

## Study of antibiotic susceptibility pattern in dacryocystitis at tertiary care hospital

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### Abstract:

**Introduction:** Dacryocystitis is an infection and inflammation of the lacrimal sac and the most common cause of ocular morbidity both in children and adults. It is mainly caused due to stagnation of tears, using kajal, working in chullas, infectious causes, and different facial structures. In adults, the most widely recommended treatment for the management of acute dacryocystitis consists of the application of heat with massage, systemic antibiotics (oral or intravenous administration, as required) and abscess drainage.

**Material and methods:** The present study was conducted in a tertiary care hospital after approval of ethical committee. The study population consists of 115 cases of Dacryocystitis who visited the Ophthalmology Outpatient Department and Wards in Tertiary Care Hospital, during the period of January 2018 to June 2019. It was an Observational Cross-Sectional study.

**Results:** Out of 115 cases, 98 (85.22%) cases were found to be Culture positive while 17 (14.78%) cases were culture negative (no growth). Gram positive organisms (70.2%) were predominantly isolated than Gram negative organisms (29.8%). The Gram positive isolates were most sensitive to Vancomycin, Amoxicillin/Clavulanic acid, Clindamycin and Linezolid. Least sensitive antibiotic against gram-positive organism were Penicillin, Erythromycin and Trimethoprim/Sulphamethoxazole showing resistant to these antibiotics. The Gram negative organisms were most sensitive to Amikacin, Gentamicin, Tobramycin, Carbapenems, Piperacillin/Tazobactam, Ciprofloxacin. Least sensitive to Ampicillin, Cefepime and Cefotaxime and Trimethoprim/Sulfamethoxazole showing resistant to these antibiotics.

**Conclusion:** To conclude, both, clinical and bacteriological examinations are important for establishing the definitive diagnosis of dacryocystitis and must be mandatory prior to the initiation of antibiotics, selection of a suitable antibiotic agent is possible only if the underlying pathogen is correctly identified which helps to control the increasing rate of antibiotic resistance.

**Keywords :** dacryocystitis , Klebsiella pneumonia, Gram positive isolates

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### I. Introduction:

Dacryocystitis refers to a series of clinical entities characterized by inflammation of the lacrimal sac. The most common signs and symptoms are reddening, oedema and the presence of a painful area of induration overlying the nasolacrimal sac. Epiphora and discharge may also be observed. Various risk factors are responsible for dacryocystitis in which increasing age can lead to this disease. Use of eye make up by women can lead to formation of dacryoliths which can lead to dacryocystitis and infectious causes. <sup>(1)</sup>Dacryocystitis poses a threat to the intraocular infection which is usually taken as a contraindication for intraocular surgery so firstly it is treated with antibiotics and then taken for surgery. <sup>(2)</sup>

In adults, the most widely recommended treatment for the management of acute dacryocystitis consists of the application of heat with massage, systemic antibiotics (oral or intravenous administration, as required) and abscess drainage. For chronic dacryocystitis, dacryocystorhinostomy and nowadays Endoscopic dacryocystorhinostomy is mainly done. <sup>(1)</sup> Thus an up-to-date knowledge of the spectrum of causative bacteria and their sensitivities is important for the treatment of this disease. This information contributes significantly to postoperative recovery following surgery. Thus, if the treatment is started early, progression to chronicity, microbial resistance, and incidence of restenosis can be reduced with specific antibiotics to which the organisms are susceptible. <sup>(3)</sup> There has been growing noise about changing trends in the microbiologic spectrum of dacryocystitis and where initial studies have shown Gram-positive isolates predominantly responsible for it. Some recent studies suggested that there has been an increasing frequency of isolation of gram-negative organisms. Knowledge of the presence of nasolacrimal duct obstruction and the potential organisms causing obstruction is of paramount importance for controlling infection with proper antibiotics. Therefore, before

planning any intraocular procedure infection should be cured because of the potential risk of endophthalmitis especially in a country like India.<sup>(4)</sup>

## II. Material And Methods :

The present study was conducted in a tertiary care hospital after approval of ethical committee. The study population consisted of all the clinically suspected cases of Dacryocystitis who visited the Ophthalmology Outpatient Department and Wards in this Tertiary Care Hospital, during the period of January 2018 to June 2019. It was an Observational Cross-Sectional study.

### INCLUSION CRITERIA

Patients with suspected clinical symptoms of dacryocystitis.

