# One Year Retrospective Study of Ocular Infection in a Tertiary Care Hospital from Timisoara

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*Eye is the most important sensory organ concerned with the perception of vision. Ocular infections are one of the common diseases of the eye. Ocular infections as blepharitis, conjunctivitis, canaliculitis, dacryocystitis, keratitis, scleritis, orbital cellulitis, endophthalmitis, panophthalmitis and other infections which are responsible for increased incidence of morbidity and blindness worldwide, their morbidity vary from self-limiting trivial infection to sight threatening infection. To identify the bacterial profile of ocular infections in patients attending Ophthalmology Department. After clinical diagnosis of ocular infection made by Ophthalmologist, specimens were collected with the help of Ophthalmologist. Samples like eyelid swab, pus from dacryocystitis, corneal scrapings, corneal swab, and tissue specimens from 189 patients attending Ophthalmology Department were analyzed from 01.01.2014 to 01.01.2015. Using predefined inclusion and exclusion criteria, samples were collected according to the standard protocol. Inclusion criteria: 1. Clinically diagnosed cases of ocular infections attending Outpatient Department and Inpatient Department of Ophthalmology, Tertiary Care Center from Timisoara 2. Patients not on antibiotics (systemic or either topical) will be included in the study. 3. Patients not responding to antibiotics. Exclusion criteria: 1. Non-infectious etiology of ocular diseases. The material was examined Gram staining. The specimens were cultured on sheep's blood agar, Chocolate agar and MacConkey agar, Chapman agar, Sabouraud dextrose agar. Drug susceptibility was tested using disc diffusion method (Kirby Bauer).The most common bacterial pathogen isolated were Staphylococcus aureus (29.7%) followed by Staphylococcus epidermidis (22.1%), other organisms isolated are Streptococcus pneumonia (17.9%), Klebsiella spp. (6.3%), Escherichia coli (4.7%), Pseudomonas aeruginosa (3.4%). Among the opportunistic pathogens, Staphylococcus epidermidis, (22.1%) were the most common isolate followed by Staphylococcus saprophyticus (0.45%). Bacterial isolates were highly susceptible to Vancomycin (100%), Gentamicin (92.1%) among Gram positive organisms. The Gram negative organisms are highly susceptible to Tobramycin (95.4%) and Imipenem (87.9%). The study suggests that Staphylococcus aureus and Staphylococcus epidermidis are the most common etiological agents of Ocular infections. Most of the strains were sensitive to Vancomycin and Tobramycin. Persistent efforts should be put for continuous surveillance and epidemiological characterization which are imperative to treat and prevent morbidity and blindness of population at risk.*

*Keywords: Staphylococcus aureus, Ocular infections, Staphylococcus epidermidis, opportunistic pathogen.*

While examination of material from the respiratory and gastrointestinal tracts as well as from surgical infection has become a routine clinical laboratory procedure, little time if any, is devoted in most hospitals to the study of the bacteriology of infections of the eye [1].

Eye is the most important sensory organ concerned with the perception of vision. Ocular infections are one of the common diseases of the eye. Ocular infections as blepharitis, conjunctivitis, canaliculitis, dacryocystitis, keratitis, scleritis, orbital cellulitis, endophthalmitis, panophthalmitis and other infections which are responsible for increased incidence of morbidity and blindness worldwide, their morbidity vary from self-limiting trivial infection to sight threatening infection.

Such infections often involve a predisposing factor that weakens the defenses, such as the use of contact lenses prior to the development of bacterial keratitis or, for endophthalmitis, the trauma caused by cataract surgery or intravitreal injection. The structural carbohydrates of the bacterial surface induce an inflammatory response able to reduce the bacterial load, but contribute to the tissue damage. A variety of bacterial secreted proteins including alpha-toxin, beta-toxin, gamma-toxin, Panton-Valentine leukocidin and other two-component leukocidins mediate tissue damage and contribute to the induction of the inflammatory response. Quantitative animal models of keratitis and endophthalmitis have provided insights into the *Staphylococcus aureus* virulence and host factors active in limiting such infections [2].

