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Original Research

Microbiological Profile of Ophthalmic Infections and the Antibiotic Susceptibility Pattern of the Bacterial Isolates at a Tertiary Care Hospital, Kanpur UP (India)

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ABSTRACT

Introduction:- Infection of the eye leads to conjunctivitis, keratitis, endophthalmitis, dacryocystitis, blephritis, infections of eye lid, microbial scleritis, canaliculitis, preseptal cellulitis, orbital cellulitis, endophthalmitis and panophthalmitis etc., which are responsible for increased incidence of morbidity and blindness worldwide. **Aim:-** To study the microbiological profile of ophthalmic infections and the antibiotic susceptibility pattern of the bacterial isolates at a tertiary care hospital, Kanpur. **Materials and methods:-** A Total 50 samples were received from infections of the eye- including conjunctivitis, corneal ulcers; cataract and FB cornea infections. The samples were processed on Blood agar and MacConkey agar, incubated aerobically at 370C for 24 hours. Samples from ophthalmic infections cases were aerobically cultured and isolates from culture positives were identified by standard procedures. Antimicrobial susceptibility testing was done following CLSI guidelines 2020. **Result:-** Out of 50 cases 34(34%) were positive for bacterial growth. Predominant bacterial isolates S. aureus 22(64.70%) S.lugdunensis 7(20.55%) MRSA 3(8.82%) CoNS, 1(2.94%),and MR CoNS 1(2.94%), were isolated Gram Positive Bacteria. All isolates were susceptible to Amikacin, Gentamicin, Linezolid, Teicoplanin, Tetracycline, Tobramycin. Frequency of inducible clindamycin resistance among Staphylococcus aureus was 7(31.81%), Staphylococcus lugdunensis was 3(42.85), Methicillin resistant Staphylococcus aureus was 1(33.33%),MR CoNS was 1(100%) and among CoNS it was 1(100%). **Conclusion**: Our findings are in general consistent with those from clinical studies of Ophthalmic infection. The most commonly isolated bacterial pathogens in this study were gram positive cocci. S. aureus and S. lugdunensis are the most common bacterial isolates found in the conjunctivitis infection. Amikacin, Gentamicin, Linezolid, Teicoplanin, Tetracycline Tobramycin, Levofloxacin and Vancomycin showed the lowest resistance rates to all bacterial isolates.

Keywords:- Conjunctivitis, Staphylococcus aureus, Antibiotics..cervical abnormalities among pregnant women.

INTRODUCTION

The eye is a unique organ that is impermeable to almost all external organisms. Continuous tear flow, aided by the blink reflex, mechanically washes substances from the ocular surface and prevents the accumulation of microorganisms. In addition, lysozyme, lactoferrin, secretory immunoglobulin's, and defensins, which are present at high levels in tears, can specifically reduce bacterial colonisation of the ocular surface**.[1,2]** Infection of the eye leads to conjunctivitis, keratitis, endophthalmitis, dacryocystitis, blephritis, infections of eye lid, microbial scleritis, canaliculitis, preseptal cellulitis, orbital cellulitis, endophthalmitis and panophthalmitis etc., which are responsible for increased incidence of morbidity and blindness worldwide**.[3,4,5]** Conjunctivitis is the most common cause of "red eye" and corneal ulceration is a major cause of mono-ocular blindness in developing countries**. [6]** Infectious keratitis is no doubt a major and growing problem in the developing countries. It sometimes becomes sight-threatening and results in permanent visual loss due to delayed diagnosis and inappropriate treatment. Acute bacterial keratitis once developed is

