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Aerobic Bacteriological Profile in Cases of Ocular Infections in a Tertiary Care Hospital (Navodaya Medical College & Research Centre, Raichur)

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Abstract:
Background: *Ocular infections are one of the common diseases of the eye.*
The current trends in the etiology of ocular infections and their antibacterial susceptibility pattern must be updated to help the clinicians.
Objective: *To identify the aerobic bacterial profile of ocular infections in patients attending Ophthalmology OPD/IPD.*
Materials and Methods: *102 patients attending Ophthalmology OPD/IPD in Navodaya Medical College Hospital & Research Centre were analysed from Nov 2010 to Sep 2011. Using predefined inclusion and exclusion criteria, samples were collected according to the standard protocol. These were cultured for microorganisms (aerobic bacterial) were identified. Drug susceptibility was done using Kirby Bauer disc diffusion method.*

Results: *The most common bacterial pathogen isolated were Staphylococcus aureus(32.8%) followed by Staphylococcus epidermidis (25%),other organisms isolated are Streptococcus pneumonia (14.1%), Kiebsiella pneumonia (6.3%), Escherichia coil (4.7%).*
Bacterial isolates were highly susceptible to Vancomycin(100%), Gentamicin(94.3%) among Gram positive organisms and among Gram negative organisms it is highly susceptible to Tobramycin(100%) and Imipenem(90.9%).
Conclusion: *The study suggest 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.*
Keywords: *Ocular infections, Staphylococcus aureus, Staphylococcus epidermidis, Vancomycin, Tobramycin.*

I. Introduction

Eye is the most important sensory organ concerned with the perception of vision.[1] Ocular infections can affect different eye structures and their presentation and treatment vary accordingly. They present as: blepharitis, conjunctivitis, canaliculitis, dacrocystitis keratitis, scleritis, orbital cellulitis, endopthalmitis, 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.[2]

Some of the ocular infections such as orbital cellulitis and panophthalmitis may lead to life threatening conditions.[3] Actions can occur when tissues of the eye are exposed to pathogens not normally present; when the eye is damaged it allows the pathogens to overcome the natural defenses of the eye or in immunosuppressed patients where normal flora may become opportunistic can be caused by bacteria, fungi, parasites or viruses.[4]

II. Objectives

To study the aerobic bacteriological profile of ocular infections and their antibiotic sensitivity pattern in tertiary care hospital (Navodaya medical college hospital and research centre) Raichur.
Objectives:
1. To study the aerobic bacteriological profile in cases of ocular infections.
2. To study the susceptibility pattern to commonly used antibiotics

III. Materials And Methods

Place of study: The present study was undertaken at Navodaya Medical College Hospital and Research centre, Raichur.
Sample size: 102 cases.
Study Period: The period of study was from November 2010 to September 2011.
Methodology: The subjects in this study include those who have fulfilled the following inclusion and exclusion

criteria.

Inclusion criteria:

1. Clinically diagnosed cases of ocular infections attending Outpatient Department and Inpatient Department of Ophthalmology, Tertiary Care Centre (Navodaya Medical College Hospital and Research Centre), Raichur.
2. Patients not on antibiotics (either topical or systemic) will be included in the study.
3. Patients not responding to antibiotics.

Exclusion criteria:

1. Non infectious etiology of ocular diseases.

Study cases: After clinical diagnosis of ocular infection made by Ophthalmologist, specimens were collected with the help of Ophthalmologist. Samples like eyelid swab, pus from Dacrocystitis, corneal scrapings, comeal swab, and tissue specimens from 102 clinically diagnosed cases of ocular infections from patients attending department of Ophthalmology, Tertiary Care Centre (Navodaya Medical College Hospital and Research Centre), Raichur. Informed verbal consent was obtained from all patients enrolled. Clinical/demographic data were collected using a prepared questionnaire.

Sample collection[12]:

Eye lid swab was collected using sterile cotton tipped swab moistened with sterile peptone water which was rolled over the eye lid margin from media to lateral side and back again.

Conjunctival swab was collected using dry sterile cotton tipped swab by asking the patient to look up, the lower lid was pulled down using thumb with an absorbing tissue paper and the swab was rubbed over the lower conjunctival sac from medial to lateral side and back again.