In addition to causing skin and soft tissue infections, osteomyelitis, endocarditis, blood-borne infections, and pneumonia, *Staphylococcus aureus* is among the most common causes of ocular infections, including blepharitis, dacryocystitis, conjunctivitis, keratitis, and endophthalmitis. Approximately 35% of the general public and 50–66% of hospital workers become colonized with the organism [3,4]. Interactions between *S. aureus* and other bacteria of the nasal flora appear to aid or retard the growth of *S. aureus* in the anterior nares [5]. Humans are not the only reservoir for this organism because the organism can be isolated from companion animals, livestock, and wild animals [6-8]. About 4% of dogs and some cats carry *S. aureus* at one or more body sites (e.g., abdomen), including MRSA strains [6]. Additionally, livestock, especially pigs but also chickens and cattle, carry strains of ST398 that have been the cause of human infections [6-9]. Animals in wild populations (e.g., chimpanzees) harbor and shed *S. aureus* [8]. Well recognized are human carriers who harbor *S.*

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*aureus* in their anterior nares, throat, and perianal body sites; however, the bacteria is often also found in areas around the human eye. Specific strains found in the flora around the eye provide the organisms that infect the eye; that is, the isolates obtained from eye infections match those found in the patient's periocular area.

The eyelid, tear duct, and conjunctiva are in contact with the tear film that contains multiple soluble factors able to protect against bacterial infection, but *S. aureus* infections of these sites are commonly encountered among the general population. Such infections are not sight-threatening unless the cornea becomes involved. Corneal infections can be challenging because the combination of the immune response and the action of bacterial toxins can cause considerable tissue damage resulting in scarring that reduces visual acuity. Likewise, infections of the inner eye involve a potent host response that together with bacterial toxins can damage tissues critical to vision, especially the retina [2].

## Experimental part

*Materials and methods*

Our main objective was to identify the bacterial profile of ocular infections in patients attending Ophthalmology Department. The study was conducted between 01.01.2014 to 01.01.2015 in the Department of Microbiology of the Municipal Emergency Clinical Hospital of Timi°oara - Ophthalmology unit. It is a retrospective study that used a cohort of 189 patients attending this unit.

Inclusion criteria:

- Clinically diagnosed cases of ocular infections attending Outpatient Department and Inpatient Department of Ophthalmology, Tertiary Care Centre Timisoara;
- Patients not on antibiotics (systemic or either topical) will be included in the study;
- Patients not responding to antibiotics.

Exclusion criteria:

- Noninfectious etiology of ocular diseases.
- Patients with antibiotics treatment (systemic or topical)

After clinical diagnosis of ocular infection made by Ophthalmologist, specimens were collected with the help of Ophthalmologist. Samples like eyelid swab, pus from dacryocystitis, corneal scrapings, corneal swab, and tissue specimens from 189 patients attending Ophthalmology Department were analyzed from 01.01.2014 to 01.01.2015. Using predefined inclusion and exclusion criteria, samples were collected according to the standard protocol. The sampling was done in accordance with the recommended aseptic rules.The material was examined Gram staining. The specimens were cultured on sheep's blood agar, chocolate agar and MacConkey agar, Chapman agar, Sabouraud dextrose agar. Drug susceptibility was detected using disc diffusion method (Kirby Bauer) according to the Clinical and Laboratory Standard Institute (CLSI) standard.

## Results and discussions

The most common bacterial pathogen isolated were *Staphylococcus aureus* (29.7%) followed by *Staphylococcus epidermidis* (22.1%). Other organisms isolated are *Streptococcus pneumonia* (17.9%), *Klebsiella spp.* (6.3%), *Escherichia coli* (4.7%), *Pseudomonas aeruginosa* (3.4%). Among the opportunistic pathogens, *Staphylococcus epidermidis*, (22.1%) were the most common isolate followed by *Staphylococcus saprophyticus* (0.45%) (table 1). 29 samples were sterile.