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rapidly progressive.Initially corneal ulcer is formed with surrounding corneal epithelium and stromal edema**.[7]** Pathogenic micro-organisms cause ocular disease due to virulence and host's reduced resistance because of the factors like personal hygiene, living conditions, socioeconomic status, decrease immune status, etc. The areas of the eye that are frequently infected are the conjunctiva, lid and cornea**.[8,9]** *Haemophilus influenza* and *Streptococcus pneumoniae* in children and *Staphylococcus aureus* in adults are the commonest bacteria causing ocular infection. Multidrug resistant bacteria isolates like Methicillin-resistant *S. aureus* (MRSA) are emerging more important pathogen. But,generally gram positive pathogens are responsible for 60% to80% of acute infections. **[10,11]** *Staphylococcus. aureus* is the major ophthalmic bacterial pathogen isolated from various ocular infections.[18] Treatment of *Staphylococcus aureus* infections has become more complicated with emergence of *Methicillin-resistant Staphylococcus aureus(MRSA*) strain in 1961 [19]. Despite the fact that *MRSA* is one of the major topics in clinical microbiological research, very little is known about the prevalence and epidemiology of eye infections due to *Methicillin-sensitive S.aureus (MSSA)* or *Methicillin resistant Staphylococcus aureus (MRSA).*

Bacteria are major causative agents that frequently cause infections in eye and possible loss of vision. Hence there is a need for an immediate treatment for the serious bacterial eye infection that threatens the cornea of eye**.[10]** For specific antibacterial treatment, isolation and identification of bacterial pathogens along with antibiotic susceptibility spectrum is essential**.[12]** As there is a worldwide problem regarding the emergence of bacterial resistance towards topical antimicrobial agents which are influenced by characteristics of pathogens, antibiotic-prescribing practices including the use of systemic antibiotics and general healthcare guidelines**.[13,14]** Fourth-generation Fluoroquinolones such as Gatifloxacin and Moxifloxacin have been proven to be efficacious in the treatment of ocular infections caused by these pathogens. **[15]** The fact that in recent times, ocular infections caused by microbial organisms are showing resistance to such fourth generation Fluoroquinolones makes it imperative to identify and report current patterns of emerging resistance. Ocular Infections caused by the bacteria is most common which is followed by fungal and then viral infections. The bacterial etiology and their susceptibility as well as resistant patterns may vary with geographical location according to the local population. **[16-21]**

This study was undertaken to study the "Microbiological profile of ophthalmic infections and the antibiotic susceptibility pattern of the bacterial isolates at a tertiary care hospital, Kanpur (India)"

MATERIAL AND METHODS

Study setting: This study was conducted in Department of Microbiology and Ophthalmology, Rama Medical College Hospital & Research Center Kanpur, Uttar Pradesh, India

Study design: Prospective study.

Type of study: Observational study.

Study period: This study was conducted from January 2019 to December 2019.

Size of sample: 50 samples from Ophthalmic department was collected.

Inclusion criteria: All patients (OPD, IPD) with clinical finding of any ocular infection in eye, presenting at Rama Medical College, Hospital & Research Centre hospital during the study period, were included.

Exclusion criteria: Patients who have take medication (Antibiotics and eye drop antibiotic) in past one week was excluded from the study.

Ethical consideration: Ethical clearance was taken from the institutional ethical committee.

Sample collection: Samples were taken on swab stick from patients presenting with ocular infections like conjunctivitis including dacrocystis, corneal ulcers, endophthalmitis and post-traumatic infections.

Sample for culture:- All swab samples were inoculated onto Blood agar base to which 10% sheep blood is incorporated, chocolate agar/heated blood agar and MacConkey agar The inoculated cultures were incubated at 37ºC according to standard procedure.

Gram stain [22]: The suspected colonies were stained using gram stain method and their shape, colour and arrangement were observed under light microscope.

Biochemical tests [22]: Catalase test, Coagulase test, Urease test,

Antimicrobial susceptibility test:- AST was performed by Kirby –Bauer disc diffusion method**.[23]**

D- Zone Test

D Test is a simple disc diffusion test giving high throughput result. It is used to study the macrolide lincosamidestreptogramin resistance (MLSB), both constitutive and inducible as well as macrolide streptogramin resistance (MSB) in Staphylococcus aureus.

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MIC test: MIC was detected by E test as per the CLSI guideline (CLSI) 2016. [**23]**

RESULT

Table No. 1: Distribution of Male & Female in the Age group from samples with Growth

Age	Male (N=15)	Female (N=19)
11-20	1	2
21-30	2	2
31-40	2	4
41-50	6	7
51-60	4	4
TOTAL	15	19

Table .2:- Distribution of culture positive and culture negative samples

No. of Culture Positive cases	No. of Culture Negative cases	Total
34 (68%)	16 (32%)	**50 (100%)**

Out of 50 samples, Culture positive cases 68% and Culture negative cases 32%.