### EXCLUSION CRITERIA

1. Patients who were on antibiotics.
2. Patients with fungal etiology
3. Cases of epiphora and pseudoepiphora caused by diagnosis other than dacryocystitis.
4. Contaminated samples

Written, informed consent of the suspected cases were taken and the following parameters were noted, upon entry into the study.

General examination of the eye was done. The ocular examination includes recording visual acuity, an external eye examination, slit-lamp biomicroscopy & regurgitation test was performed.

The data were analyzed by using SPSS Software statistical programme.

## III. Results :

All the clinically suspected cases of Dacryocystitis visiting Ophthalmology Outpatient Department (OPD) and Wards of Department of a tertiary care hospital during January 2018 – June 2019 were included in this study. A total of 115 clinically suspected cases of Dacryocystitis were studied. All the samples were subjected to bacteriological investigations and the observations that were made are as follows. In our study out of 115 cases, Chronic dacryocystitis was isolated from 90 cases (78.26%) and was more common in females than males than Acute dacryocystitis which was isolated from 25 cases of dacryocystitis (21.74%).

**Table no.1:- Distribution of age in association with gender in cases of dacryocystitis**

Age	N	Percentage(%)	Male		Female	
			N	%	N	%
0-20 years	0	0	0	0	0	0
21-40 years	10	8.7	3	9.38	7	8.43
41-60 years	75	65.22	22	68.75	53	63.86
61-80 years	28	24.35	6	18.75	22	26.51
81-100 years	2	1.74	1	3.13	1	1.2
Total	115	100	32	100	83	100
			Chi square value=1.17, P=0.76 NS			

Age distribution	Min	Max	Mean age	Median age
	23	85	55.28	55

In age of study population of 115 cases, maximum suspected patients belong to 41-60 years of age group which contributed to 75 cases (65.22%) followed by age group of 61-80 years which included 28 cases (24.35%), followed by 21-40 years of age group which include 10 cases (8.7%) and 2 cases between age group of 81-100 years of age (1.74%).

No cases of dacryocystitis were found between 0-20 years of age group (pediatric and adolescents age group). The median age group in our study was 55 years.

**Table no.2:- Distribution of eye with association of gender in cases of dacryocystitis**

Gender	Eye involved			Total
	Left	Right	Bilateral	
	N(%)	N(%)	N(%)	N(%)
Male	12(37.5%)	15(46.88%)	5(15.63%)	32(100%)
Female	53(63.86%)	24(28.92%)	6(7.23%)	83(100%)
Total	65(56.52%)	39(33.91%)	11(9.57%)	115(100%)
Chi square value=6.73,P=0.034, Significant difference				

The percentage distribution of the patients in Table no.5 reveals that dacryocystitis was more common in the left eye (56.52%) than the right eye (33.91%). Both eyes were involved in 11 cases (9.57%). The incidence of left eye involment was more seen in females i.e. 63.86% than males followed by right eye (28.92%) and bilateral eye (7.23%).

The incidence of left eye involvement in male was 37.5% than right eye (46.88%) and bilateral cases (15.63%).

1. Chi-square value was 0.28 and the p-value was 0.87 (since  $p > 0.05$ ), it was not statistically significant. So there was no significant correlation between types of dacryocystitis with gender.

2. Out of 64 isolates of *Staphylococcus aureus*, all were 100% sensitive to Vancomycin, Amoxicillin/Clavulanic acid and Ampicillin and Linezolid, 56 isolates were 87.5% sensitive to Doxycycline, 44 isolates were 68.75% sensitive to Gentamicin, 51 isolates were 79.7% sensitive to Clindamycin, 38 isolates were 59.4% sensitive to Tetracyclin. 35 isolates were 54.68% resistant to Trimethoprim/Sulfamethoxazole, 44 isolates were 68.75% resistant to Erythromycin, 59 isolates were 92.2% resistant to Penicillin and 41 isolates were 64.1% resistant to Ciprofloxacin.