Pus from lacrimal sac was collected using dry sterile cotton tipped swab either by applying pressure over the lacrimal sac and allowing the purulent material to reflux through the lacrimal punctum or by irrigating the lacrimal drainage system with sterile saline called as Lacrimal Syringing and collecting the sample from the refluxing material ensuring that the lid margins or the conjunctiva were not touched. In cases of acute lacrimal abscess on chronic Dacryocystitis pus was drained and taken on a dry sterile cotton tipped swab.

Corneal scrapings was collected after instilling 2 to 3 drops of local anesthetic into the conjunctiva, patient is asked to wait for 2 to 3 min and corneal surface was cleaned for debris and discharge using dry sterile cotton tipped swab and with the help of slit lamb the edge of the ulcer was scraped using sterile disposable scalpel blade no 15 taking care not to perforate the cornea.

The number of swabs and scrapings collected depended on the material obtained on
swab stick or the blade, at least a minimum of 2 swabs or scrapings and maximum of 4 swabs or scrapings were collected, labelled and were inoculated immediately bed side into various culture media as mentioned below.

The corneal button, the lacrimal sac, chalazion removed by surgery was sent to the microbiology laboratory in a sterile container filled with sterile normal saline immediately.

The corneal button and the lacrimal sac tissue were labelled and processed after cutting into small bits using sterile scalpel blade and sterile foreceps in a small sterile petridish following all aseptic precautions and processed immediately Aerobic growth cultured[13] and identified. Antimicrobial susceptibility tests[14,15] done.

IV. Results

In the present study 102 clinically diagnosed cases of Ocular infections of all ages and both sex attending Ophthalmology OPD and IPD of Navodaya Medical college, Raichur during the study period were taken.

TABLE 1: Total culture report.

Total samples	Positive	Percentage	Negative	Percentage
102	75	73.6	27	26.4

The above table shows that out of 102 samples studied culture yielded positive in majority of samples i.e. 75(73.6%) samples and the rest 27(26.4%) in negative for culture.

TABLE 2: Total number of isolates obtained from ocular infections

Total samples	Total organisms isolated	Percentage
102	87	85.3

Out of 102 cases of eye infection studied which included patients suffering from Chalzizion, Conjunctivitis, Keratitis, Dacrocystitis, Endophalmitis and cubical cellulitis, 75 samples had growth and the isolation rate is 73.6% and the …organisms isolated from these 75 samples is 87(85.2%).

TABLE 3: Correlation of Gram stain with culture results

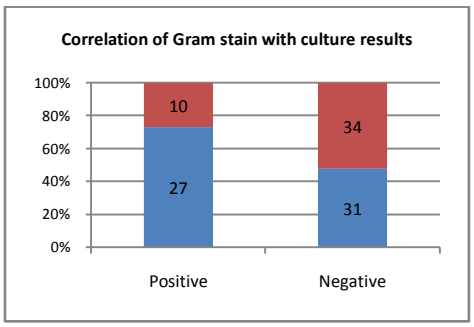
Gram stain	Culture		Total
	Positive	Negative	
Positive	27	10	37
Negative	31	34	65
Total	58	44	102

$X^2 = 5.156$, df=1, p<0.022

Sensitivity and specificity

Variable	Value
Sensitivity	46.55 %
Specificity	77.27 %
Positive Predictive Value	72.97 %
Negative Predictive Value	52.31 %

Out of 37 Gram stain positive result, 27 correlated with culture ……Gram stain negative results, 31 positive with culture results with …..and sensitivity of 46.55% with significant p value 0022.

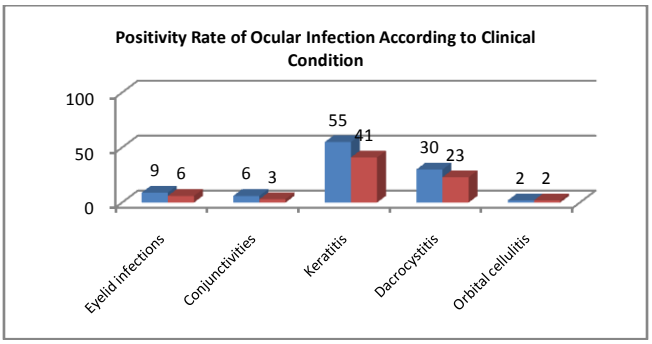


GRAPH 1: showing the correlation of Gram stain with culture.