Table No. 3: Sample wise distribution of 50 samples

Eye disease	Growth	No growth
Conjuctivitis	13	2
Corneal Ulcer	11	2
Cataract	6	5
FB Cornea	4	7
Total No. of sample =50	**34**	**16**

Table No. 4: Microbiological profile of Ophthalmic infections from clinical samples

Organism	Number (N=34)	Percentage %
S. aureus	**22**	**64.70%**
S. lugdunensis	7	20.58%
MRSA	3	8.82%
CoNS	1	2.94%
MRCoNS	1	2.94%
Gram negative bacteria	0	0%
Fungal	0	0%
Parasites	0	0%

Table No. 5: Antibiotic sensitivity pattern of all isolated organism

Antibiotics	***S.aureus*** **(N=22)**	***S. lugdunensis*** **(N=7)**	***MRSA*** **(N=3)**	***CoNS*** **(N=1)**	***MRCoNS*** **(N=1)**
Amikacin	22 (100%)	7 (100%)	3 (100%)	1 (100%)	1 (100%)
Cefoxitin	(36.36%)	4 (57.14%)	0	1 (100%)	0
Erythromycin	15 (68.18%)	4 (57.14%)	2 (66.66%)	0	0
Clindamycin	15 (68.18%)	4 (57.14%)	2 (66.66%)	0	0
Gentamicin	22 (100%)	7 (100%)	2 (66.66%)	1 (100%)	1 (100%)
Linezolid	22 (100%)	7 (100%)	3 (100%)	1 (100%)	1 (100%)
Oxacillin	8 (36.36%)	2 (28.57%)	0	0	0
Penicillin	**0**	1 (14.28%)	0	0	0
Tetracycline	22 (100%)	5 (71.42%)	3 (100%)	1 (100%)	1 (100%)
Teicoplanin	22 (100%)	7 (100%)	3 (100%)	1 (100%)	0
Vancomycin (E-test for MIC)	22 (100%)	7 (100%)	2 (66.66%)	1 (100%)	1 (100%)
Chloramphenical	15 (68.18%)	3 (42.85%)	1 (33.33%)	0	0
Ciprofloxacin	10 (45.45%)	2 (28.57%)	1 (33.33%)	0	0
Levofloxacin	22 (100%)	4 (57.14%)	3 (100%)	1 (100%)	1 (100%)
Ofloxacin	11 (50%)	3 (42.85%)	2 (66.66%)	0	0
Tobramycin	22 (100%)	7 (100%)	3 (100%)	1 (100%)	1 (100%)

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Table No. 6: D- Zone Test (Clindamycin resistance) of the *Staphylococcal* isolates

Organism	Percentage (N= 34)
S. aureus	7 (20.58%)
S. lugdunensis	3 (8.82%)
MRSA	1 (2.94%)
Total	**11 (32.35%)**

DISCUSSION

Total of 50 ophthalmic infection (including conjuctivitis, corneal ulcer, cataract, FB cornea samples were collected from the patients. The results were compared with other studies and discussed as follows:

Table No.1: Comparison of age wise distribution with other studies

Serial No.	Study	Year	Result
1.	M.Jeyaet.al.**[24]**	2013	55(44%) cases were in the age group of>60
2.	TeweldeTesfaye et al.[25]	2013	72(36.4) cases were in the age group of up to 18-39
3.	ReenAnieJose et. al.**[26]**	2017	45(33.33%) cases were in the age group of 40-59
4.	**Presentet.al.**	**2019**	**25 (50%) cases were in the age group of41-50**

In the present study an increased incidence of infective ophthalmic case was seen in the age group of 41-50 years, which is similar to study by M. Jeya et.al.