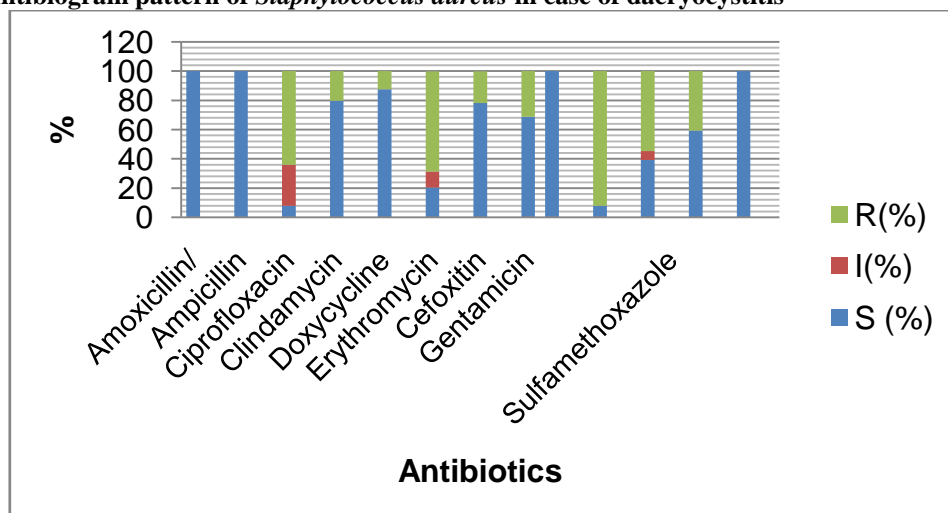
3. Out of 5 isolates of *Streptococcus pyogenes*, all were 100% sensitive to Amoxicillin/Clavulanic acid and Linezolid, 4 isolates were 80% sensitive to Cefotaxime and 5 isolates were almost resistant to Clindamycin, Erythromycin and Penicillin.

4. Out of 2 isolates of *Streptococcus viridians*, both were 100% sensitive to Amoxicillin/Clavulanic acid, Clindamycin, Linezolid, Tetracyclin, Cefotaxime, Levofloxacin and 1 isolate was almost resistant to Erythromycin and 2 isolates were resistant to Penicillin.

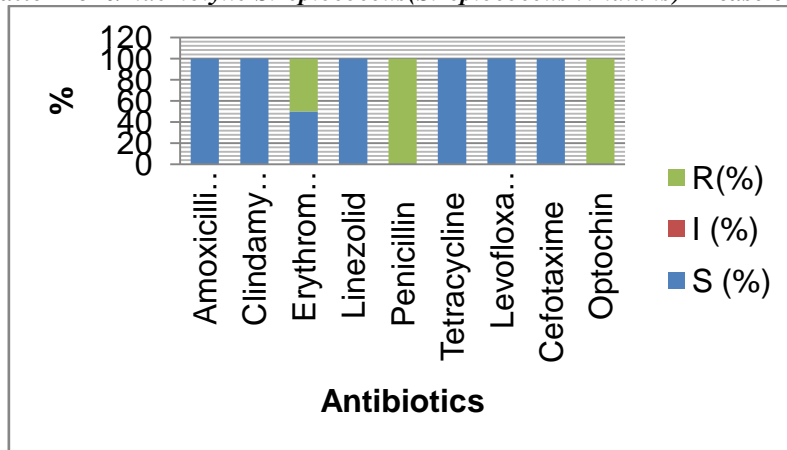
5. Out of 2 isolates of *Enterococcus spp*, both were 100% sensitive to Ampicillin, Ciprofloxacin, High level gentamicin, Linezolid, Vancomycin and 1 isolate was 50% sensitive to Doxycycline, Erythromycin and Penicillin and 1 isolate was resistant to penicillin.

**Graph 1:-Antibiogram Pattern Of Gram Positive Isolates In Case Of Dacryocystitis**

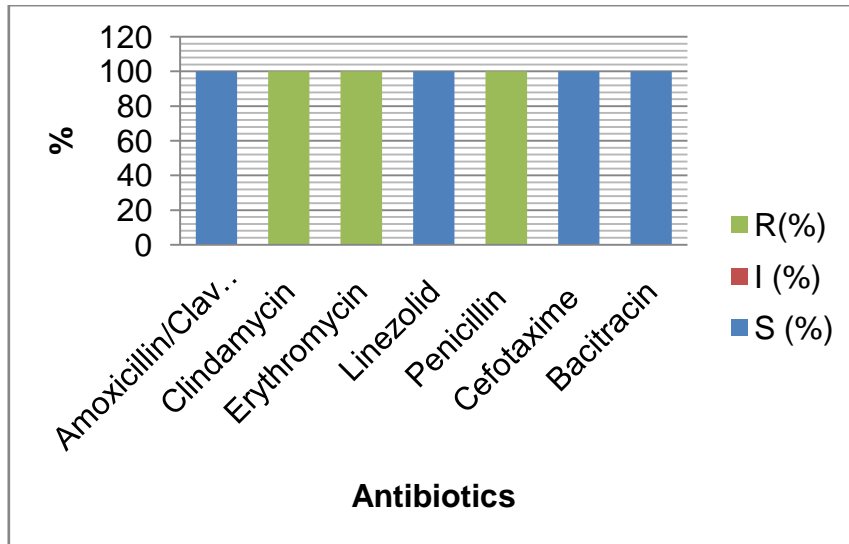
1) **Antibiogram pattern of *Staphylococcus aureus* in case of dacryocystitis**



