscopy, culture and Lactophenol cotton blue (LPCB) mount of corneal specimen.Antimicrobial susceptibility of bacterial isolates and biochemical test was performed. **Result:** Out of 55 suspected cases, 12(21.81%) were culture positive and 43 (78.18%) were culture negative. Further, bacterial pathogens were detected in 9(16.36%) cases and fungal growth were detected in 3(5.45%) cases. Vancomycin(100%) and linezolid (100%)were most sensitive antibiotics among gram positive organisms.Imipenem (50%)and Amikacin(67%) were most sensitive antibiotic among gram negative organims. **Conclusion:** The emergence of bacterial resistance towards topical antimicrobial agents may increases the risk of treatment failure with potentially serious effects. Hence, proper information is essential for appropriate antimicrobial therapy and management of ocular infections.

KEYWORDS : Ocular Infection, Direct Microscopy, Culture, Antimicrobial Susceptibility

INTRODUCTION

The eye is an unique organ. It is impermeable to almost all external organisms. The eye may be infected from external sources or intra ocular invasion of microorganism through blood stream. The incidence of corneal infection and the apprehension over the emergence of resistant organisms is increasing with increasing use of broad-spectrum antibiotics and corticosteroids which favor the growth of fungi and also cause invasive infection.

A wide range of factors determine clinical outcome in microbes causing eye infection and the epidemiological patterns vary from one country to the other and in different geographical areas in the same country. Broad spectrum antibiotics are used for the management of bacterial eye infections. The arbitrarily use of antibiotics lead to the development of resistance to many commonly used antimicrobial medications.

The purpose of this study was to identify the etiology, incidence and prevalence of ocular bacterial and fungal infections, and to assess the in-vitro susceptibility of these ocular bacterial isolates to commonly used antibiotics.

MATERIALAND METHOD

Study Type: Observational Prospective cross-sectional study.
Study Duration: 11 months
Specimen Collection and Processing: The samples were collected following examination of the patients in OPD and admitted in an ophthalmic ward by ophthalmologist and were sent to the Microbiology Department.

Inclusion Criteria

1. Patients of all age group having clinically suspected ophthalmic infections.
2. Patients having post-operative ocular infection.

Exclusion Criteria

1. Previously received sample of same patient will be excluded.
2. Patients having any other ocular morbid condition suggestive of non-infective origin and infection other than bacterial and fungal.
3. Patients on antibacterial and antifungal treatment.

Laboratory Procedures

Direct Gram's staining and KOH mount was performed for all the samples. All samples were inoculated on to Nutrient agar, Macconkey agar, Blood agar, Sabouraud's dextrose agar. Multiple C shaped streaks were performed on the solid media for the corneal scrapings.

Microscopy:

Smear preparation: Material obtained by corneal scraping was put between the 2 slides and was sent to the laboratory.

Gram Staining

Material was smeared within marked area on a slide and allow to dry. It was followed by heat-fixation and gram stain was performed. Then examined under the oil immersion objective lens of microscope.

Potassium Hydroxide (KOH) Wet Preparation:

Material was placed on the glass slide and then covered with one drop of 10% KOH & cover-slip. When material was dissolved completely, slide was screened under the low power (10X) and high power (40X) field by using bright field microscope to see for fungal hyphae.

Culture

Bacterial Culture

The inoculated plates of Nutrient agar, Mac Conkey agar, Blood agar were incubated for 24 hours at 37°C. After incubation, culture plates examined for any microbial growth.Any pigmentation, hemolysis or swarming was noted.

Fungal Culture

For the culture of fungus pathogen, material was inoculated in C streak on the sabouraud's dextrose agar plate and incubated at 25°C & 37°C for isolation of fungi. Cultures were examined for the growth daily during first week and twice a week during next 2 weeks. Fungi were identified by their colony characteristics on SDA and by morphological appearance of the spores in Lacto Phenol Cotton Blue (LPCB) stain.

