# Comparison of conjunctival microflora in patients undergoing cataract surgery

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## Abstract

**Purpose:** To isolate the bacterial flora from the conjunctival sac in patients undergoing cataract surgery and to determine the antibiotic sensitivity pattern of these organisms.

**Methods:** A total of 500 cases both men and women were included in this study. Specimen were taken 1 day prior to the surgery from the conjunctival sac of the patients and then cultured for isolation of the bacteria along-with antibiotic sensitivity testing if any culture came positive. The percentage of bacterial isolates and the drug resistant isolates were compared. The study was conducted for a period of 18 months after obtaining a written and informed consent from all the patients. All forms of cataract in all age groups with the absence of any associated ocular infection were included in this study. Patients with prior history of any ocular infectious diseases and traumatic cataracts were excluded from this study.

**Results:** Out of the 500 cases, 61 (12.2%) had positive cultures. The most frequently isolated bacterium was the Staphylococcus aureus found in 44(72.13%) cases, followed by coagulase negative Staphylococcus (CoNS) from 11(18.03%) cases, both showing high sensitivity to cefpodoxime (65%), cefuroxime (67%), gentamicin (74%), ciprofloxacin (72%) and vancomycin (83%), amoxycillin and clavulanic acid (53.5%) and methicillin (59%). Methicillin resistant strains were noted in 19.36% eyes.

**Conclusion:** The most frequent bacterium in the conjunctival flora is the *Staphylococcus* aureus with high susceptibility rates to cefpodoxime, cefuroxime, gentamicin, vancomycin, ciprofloxacin and augmentin.

**Keywords:** Antibiotics, Cataract surgery, Conjunctival flora, Sensitivity,

## Introduction

Cataract operation is one of the most frequently performed eye surgeries in the world. Endophthalmitis, an ocular inflammatory condition, is one of the most serious complications of this surgery, that although rare, leads to significant ocular morbidity and visual loss even with antibiotic treatment.[1]

Possible sources of postoperative endophthalmitis may include the tear film, ocular adnexal tissues, irrigation solutions used during surgery, surgical instruments, respiratory and cutaneous flora of the operating surgeon and assistants and room air of operation theatre.[2] Among all the microorganisms, bacteria are the most common cause of postoperative endophthalmitis and most of them are part of the normal conjunctival microbial flora of the patient itself.[3,4] Literature shows that gram positive bacteria are responsible for 60% to 80% of acute endophthalmitis, of which Coagulase-negative Staphylococci (CoNS) are the most common ones. They are also the most common organism isolated among the normal conjunctival flora. Gram negative bacterias account for roughly 15% of the infections.[5-8] The superficial conjunctival flora penetrates the anterior chamber during cataract surgery but does not always necessarily lead to infection, suggesting that a small inoculum of bacteria can be removed by anterior chamber without causing endophthalmitis.[11,12]

Use of prophylactic antibiotic pre-and postoperatively helps in reducing the risk of endophthalmitis.[11-13] Bacterial resistance patterns are continuously changing among various commonly used antibiotics such as erythromycin, penicillins and tetracycline.[14] However, topical fluoroquinolones, the most frequently used pre- and postoperative prophylactic agents for ocular surgeries show a variable trend for bacterial resistance. In some areas the resistance is increasing,[15-17] whereas in other areas, only less than 15% of Staphylococcus aureus, CoNS, Streptococcus species and Gram negative organisms were found resistance to quinolones.[14,18] S.aureus, CoNS, Streptococcus species show low resistance to antibiotics like vancomycin, cefuroxime and newer quinolones such as ofloxacin, or gatifloxacin.[14,18] Increasing trends in antimicrobial resistance are complex and are mostly dependent upon inherent pathogens' factors, arbitrary and long-term use of the topical drugs and the common practice of self-medication among people.[18]

Identifying the organisms found most frequently in the ocular conjunctival flora and their antibiotic sensitivity pattern may provide a better guide in choosing an antibiotic preoperatively and postoperatively for prophylaxis.

## Methods

A prospective study was conducted preoperatively on 500 patients undergoing cataract surgery at Department of Ophthalmology, Silchar Medical College and Hospital, during the period of October 2015 to March 2017. The study was approved by Institutional Ethical Committee of Silchar Medical College and Hospital.

**Inclusion criteria:** Patients undergoing cataract surgery during the selected time period

**Exclusion criteria:** Patients with ocular surface disease such as meibomitis, dry eye, and chronic dacryocystitis.

After obtaining consent, ophthalmologic evaluation was done in all the patients. Conjunctival swabs were taken 1 day before cataract surgery from the eye to be operated before applying any antibiotic or anesthetic drops. Specimens were taken from the inferior conjunctival fornix with sterilized cotton swabs without touching the eyelids. The swabs were sent immediately to the microbiology department in sterile glass tubes. The microbiological investigation followed these steps:

1. **Microscopic examination:** A smear was prepared from the collected swabs and gram staining was done.
2. **Culture**: Blood agar and MacConkey agar plates were used for the bacterial culture. The material collected by the swab was streaked into solid culture medium. Later, the plates were incubated at 36±1°C for 24 to 48 hours and looked for any growth. Then the isolates were identified using various morphological characteristics and biochemical reactions. Antibiotic susceptibility tests were carried out for all the isolates.
3. **Antibiotic susceptibility tests:** Disc-diffusion method was used for antibiotic sensitivity of the isolated microorganisms and the inhibition zone surrounding the disc was measured.