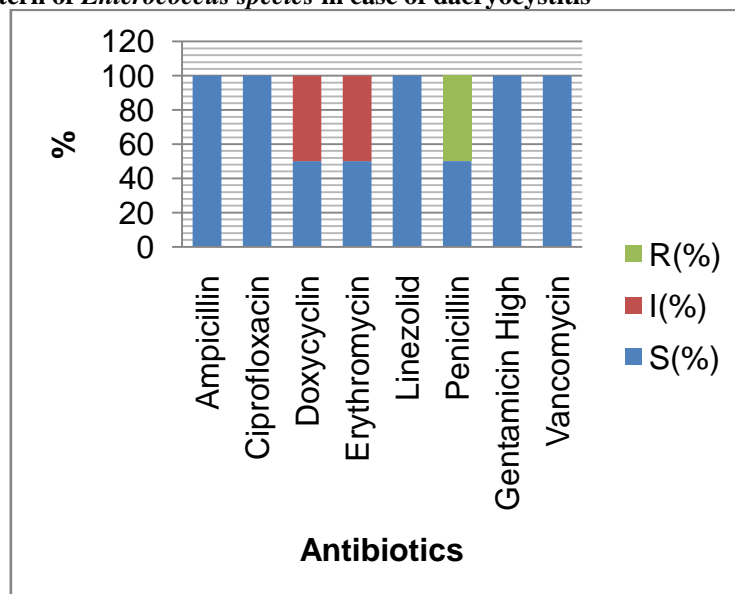
2) Antibiogram pattern of  $\alpha$ -haemolytic *Streptococcus*(*Streptococcus viridians*) in case of dacryocystitis



3) Antibiogram pattern of  $\beta$ -haemolytic *Streptococcus*(*Streptococcus pyogenes*) in case of dacryocystitis



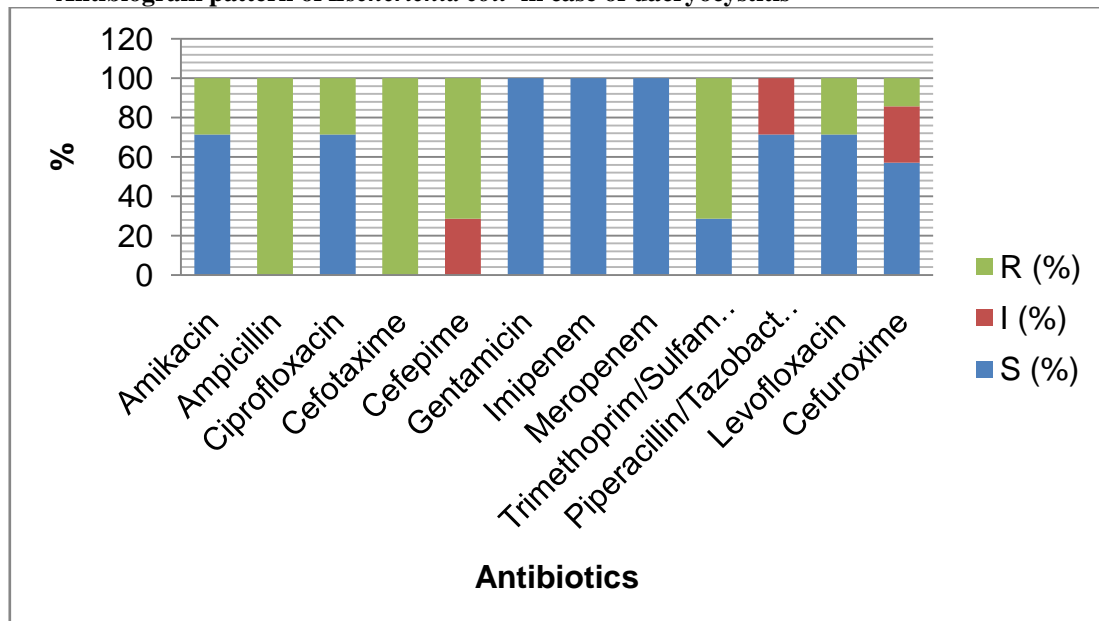
4) Antibiogram pattern of *Enterococcus* species in case of dacryocystitis