TABLE 4: Positivity Rate of Ocular Infection According to Clinical Condition

Clinical condition	Total number of samples	Number of samples with growth	Percentage
Eyelid infections	9	6	
Conjunctivities	6	3	
Keratitis	55	41	
Dacrocystitis	30	23	
Orbital cellulitis	2	2	
Total	102	75	

The maximum yield is obtained from orbital cellulitis cases ….studied, 2(100%) yielded growth followed by dacrocystitis cases ……studied 23(76.7%) yielded growth, in keratitis samples,….
41(74.5%) showed growth, in eyelid infections out of 9 samples studied,…..yielded growth, in conjunctivitis cases out of 6 samples studied ……organisms.

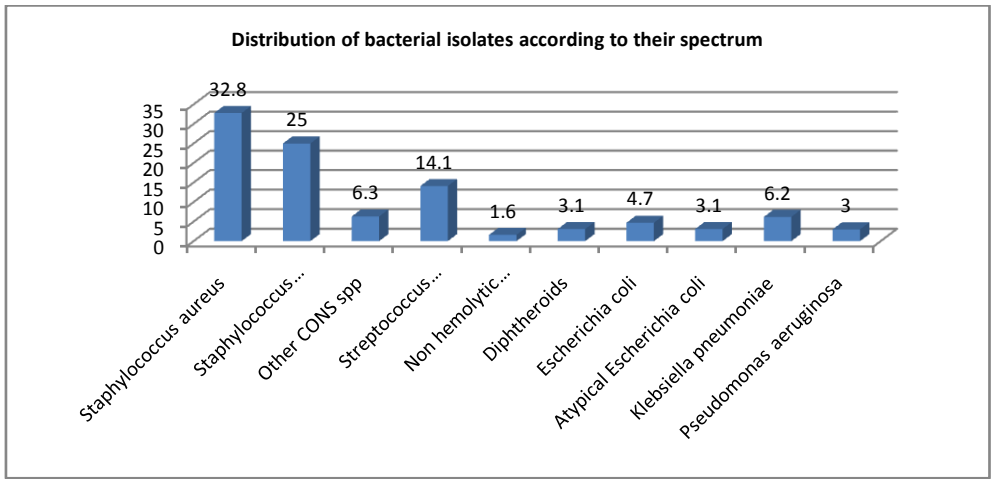


GRAPH 2: showing the positivity rates according to clinical condition

TABLE 5 : Distribution of bacterial isolates according to their spectrum

Bacterial isolates	**Number of isolates**	**Percentage**
Gram positive cocci		
Staphylococcus aureus	21	32.8
Staphylococcus epidermidis	16	25.0
Other CONS spp	4	6.3
Streptococcus pneumoniae	9	14.1
Non hemolytic Streptococcus	1	1.6
Gram negative cocci		
Nil		
Gram positive bacilli		
Diphtheroids	2	3.1
Gram negative bacilli		
Escherichia coli	3	4.7
Atypical Escherichia coli	2	3.1
Klebsiella pneumoniae	4	6.2
Pseudomonas aeruginosa	2	3.0
TOTAL	64	

Of the 87 isolates, 64(74%) is bacterial isolates, the most frequent is the **Staphylococcus aureus** 21(32.8°/0) followed by **Staphylococcus epidermidis** 16(25%), **Streptococcus pneumoniae** 9(14.1%), other CONS spp and **Streptococcus pneumoniae** each 4 (6.3%), **Escherichia coli** 3(4.7%), Diphtheroids… Escherichia coli and Pseudomonas aeruginosa each 2(3.l%) in descending order.



GRAPH 5 : Distribution of bacterial isolates according to their spectrum

TABLE 6: Sample wise distribution of organisms

Organisms	**Eyelid swab**	**Excised tissue chalagion**	**Conjectial swab**	**Pus from dacrocystitis**	**Lacrimalsac tissue**	**Corneal button**	**Corneal scrapings**	**Corneal swab**	**Pus swab from orbital cellulitis**	**Total**
Staphylococcus aureus	1	1	1	6		1	4	5	2	21
Staphylococcus epidermidis	3		1	1			3	8		16
Other CONS spp				1	1		2			4
Staphylococcus pneumonia				3			5	1		9
Nonhemolytic Staphylococcus								1		1
Disphtheroids				2						2
Escherichia coli				2	1			1		3
Atypical Escherichia coli				1						2
Klebsiella Staphylococcus				3	1					4
Pseudomonas aeruginosa				2						2
Total	4	1	3	23	3	2	27	22	2	87
Percentage	4.6	1.1	3.4	26.4	3.4	2.3	31.0	25.3	2.3	100

The percentage of isolation from different samples is as follows:

From eyelid swab out of 4(4.6%) isolates, Staphylococcus epidermidis (3) is the most common isolate followed by Staphylococcus aureus (1).From chalazion tissue 1(l.l%) isolate is Staphylococcus aureus.