In order to highlight the behavior of the pathogen strains versus beta-lactam, we tested the following classes of

**Table 1**

THE MOST COMMON BACTERIA ISOLATED FROM THE SAMPLES COLLECTED (PATHOGEN AND OPPORTUNISTIC PATHOGENS)

| Pathogen | Percent | Number |
|---|---|---|
| *Staphylococcus aureus* | 29.7% | 56 |
| *Staphylococcus epidermidis* | 22.1% | 42 |
| *Streptococcus pneumonia* | 17.9% | 34 |
| *Klebsiella spp.* | 6.3% | 12 |
| *Escherichia coli* | 4.7% | 9 |
| *Pseudomonas aeruginosa* | 3.4% | 6 |
| *Staphylococcus saprophyticus* | 0.45% | 1 |

antibiotics: aminopenicillins (ampicillin), aminopenicillins with beta-lactamase inhibitors (amoxicillin + clavulanic acid), ureidopenicillins (piperacillin), second generation cephalosporins (cefuroxime), third generation cephalosporins (ceftazidime, cefotaxime, cefpodoxime), cephamycin (cefoxitin), fourth-generation cephalosporins (cefepime) and carbapenems (imipenem) (table 2). We also tested the susceptibility of bacteria to glycopeptide antibiotics (Vancomycin), aminoglycosides (Gentamycin, Tobramycin).

**Table 2**

DRUG SUSCEPTIBILITY OF BACTERIA ISOLATED FROM THE SAMPLES COLLECTED (PATHOGEN AND OPPORTUNISTIC PATHOGENS)

| ANTIBIOTIC | CLASS |
|---|---|
| Aminopenicillins | R |
| Aminopenicillin+BIL | S/I/R |
| Carboxipenicillin | R |
| Ureidopenicillin | R |
| I-st geenration cephalosporins | R |
| II-nd generation cephalosporins | R |
| III-rd generation cvephalosporins | R |
| IV-th generation cvephalosporins | R |
| Cephamycin | S/I/R |
| Carbapenems | S |
| Aminoglycosides | S |
| Glycopeptide | S |

Bacterial isolates were highly susceptible to Vancomycin (100%), Gentamicin (92.1%) among Gram positive organisms and among Gram negative organisms it is highly susceptible to Tobramycin (95.4%) and Imipenem (87.9%).

## Conclusions

The study suggests that *Staphylococcus aureus* and *Staphylococcus epidermidis* are the most common etiological agents of ocular infections. Most of the strains were sensitive to Vancomycin and Tobramycin. Persistent

efforts should be put for continuous surveillance and epidemiological characterization which are imperative to treat and prevent morbidity and blindness of population at risk.

Routine hospital epidemiologic practice to combat MRSA includes hand hygiene and isolation of patients known to harbor this pathogen. In addition, active surveillance of patients for asymptomatic colonization at the time of admission and enhanced contact precautions are being used in many institutions. This continual evolution of drug-resistant *S. aureus* strains foreshadows not only the near-future exhaustion of existing antibiotics but also the transient nature of their efficacy even in a single patient.

Novel methods to prevent and treat infection are urgently needed to combat this superbug. Highly targeted *designer* therapies informed by molecular knowledge of pathogenesis hold promise to bypass or limit specific concerns associated with antimicrobial therapy. Monoclonal antibody prophylaxis and treatment is perhaps the most refined biological technology for targeting pathogens including *S. aureus.* Through knowledge of virulence factor action in disease, a number of monoclonal antibodies have demonstrated success in preclinical investigations of severe *S. aureus* infection [10-22]; several are now being examined in clinical trials [23-27]. In addition, pharmacologic agents and monoclonal antibodies that act on host proteins to mitigate the pathophysiological consequences of life-threatening infection have similarly demonstrated promise in preclinical studies of disease [28]. Given the need for these interventions to be applied in a precisely defined clinical setting and the economic cost associated with molecular targeting, such therapies are unlikely to be cost-effective in population-based low-risk settings. However, the mortality and short- and long-term morbidity rates caused by infection in medical and surgical areas-coupled with the cost of advanced care-may provide a unique rationale for implementing these approaches in this patient population.

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