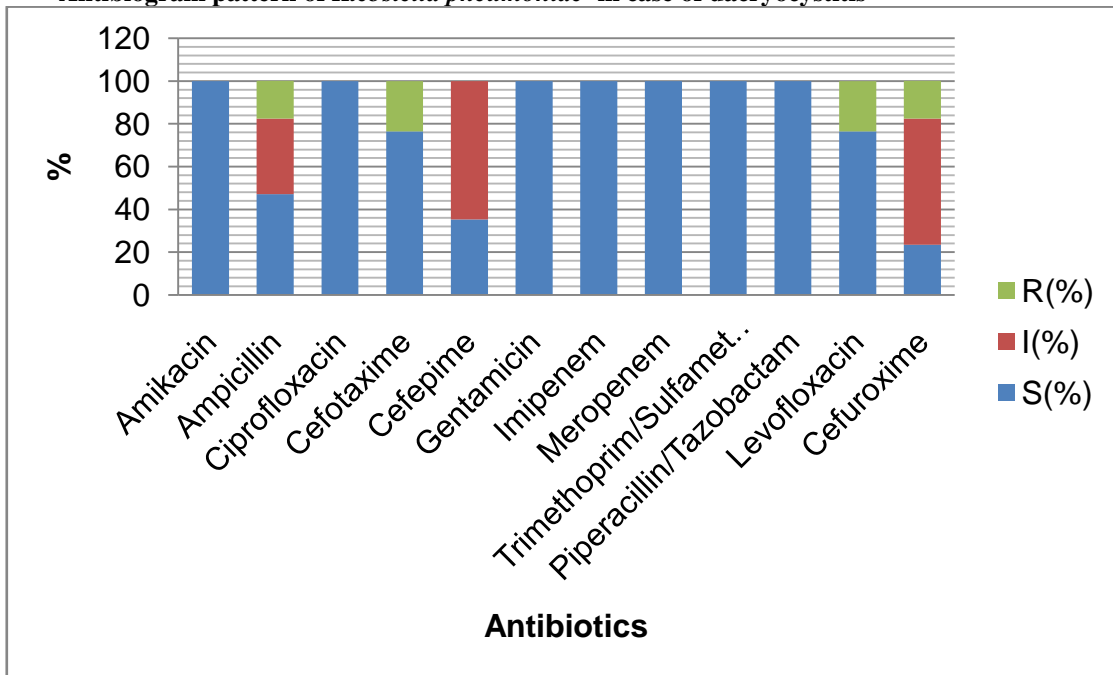
1. In Gram negative bacteria, out of 17 isolates of *Klebsiella pneumonia*, all were 100% sensitive to Amikacin, Ciprofloxacin, Gentamicin, Imipenem, Meropenem, Trimethoprim/Sulfamethoxazole and Piperacillin/Tazobactam, 13 isolates were 76.5% sensitive to Levofloxacin, Cefotaxime, 8 isolates were 47.1% sensitive to Ampicillin, 6 were 35.3% sensitive to Cefepime and 11 were 64.7% intermediate to Cefepime. 4 isolates were 25.3% sensitive to Cefuroxime and 10 isolates were 58.9% intermediate to Cefuroxime.
2. Out of 7 isolates of *E. coli*, all were 100% sensitive to Gentamicin, Imipenem, Meropenem, 5 isolates were 71.4% sensitive to Ciprofloxacin, Levofloxacin and Piperacillin/Tazobactam, Amikacin, 4 isolates were 57.1% sensitive to Cefuroxime. 7 isolates were 100% resistant to Ampicillin, Cefotaxime, 5 isolates were 71.4% resistant to Cefepime and Trimethoprim/Sulfamethoxazole.
3. Out of 1 isolate of *Citrobacter freundii*, it was 100% sensitive to Gentamicin, Amikacin, Levofloxacin, Meropenem, Ciprofloxacin, Imipenem, Piperacillin/Tazobactam, intermediate to Cefuroxime and almost resistant to Trimethoprim/Sulfamethoxazole, Ampicillin, Cefotaxime, Cefepime.
4. Out of 4 isolates of *Pseudomonas aeruginosa*, all were 100% sensitive to Amikacin, Imipenem, Meropenem, Minocycline, Ampicillin/Sulbactam, Tetracycline, Tobramycin and Aztreonam, Levofloxacin, 3 isolates were 75% sensitive to Ciprofloxacin, Ceftazidime and Piperacillin/Tazobactam, 4 isolates were 100% intermediate to Gentamicin and almost resistant to Cefepime and Trimethoprim/Sulfamethoxazole.
5. Out of 2 isolates of *Acinetobacter baumannii*, all were 100% sensitive to Amikacin, Imipenem, Meropenem, Minocycline, Ampicillin/Sulbactam, Tetracycline, Tobramycin, Ceftazidime, Ciprofloxacin and Piperacillin/Tazobactam. 2 isolates were 100% intermediate to Gentamicin and 2 isolates were almost resistant to Cefepime and Trimethoprim/Sulphamethoxazole.