From conjunctival swab out of 3(3.4%) isolates, 1 Staphylococcus aureus, l Staphylococcus epidermidis & 1 Mucor spp are isolated.

Pus from Dacrocystitis, out of 23(26.4%) isolates, 6 Staphylococcus aureus, Streptococcus pncumoniae and Klebsiella pneumoniae 3 each, Diphtheroids, Pseudomonas aeruginosa and Escherichia coli 2 each, Staphylococcus epidermidis, Other CONS spp, Atypical Escherichia coli, Rhizopus spp and Alternaria spp l each are isolated.

From lacrimal tissue out of 3(3.4%) isolates, Other CONS spp, Escherichia coli and Klebsiella pneumoniae l each are isolated.

From corneal button out of 2(2.3%) isolates, Staphylococcus aureus and Alternaria spp l each are isolated. ,

From corneal scrapings out of 27(3l%) isolates, 5 Streptococcus pneumoniae, Staphylococcus aureus, Staphylococcus epidermidis and Rhizopus spp 3 each, Other CONS spp.

From corneal swab out of 22(25.3%) isolates 8 Staphylococcus epidermidis, 5 Staphylococcus aureuse, Streptococcus pneumoniac, Nonhemolytic

V. Discussion

In the present study, 102 clinically diagnosed cases of ocular infections attending Ophthalmology out-patient and in patient department at Navodaya Medical College Hospital and Research centre, Raichur from Nov 2010 to Sep 2011 was studied. The pattern of relative incidence of various factors varies in different studies Distribution of cases according to sen the present study males (57.5%) were affected more than females (42.2%) Correlates with the study conducted by Sharma VK et al Darek V Kunimoto et al"

The predominance of ocular infections in males can be attributed to their greater involvement in outdoor activities, thus more prone to corneal injury with external agenis.

In the present study the mean age for ocular infections is *45.20* years-with standard deviation (SD) of 18.60 (range 4months to 78 years) which almost correlated with the study by Gopinathan19(U et 0.96 where majority of patients 64.4% belonged to younger age group in 16 to 49 years age group, the average age at presentation was 40.4 *+1-* 15.3 Years,

Distribution of Clinical Diseases

In the present study the commonest infection is keratitis 55(53.9%), followed by Dacrocystitis 30(29.4%), eyelid infections 9(8.8%), conjunctivitis 6(5.9%) and orbital cellulitis 2(2.0%). Of the 55 cases of keratitis, 2 cases progressed to endophthalmftis and patients were taken for enucleation when corneal button was the sample provided. Dacrocystitis is the most common infection of lacrimal apparatus; the basis for this infection is blockage of lacrimal duct system resulting in accumulation tears and creation of a fertile environment for secondary bacterial 3 infection and dacryolith formation$ In other studies by Modarres Sh et aLW[8] Conjunctivitis was the most common presentation (77.9%) and the least common was endophthalmjt,s (2.5%) another study by Sherwal B I. et al[11], the most common ocular infection was conjunctivitis (59.2%) followed by keratitis (53.34%)

Distribution of bacterial isolates according to their spectrum

Tabl 4 OMP Comparative studies of Distribution of spectrum of bacterial isolates:

Organism	**Khosravi AD et al 2007 Iran**	**Dumre SP Ct al 2008 Nepal**	**Sherwal BL et al 2008 India**	**Ramesh S et 2010 Tamil**	**Present study**
Staphylococcus aureus	12.9%	20%	19.13%	*25.13%*	32.8%
Staphylococcus epidermidis	-	*0*	19.13%	-	25%
Streptococcus peurnoniae	8.6%	40%	10.93%	21.78%	14.1%
Other CONS spp	32.9%	0	*1.65%*	*18.29%*	6.3%
Nonhaernolytic Streptococcus	*0*	*0*	*0*	0	1.3%
Diphilisroids	*0*	*0*	*0*	*1.25%*	3.1%
Klebsiella spp	-	1.5%	2.74%	3.9%	6.3%
Escherichia coil	8.6%	0	1.10%	12.1%	7.8%
Pseudomonas aeruginosa	24.2%	4%	4.92%	3.45%	3.1%