The bacterial isolates were further identified by using colony characteristic, gram stain, various biochemical tests.

Antimicrobial Susceptibility Testing

The antimicrobial susceptibility testing was performed with the help of the Kirby-Bauer disc diffusion method using commercially available discs. The result was interpreted as per the Clinical and Laboratory Standards Institute (CLSI) guidelines.

RESULT

- In this study total of 55 ocular samples were collected and processed such as corneal tissue (n=11), conjunctival swabs (n=36), pus (n=1), anterior chamber material (n=2) Bandage contact lens (n=2), uveal tissue (n=2) and retinal tissue (n=1).
- In present study, Corneal ulcer 14(25.45%) is the predominant type of eye infection followed by corneal perforation 5(9.09),

corneal tear 5(9.09), panopthalmitis 5(9.09), mucormycosis 5(9.09) and keratitis 4(7.27).
- Among them, bacterial isolates 4(7.27%) and fungal isolates 2 (3.63%) were most commonly isolated from Corneal ulcer.
- Among the 55 samples, 12(21.81%) were culture positive and remaining 43 specimens (78.18%) were culture negative. Further, bacterial pathogens were in 9(16.36%) cases and fungal growth were in 3(5.45%) cases.
- Maximum number of suspected cases were reported in the age group of >50 years and no cases were recorded in age group of 1-10 years.
- Out of 55 cases of ocular infections 43(78.18%) were male and 12(21.81%) were female.
- Out of total 55 specimens, positive smears were in 13(23.63%), out of which the culture positive specimens were 9(16.36%) and culture negative specimen was 4(7.27%) and negative smears were seen in 42(76.36%), out of which the culture positive were 3(5.45%) and culture negative was 39(70.90%).
- Out of the total 9 bacterial cultures, 3(5.45%) were gram positive cocci and 6 (10.91%) were gram negative bacilli. Streptococcus spp. was isolated in 2(3.63%) and Coagulase Negative Staphylococcus was isolated in 1(1.82%). The most common gram-negative bacilli isolated was Pseudomonas aeruginosa 3(5.45%), Acinetobacter baumannii 1(1.81%), Klebsiella pneumoniae 1(1.81%) and Escherichia coli 1(1.81%)

Antibiotic Sensitivity Pattern

Sensitivity Pattern of Gram-positive Organisms
- Streptococcus spp. were maximally resistant to penicillin, CoNS were resistant to ciprofloxacin,erythromycin, clarithromycin, azithromycin, ofloxacin and moxifloxacin.
- No resistance was detected for vancomycin and linezolid antibiotics for both gram positive organisms. CoNS were Methicillin resistant Staphylococcus.

Sensitivity Pattern of Gram-negative Organisms
- Acinetobacter baumannii was sensitive to Ampicillin-Sulbactam, Imipenem, Gentamycin, Tobramycin, Tetracycline, Doxycycline, Minocycline and Netilmycin.
- Klebsiella pneumoniae was resistant to all antimicrobials except Chloramphenicol in this study.
- Ciprofloxacin and Levofloxacin were the resistant drugs among all gram-negative organisms.
- P. aeruginosa were 100% sensitive to Meropenem and Amikacin and 100% resistant to Gentamycin and Levofloxacin.
- Among 12 culture positive specimens, the most common cause of bacterial ocular infection was by Pseudomonas aeruginosa 3(5.45%).
- Among hyaline fungi like Fusarium spp. 1(1.81%), Aspergillus fumigatus 1(1.81%) and Mucor spp. 1(1.81%) are isolated.