**Graph 2:- Antibiogram Pattern Of Gram Negative Isolates In Case Of Dacryocystitis**

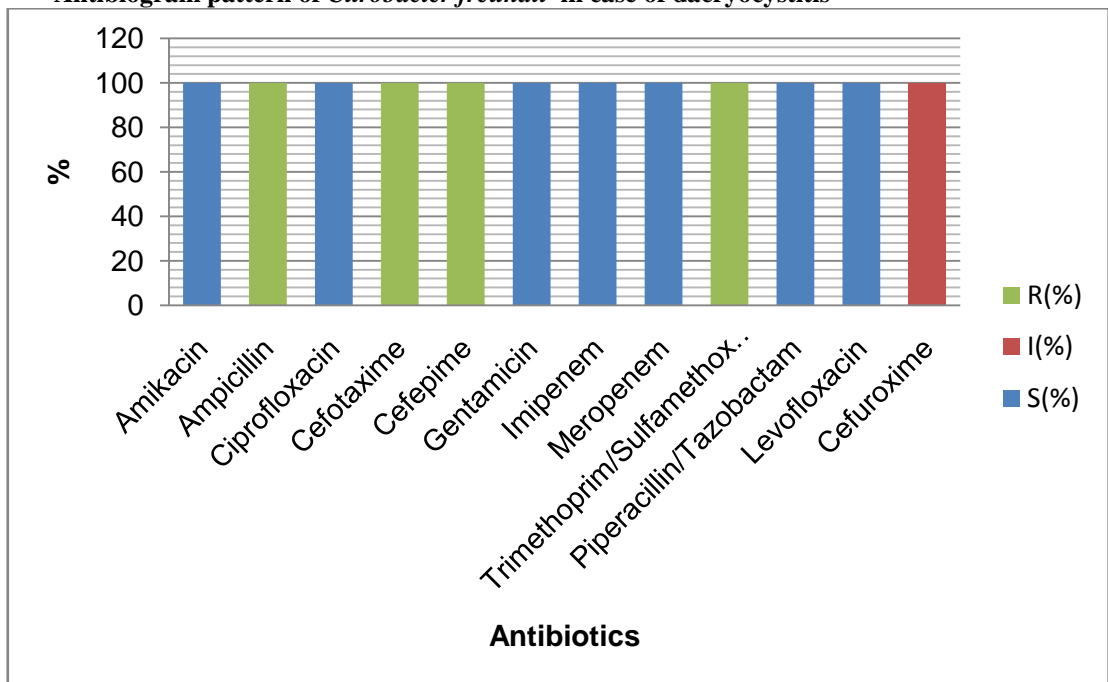
1) **Antibiogram pattern of *Escherichia coli* in case of dacryocystitis**