TableNo.2: Comparison of sex wise distribution with other studies

Serial No.	Study	Years	Male	Female	Total
1.	M.Jeyaet. al**[24]**	2013	70(56%)	55(44%)	125
2.	Reena Anie Joseet.al.[26]	2017	89(66%)	46(34%)	135
3.	S.Rajeshet.al**[27]**	2017	44(44%)	56(56%)	110
4.	**PresentStudy**	**2019**	**23(46%)**	**27(54%)**	**50**

Females 27 (54%) were more affected than Males 23 (46%) in the present study. the findings was in accordance with S. Rajesh et. al.

TableNo.3 Comparison of culture positive and negative cases with other studies:-

Serial No.	Study	Years	Culture Positive GPC	Culture Positive GNB	Fungal	Culture Negative
1.	Mulla Summaiya et. Al[28]	2012	21/38 (55.26%)	12/38 (31.57%)	0	92/130 (70.76%)
2.	Tewelde Tesfayeet. Al**[25]**	2013	52%	48%	0	148/198 (74.7%)
3.	Reena AnieJose et al.[26]	2017	16/48 (33.33%)	9/48 (18.75%)	23/48 (47.91%)	87/135 (64.44%)
4.	S.Rajesh et. al.[26]	2017	36/54 (66.66%)	15/54 (27.77%)	3/54 (5.5%)	56/110 (50.90%)
5.	**Present Study**	**2019**	**34/50 (68%)**	**-**	**-**	**16/50 (32%)**

Most of the ophthalmic bacterial infections are due to Gram positive bacteria than Gram negative bacteria. The present study mainly focused on Gram positive cocci causing eye infections. Several other studies in S. Rajesh et. Al and other parts of world have shown similar results inferring Gram positive cocci as a primary cause of Ophthalmic infections.

TableNo.4: Organisms isolated in different studies:-

Serial No.	Study	Years	Result
1.	Tewelde Tesfaye et al.[25]	2013	S.aureus followed by Pseudomona aeruginosa
2.	Reena Anie Jose et al.[26]	2017	S.epidermidis followed by Streptococcus pneumonia And Pseudomonasaeuruginosa
3.	S.Rajeshet.al.[27]	2017	S.aureus followed by CoNS, MRSA and MRCoNS Pseudomonaand Klebsiellaspp
4.	**Present Study**	**2018**	**S.aureus followed by S.lugdunensis, CoNS, MRSA and MRCoNS**

In the present study most of the Ophthalmic bacterial infections spp. are due to ***S. aureus***followed by ***S. lugdunensis, CoNS , MRSA*** **and** ***MRCoNS*** which issimilar to S. Rajesh et. al

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TableNo.5: Percentage of Gram positive bacterial isolates susceptibility:-

S.No.	Study	Bacteria	Year	Antibiotic	Percentage
1.	M,Jeyaet. et al.[23]	*S.aureus*	2013	Amikacin	100%
				Vancomycin	100%
2.	S.Rajeshet et al.[25]	*S.aureus*	2017	Amikacin	75%
				Vancomycin	100%
3.	**Present study**	***S.aureus***	**2019**	**Amikacin**	**100%**
				Vancomyci	**100%**

In case of ***Staphylococcus aureus,*** Amikacin, Vancomycin, were 100% sensitivity. the findings accordance with S. Rajesh et. al

CONCLUSION

Our findings are in general consistent with those from clinical studies of ophthalmic infection. *S. aureus* and *S. lugdunensis* are the most common bacterial isolates found in the conjunctivitis infection. Amikacin, Gentamycin, Linezolid, Teicoplanin, Tetracycline, Tobramycin, Levofloxacin and Vancomycin showed the lowest resistance rates to all bacterial isolates. The predominant resistant isolates were *MRSA and MRCoNS*. High antibiotic resistance to commonly prescribed antibiotics was observed. Methicillin resistance has been observed in both of the Gram positive isolates, *Staphylococcus aureus & Coagulase negative Staphylococci* for which vancomycin, Amikacin showed 100%. Therefore, to prevent the increasing rate of antimicrobial resistance the practice of starting empirical therapy to be avoided improper selection of antibiotics, inadequate dosing and poor compliance to therapy may play an important a role in increasing resistance. Changes in bacterial resistance patterns have been a major problem in the effective management of conjunctivitis infections, early access to diagnosis and appropriate treatment and better patient health education can prevent the ocular morbidity and mortality.

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