## Results

A total of 500 patients from whom the conjunctival swabs were taken were analyzed. In this study, 262 (52.4%) were males and 238 (47.6%) were females. The age group was in range of 40–85 years. 439(87.8%) cases showed absence of any bacterial growth while the cultures were positive in 61(12.2%) cases to be operated. (Table 1). Amongst those patients with positive cultures (61 eyes), 34 were males and 27 were females. Fifty seven (93.44%) of the microorganisms isolated were gram-positive and four (6.55%) were gram-negative (Table 2). The most frequently isolated bacterium was the Staphylococcus aureus, found in 44(72.13%) cases, coagulase negative Staphylococcus (CONS) from 11(18.03%) cases, Streptococcus pneumoniae from 2(3.27%) cases (Table 3). Gram negative bacilli that were isolated included Klebsiella pneumoniae and Acinetobacter species in total 4 eyes.(Table 4)

As regards to susceptibility pattern of gram positive organisms that were isolated, the organisms showed high sensitivity to cefpodoxime (65%), cefuroxime (67%), gentamicin (74%), ciprofloxacin (72%) and vancomycin (83%), amoxycillin and clavulanic acid (53.5%) and methicillin (59%). Methicillin resistant strains were noted in 19.36% eyes. Resistance to azithromycin was noted in only one eye.

As regards to the sensitivity pattern in case of gram negative bacterias that were isolated, all the organisms were most susceptible to ciprofloxacin, cefpodoxime, ceftazidime, amoxicillin and clavulanic acid, imipenem and cefixime but were resistant to nil.

**Table 1: The number of cases with growth and no growth (*n*=500)**

| Growth status | No. of cases | % |
|---|---|---|
| No bacterial growth | 439 | 87.8 |
| Bacterial growth | 61 | 12.2 |

**Table 2: Number of cases showing gram positive and gram negative bacterial isolates**

| Bacterial Isolates | No. of cases | % |
|---|---|---|
| Gram positive | 57 | 93.44 |
| Gram negative | 04 | 06.55 |

**Table 3: Proportion of various Gram Positive organisms in the isolates**

| Gram positive Organism | No. of cases | % |
|---|---|---|
| Staphylococcus aureus | 44 | 72.13 |
| CONS | 11 | 18.03 |
| Streptococcus pneumoniae | 02 | 03.27 |

**Table 4: Proportion of various Gram Negative organisms in the isolates**

| Gram negative organisms | No. of cases | % |
|---|---|---|
| Klebsiella pneumoniae | 03 | 4.91 |
| Acinetobacter species | 01 | 1.63 |

**Table 5: Antibiotic susceptibility of gram positive isolates**

| Sensitivity | Cefpo | Cefu | Genta | Cipro | Vanco | Amoxyclav | Methicillin | Azithro |
|---|---|---|---|---|---|---|---|---|
| Sensitive | 65 | 67 | 74 | 72 | 83 | 53.5 | 59 | 82 |
| Resistant | 35 | 33 | 26 | 28 | 17 | 26.5 | 19.36 | 18 |

**Table 6: Antibiotic sensitivity of various gram negative isolates**

| Sensitivity | Cipro | Cefpo | Cefta | Amoxyclav | Imipenem | Cefixime |
|---|---|---|---|---|---|---|
| Sensitive | 75 | 50 | 75 | 50 | 75 | 100 |
| Resistant | 0 | 0 | 0 | 0 | 0 | 0 |

## Discussion

Postoperative endophthalmitis is one of the most dreaded complications of cataract surgery and conjunctival flora is known to be the primary and most frequent source of bacteria responsible for it. So identification of the conjunctival bacterial flora in preoperative patients and their antibiotic susceptibility pattern is of utmost importance in choosing the appropriate antibiotic for prophylaxis.

In our study, we were able to isolate bacteria in 61(12.2%) cases. In a study conducted by Reza *et al*.,[5] the percentage isolation was found to be 52.4%. Another study by Terence *et al*.[6] showed the isolation was of the order of 80%. In both cases, the inoculation was in blood agar and samples collected from the lid margin were also taken into account which were probably the reason for such a high positivity in the latter case.

The most common organism isolated in our study was Staphylococcus aureus (72.13%) which is different with most of the studies.[5–8] indicating the prevalence of Staphylococcus aureus in our area.

With regards to sensitivity patterns particularly in case of gram positive isolates, ciprofloxacin, gentamicin, vancomycin, amoxy-clavulanic acid, cefuroxime, cefpodoxime were found to be most effective. Few strains showed methicillin resistance.

Amongst the gram negative isolates, almost all showed sensitivity to ciprofloxacin, ceftazidime, amoxy-clavulanic acid and imipenem but resistance to nil.

Another issue of interest is that our tests of antibiotic sensitivity were performed in vitro and may differ from the real efficiency of these antibiotics in vivo. In addition, the disc-diffusion sensitivity test technique for antibiotic sensitivity is based on the serum concentration of the antibiotics that might be different from the concentration in the conjunctiva on topical installation of eye drops. Keeping these points in mind, it is believed that this study can be used by the ophthalmologists to get an orientation in choosing a prophylactic antibiotic to be used preoperatively and postoperatively in their surgeries to prevent postoperative ocular infection but these results should be confirmed by in vivo tests.

## Conclusion

This study showed that Staphylococcus aureus was the most frequently isolated bacterium from the conjunctival sac of the patients undergoing cataract surgery. Isolates of this bacterium had low susceptibility rates to neomycin and high susceptibility to cefpodoxime, gentamicin vancomycin, ciprofloxacin and augmentin.

Nowadays, with the increasing trend of bacterial resistance to antibiotics, understanding the pattern of sensitivity of the conjunctival flora to antibiotics is of utmost importance.

Additionally, these studies can help the ophthalmologists in choosing a prophylactic antibiotic to be used in their surgeries so as to prevent postoperative ocular infections and thus reducing the ocular morbidity.

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