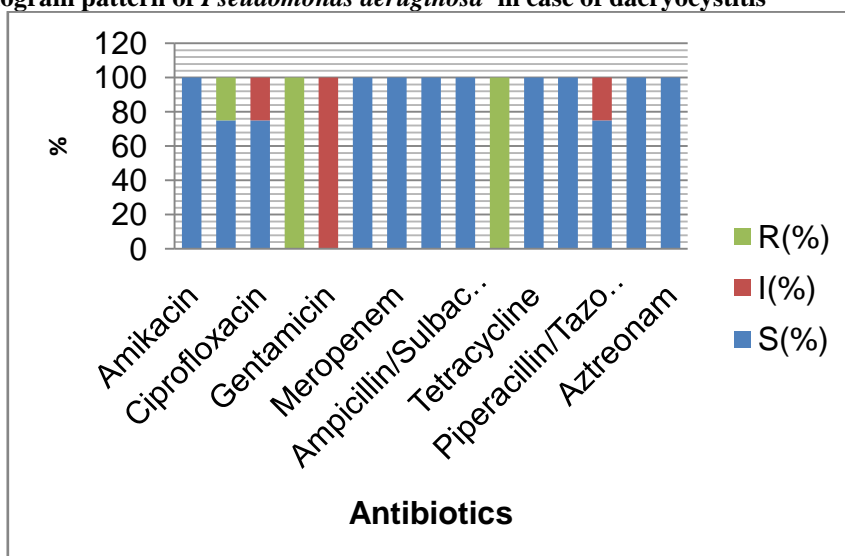
2) **Antibiogram pattern of *Klebsiella pneumoniae* in case of dacryocystitis**



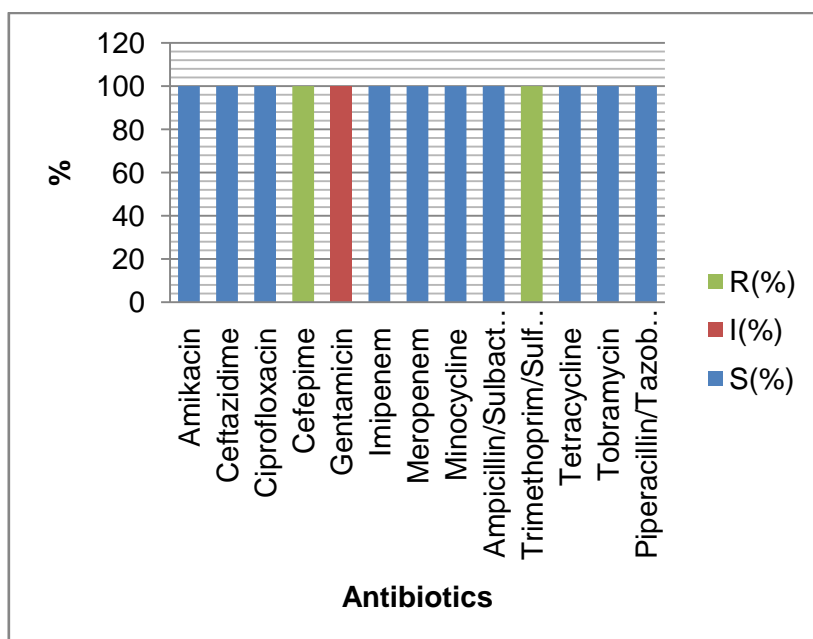
3) **Antibiogram pattern of *Citrobacter freundii* in case of dacryocystitis**



4) **Antibiogram pattern of *Pseudomonas aeruginosa* in case of dacryocystitis**



5) **Antibiogram pattern of *Acinetobacter baumannii* in case of dacryocystitis**



**IV. Discussion:**

Dacryocystitis acute or chronic poses a constant threat to the cornea and orbital soft tissue if neglected revealing the importance of the condition. Infection with microbes in these patients can cause severe morbidity.<sup>(5)</sup> The bacteriological study would contribute to the choice of effective antibiotics which would also help the clinicians for treating the cases of dacryocystitis and reducing complications associated with it.<sup>(6)</sup>

Out of 83 cases in females, 53 cases of females were predominant in 41-60 years of age group i.e. 63.86% followed by 61-80 years of age group i.e. 26.51%, 8.43% in 21-40 years of age group and 1.2% in 81-100 years of age group while in males (out of 32 cases) which contribute to 68.75% in 41-60 years of age group followed by 18.75% in 61-80 years of age group, 9.38% in 21-40 years of age group and 3.13% in 81-100 years of age group.