In the present study the most frequently isolated organism is Staphylococcus aureus (32.8%) followed by Staphylococcus epidermidis (25%), Streptococcus pneumoniae (14.1%) other CONS spp (6.3%) and nonhaemolytic Streptococcus (1.6%), Among Gram negative bacilli Kiebsiella pneumoniae (6.3%), Escherichia coil (4. , Atypical Escherichia coli (3.1%) and Pseudomonas aeruginosa (3.1%) and Diphtheroids (3.1%).

In studies by Ramesh S et al[3] & Sherwal BL et al[11] `2AStaphyiococcus aureus were the most common isolate in ocular infections with 25% & 19.3 1% incidence respectively in par with the present study where also Staphylococcus aureus is the most common isolate (32.8%).

The other organism isolated in studies by the above two authors are Streptococcus pneumoniae

21.78% & 10.93% respectively (present study it is 14.1%), other CONS spp, 2 1.78% & 10.93% respectively (present study 6.3%), Kiebsielia spp, 3.9% &2.74% respectively (present study 6.3%), Escherichja coil, 12.1% & 1.10% respectively (present study 7.8%), Pseudomonas aeruginosa, 3.45% & 4.92% respectively (present study 3.1%). Sherwal BL et al[11] isolated 19.3% Staphylococcus epidermidis (present study 25%), Ramesh S et al isolated 1.25% Diptheroids, (present study 3.1%) Study by Khosravi et al[5]. CONS was the most frequently isolated organism with frequency of 32.9% (present study 6.3%).

Studies by Dumre SP et al[7], Streptococcus pneumoniae was the most common isolate with the incidence of 34% (present study 14.1%).(03.03%),

In the present study GPC are highly sensitive (100%) to Vancomycin and Bacitracin. Gentamicin is 100% sensitive to Streptococcus pneumoniae & nonhemolytic Streptococcus; it is 95.2%, 93.15% & 75% sensitive to Staphylococcus aureus, Staphylococcus epidermidis & other CONS spp respectively.

Erythromycin & Clindamicin is 100% sensitive to Streptococcus pneumoniae & nonhernolytic Streptococcus. They are intermitental ly sensitive to Staphylococcus aureus (66.6% & 87.7%), Staphylococcus epidermidis (62.5%) and CONS (50% & 75% to Erythromycin & Clindamicin respectively) Oxacillin & Cephoxitin is 71.4%, 56.2% & 50% sensitive to Staphylococcus aureus, Staphylococcus epidermidis & other CONS spp respective iprofloxacin is 66.6%, 68.75%, 75%, 88.8% & 100% sensitive to Staphylococcus aureus, Staphylococcus epidermidis, other CONS spp, Streptococcus nonhemolytic

Among GNB it is highly sensitive to Tobramycin (100%), pet Cefepime, Piperacillin/Tazobactum and Imipenem each 88.8%. Pseudomonas aeruginosa is highly sensitive to most of the drugs like Co-Ciprofloxacin, Gentamicin, Amikacin, Ceftazidime, Cefei Piperacillin Tazobactum, Imipenem.

In the present study Staphylococcus aureus (n21) is highly Vancomycin, Rifampicin and Bacitracin, 95.2% sensitive to Tetracycline, 90.4% to Polymyxin B, 85.7% to Clindamycin, 76.1% Chloramphenicol, 71 4% to Oxacillin, 66 6% to Erythromycm 61.9% to Cotrimoxazole & least sensitive to Penicillin 4.76%..

Modarres Sh **et al**[8] Staphylococcus aureus (n=97) is 87%, 83%, 7f%, and 0% sensitive to Vancomycin, Chioramphenicol, Gentamic, Cotrimoxazole & Penicillin respectively.