DISCUSSION
- In this study, out of total 55 samples from clinically suspected ocular infections, total culture positive were 12(21.81%) which is compared with Rani and Madhumati and Hemavathi et al. study with rate of isolation of 247(40.5%) and 113(48%) respectively.
- In the present study, bacteria were 9(16.36%) followed by fungal pathogens 3(5.45%).In Rani and Madhumati and Hemavathi et al. study bacterial pathogens (35.30% and 34.46% respectively) were more common than Fungal pathogens (4.43% and 13.61% respectively).
- In present study, patients with Corneal ulcer 14(25.45%) was the predominant type of eye infection.
- Out of the total 9 bacterial cultures, 3(5.45%) were gram positive cocci and 6 (10.91%) were gram negative bacilli. Streptococcus spp. was isolated in 2(3.63%) and Coagulase Negative Staphylococcus was isolated in 1(1.82%). The most common gram-negative bacilli isolated was Pseudomonas aeruginosa 3(5.45%), Acinetobacter baumannii 1(1.81%), Klebsiella pneumoniae 1(1.81%) and Escherichia coli 1(1.81%).
- In the present study, the antimicrobial sensitivity pattern of all the gram positive organisms were 100% sensitive to Vancomycin similar Rani and Madhumati, S. Rajesh et al. study. all the gram-positive organisms were 100% sensitive to Linezolid which similar to Tewari A et al. study.
- In this study all the gram positive organism were resistant to Ciprofloxacin, while in Rani Madhumati and Tewari A et al. study, sensitivity of gram positive organisms to Ciprofloxacin is 52.77% and 58.33% respectively.
- In this study, gram positive organisms were 66.66% sensitive to Levofloxacin, while in Rani and Madhumati and Tewari A et al.study it was 85% and 100% respectively. Organisms were 66.66% sensitive to Tetracycline in the present study similar to Tewari A et al. that was 62.85%.
- Gram positive organisms were 66.66% sensitive to chloramphenicol in present study which is more than 44.44% from Tewari A et al. Study. While in Rani and Madhumati study,it was 84%. In present study the gram positive organisms were 33.33% sensitive to Erythromycin which is 100% resistance in Rani and Madhumati study. Organisms were 66.66% sensitive to Clindamycin and 33.33% sensitive to Gentamicin in present study while in Tewari A et al. 100% sensitivity to Erythromycin and Clindamycin and it was 61.11% to Gentamicin
- In the present study, all the gram-negative organisms were resistant to Cefuroxime and Ceftriaxone while in Tewari A et al.study it was 26.66% and 80% respectively and in study done by S.Rajesh et al. sensitivity to Ceftriaxone was 13.33%.
- Gram negative isolates were 16.66% sensitive to Ceftazidime in our study while in Rani and Madhumati study, all isolates were resistant to Ceftazidime. In our study gram negative isolates were 16.66% sensitive to Ampicillin- Sulbactam whereas in Tewari A et al. study it was 80%.
- In present study gram negative isolates were 33.33% sensitive to Gentamycin. In S.Rajesh et al. and Tewari A et al. study it was 26.66% and 60.86% respectively.
- Gram negative organisms were 66.66% sensitive to Amikacin in our study while 100% sensitive in Tewari A et al. study.
- In the present study sensitivity of gram-negative isolates to ciprofloxacin and Levofloxacin were 16.66% and 0% respectively while in Tewari A et al. it was 52.17%, 86.95% respectively.
- In this study gram negative organisms were resistant to Co-trimoxazole, while in Tewari A et al. study sensitivity to Co-trimoxazole was 43.47%.
- Gram negative organisms were 16.66% sensitive to Aztreonam, 16.66% sensitive to Chloramphenicol and Piperacillin-Tazobactam were 33.33%.sensitive in our study while in Tewari A et al. study it was 82.60%, 60.86% and 100% respectively

CONCLUSION
In conclusion, the prevalence of the bacterial infection among patients with ocular infection in this study was high. Probable diagnosis on the basis of Gram's stain and the KOH preparation for empirical therapy and modification of treatment according to culture and sensitivity report can help in the proper management and prevention of ocular morbidity and mortality and active follow up of traumatic and immunocompromised patients can also help in reducing the morbidity.

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