As the chi-square value was 1.17 and the p-value was 0.76 (since  $p > 0.05$ ), so it was not statistically significant and there was no significant correlation between age and gender. Thus, maximum numbers of cases were clustered between 40-60 years of age group especially females were more prone to developing dacryocystitis suggesting that the middle generation age group was more at risk for developing

dacryocystitis. The percentage distribution of the patients reveals that the incidence of dacryocystitis was more (72.17%) among females than males (27.83%). Female preponderance was seen with female to male ratio of 2.5:1 This suggests females being more at risk of developing dacryocystitis than males.

Out of 64 isolates of *Staphylococcus aureus*, all were 100% sensitive to Vancomycin, Amoxicillin/Clavulanic acid and Ampicillin and Linezolid, 56 isolates were 87.5% sensitive to Doxycycline, 44 isolates were 68.75% sensitive to Gentamicin, 51 isolates were 79.7% sensitive to Clindamycin, 38 isolates were 59.4% sensitive to Tetracycline. 35 isolates were 54.68% resistant to Trimethoprim/Sulfamethoxazole, 44 isolates were 68.75% resistant to Erythromycin, 59 isolates were 92.2% resistant to Penicillin and 41 isolates were 64.1% resistant to Ciprofloxacin.

In Gram negative bacteria, out of 17 isolates of *Klebsiella pneumoniae*, all were 100% sensitive to Amikacin, Ciprofloxacin, Gentamicin, Imipenem, Meropenem, Trimethoprim/Sulfamethoxazole and Piperacillin/Tazobactam, 13 isolates were 76.5% sensitive to Levofloxacin, Cefotaxime, 8 isolates were 47.1% sensitive to Ampicillin, 6 were 35.3% sensitive and 11 were 64.7% intermediate to Cefepime. 4 isolates were 25.3% sensitive and 10 isolates were 58.9% intermediate to Cefuroxime.

So, in Gram positive isolates, they were 100% sensitive to Vancomycin (Sensitivity to Vancomycin was tested by Vancomycin screen agar), Linezolid, Amoxicillin/Clavulanic acid, Ampicillin, High level gentamicin, Clindamycin. Penicillin and erythromycin were resistant and in Gram negative isolates, they were 100% sensitive to Amikacin, Gentamicin, Meropenem, Imipenem, Ciprofloxacin, Levofloxacin and Piperacillin/Tazobactam and almost resistant to Cefepime, Cefotaxime in some of the isolates.

Pradeep V et al, 2013, Vancomycin, amikacin, 3rd generation cephalosporins and amoxycylav were most effective antibiotics against the Gram positive isolates (100%, 89%, 83% and 78% sensitivity respectively). However, penicillin (72% resistance) and erythromycin (75% resistance) were the least reliable antibiotics among antibiotics tested.<sup>(7)</sup> Kumar et al, 2019, stated that in Gram positive cocci, the sensitivity to Vancomycin, and Linezolid were 100%. The sensitivity of Macrolides ie, Erythromycin and Clindamycin is about 72.72%. Doxycycline, Tetracycline showed the sensitivity of 90%. Sensitivity with Amoxicillin/Clavulanic acid is also good ie, 63.63%. The susceptibility of fluoroquinolones were about 30-45%. In Case of Gram negative bacilli the sensitivity of Aminoglycosides were about 89 to 90%. Amoxicillin showed resistant to about 75%. Sensitivity of cephalosporins was about 60-89%. Sensitivity to carbapenems was 100% and the sensitivity of fluoroquinolones were 30-40%.<sup>(8)</sup>

In our study, all patients of acute dacryocystitis was mainly relieved by giving topical and systemic antibiotics based on the antibiotic sensitivity report of the organism. The patients of chronic dacryocystitis were initially treated with antibiotics based on the antibiotic sensitivity report for 5-7 days and once the infection got resolved, the patients were taken for Dacryocystorhinostomy (DCR) or Dacryocystectomy (DCT).

Despite the surgical procedures, in the absence of systemic antibiotics, the likelihood of soft tissue infection is fivefold, which indicates the role of antibiotics in the treatment of dacryocystitis.<sup>(9)</sup> Therefore, management of dacryocystitis usually employed systemic antibiotics initially, followed by surgery after the control of infection. The success rate was reported to be about 90%.<sup>(10)</sup>

## V. Conclusion:

To conclude, both, clinical and bacteriological examinations are important for establishing the definitive diagnosis of dacryocystitis and must be mandatory prior to the initiation of antibiotics, selection of a suitable antibiotic agent is possible only if the underlying pathogen is correctly identified which help to control the increasing rate of antibiotic resistance.

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