In the present study Staphylococcus epidermidis is 100% sensitive to Bacitracin, 93 75% to Gentamicin

& Rifampicin, 87 5% to Tetracycline, 75% to Chloramphenicol, 68.75% to Ciproflos Erythromycin & Clindamycin, 56 2% to Oxacillin & Ceph Cotrimoxazole, least sensitive to Penicillin 12.5%, in the study..kky 4/3.7., Staphylococcus epiderinidis is 87%, 81%, 54%, 41%, 33% & Chloramphenjcol Vancomycin, Gentamicin, Erythromycin Cotrimoxa.zole & Penicillin respectively.

In the present study Streptococcus pneumoige **(n9) is** 100% sensitive to Vancomycin Penicillin Gentamicin Oxacijjn, Erythromycin & Clindamycin, 88.8% to Ciprofloxa4n, Chioramphenicol & Tetracycline 33.3% sensitive to Cotrimoxole Study by Modarres Sb et al[8], Streptococcus pneumonigis 98% sensitive to Penicillin & Erythromycjn, 96%, 94%, 44% & 33% sensitive to Chioramphenicol, Ampici Ilin, Vancomycjn & Cotrimoxazole respectively.

In the present study Gram negative enteric bacilli (n=9) is 100% sensitive to Tobramycin, 88.8% to Cefipime, & Imipenem. 77.7% to Gentarnicin & Amikacin, 55.5% to Cotrimoxazole Ciprofloxacjn Chioramphenicol & Piperacillin 44 4% to Amoxyclav, Ceftriaxone, Cefuroxjme & Cefta.zidime, in the study by Modarres Sh Ct M-7, **Gram negative enteric** bacilli is 94%i88% & 83% to Cotrimoxazole, Chloramphenicol & Polymyxin B respectively, 73% sensitive to Gentamicin & CarbjniciUin 66% & 16% sensitiye to Amkacin & Ampicillin respectively.

In the present study, Pseudomonas aeruginosa (n=2) is 100% sensitive to Cotrimoxazole, Ciprofloxacin, Gentamicin, Amikacin, Ceftazidime, Cefipime, Cefiriaxone Piperacillin, PiperacillinjTazobactam Tobramycin & Imipenem. It is 50% sensitive to Amoxyclav & Cefuroxime, in the study by Modarres Sh et **al",** Pseudomonas aerugillosa is 99% sensitive to Polymyxin B, 88% sensitive to Gentamicin Anrijkacjn Tobramicjn33% & 11% sensitive to Cotrimoxazole & Chioramphenicol respectively.

In the study by Khosrayj AD et al[5] 6 1.7%, 55%, & 53% of GPC are sensitive to Tetracycline, Cephalothin & Cefiriaxone respectively (in the present study Tetracycline has 86.97% coverage). All the tested GPC was resistant to Penicillin I. which is similar to the present study. The coverage of Vancomycin was 100% to CONS, but 0% to Staphylococcus aureus (in the present study all GPC has 100% coverage to Vancomycin). 74.5% of GPC & 82.6% of GNB was sensitive to Gentamicin (in the present study 94.3% of GPC & 8 1.8% of GNB is sensitive to 2 Gentamicin.

VI. Conclusion

Ocular infections are then major cause of ocular morbidity and modality which is a major public health problem in terms of visual compromise especially in developing countries like India.

Changes in bacterial resistance patterns have been a major problem in the effective management of ocular infections, better access to effective and safe topical antibiotics has been cited as the primary factor in improving patients outcomes and quality of life.

This study aims at isolating a variety of aerobic bacterial pathogens causing ocular infections and testing for the antibiotic susceptibility pattern of the aerobic bacterial pathogens isolated.

In conclusion, varity of organisms are implicated as causative agents of ocular infections. Of the various aerobic bacterial and fungal pathogens isolated *Staphylococcus aureus* was the most common bacterial pathogen isolated.

Antibiotic susceptibility pattern showed that most of the isolates were the sensitive agents and among Gram positive organisms Vancomycin was 100% sensitive and the next sensitive drugs were Bacitracin, Gentamicin, Rifampicin and Penicillin being the least sensitive drug. Among Gram negative organism Tobramycin was the most sensitive drug (100%) followed by Imipenem, Cefipime, Piperacillin/Tazobactum and least sensitive was to Chloramphenicol, Ceftriaxone and Amoxyclay.

This susceptibility pattern shows the need for broad spectrum antibiotics with greater antibacterial efficacy which are more sensitive than older.

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