

## A Prospective Study of Clinical and Microbiological Profile of Dacryocystitis

Valluru Pragna<sup>1</sup>, B Jyothi<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Ophthalmology, Prathima Institute of Medical Sciences, Naganoor, Karimnagar, Telangana

<sup>2</sup>Assistant Professor, Department of Ophthalmology, Prathima Institute of Medical Sciences, Naganoor, Karimnagar, Telangana

---

Received: 11-10-2024 / Revised: 12-11-2024 / Accepted: 05-12-2024

Corresponding Author: Dr. B Jyothi

Conflict of interest: Nil

---

### Abstract

**Background:** Dacryocystitis, an inflammatory condition of the lacrimal sac, presents in both acute and chronic forms. Chronic dacryocystitis is more prevalent, accounting for 87.1% of epiphora cases, often causing social discomfort due to persistent eye-watering. Identifying the antibiogram of causative microorganisms is crucial for guiding effective antimicrobial therapy. This study aimed to evaluate the clinical profile and antibiogram of acute and chronic dacryocystitis.

**Method:** This prospective observational study included patients with acute or chronic dacryocystitis attending the ophthalmology outpatient department. Eligible participants were enrolled, and samples were collected for microbiological analysis, including gram staining, culture, and sensitivity testing.

**Results:** A total of 50 cases of acute and chronic dacryocystitis were included in the study. The majority of cases were observed in the >40-50 age group for both acute (25%) and chronic (34.2%) dacryocystitis. *Staphylococcus aureus* was the most common organism isolated in both acute and chronic cases. *Staphylococcus epidermidis* was also frequently isolated, particularly in chronic cases. *Pseudomonas aeruginosa* was the most common gram-negative organism isolated. *Staphylococcus aureus* showed a high susceptibility to vancomycin and gentamicin. *Staphylococcus epidermidis* showed a high susceptibility to vancomycin. *Streptococcus pneumoniae*: was highly susceptible to beta-lactam antibiotics. *Pseudomonas aeruginosa*: had a high susceptibility to beta-lactam antibiotics, moderate susceptibility to aminoglycosides, and variable susceptibility to fluoroquinolones.

**Conclusion:** The most commonly isolated bacterial pathogen in dacryocystitis in this region was *Staphylococcus* (Gram-positive), followed by *Pseudomonas*, *Pneumococcus*, and *Staphylococcus epidermidis*. Vancomycin showed the highest efficacy against Gram-positive bacteria, while third-generation cephalosporins, gentamycin, and amikacin were most effective against Gram-negative bacteria.

**Keywords:** Dacryocystitis, epiphora, gram-positive isolates, gram-negative isolates antibiotic sensitivity.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

---

### Introduction

Dacryocystitis is an inflammatory condition of the lacrimal sac [1] that occurs in two forms: acute and chronic dacryocystitis is more prevalent, accounting for 87.1% of cases of epiphora, often causing social discomfort due to persistent eye watering [2, 3]. Naso-lacrimal duct obstruction disrupts the normal flow of tears, leading to stasis. This stasis facilitates the accumulation of tears, mucoid secretions, and desquamated cells, creating an ideal environment for bacterial growth in the lacrimal sac. Over time, this results in bacterial colonization, infection, and inflammation, culminating in dacryocystitis. Chronic dacryocystitis poses a constant threat to the ocular surface and surrounding tissues, acting as a source

of infection that can lead to corneal ulcers and severe complications, including orbital cellulitis and cavernous sinus thrombosis, which may endanger a patient's life. Changes in the microbiological spectrum of dacryocystitis have been observed over time [4-6], with noted geographical variations in causative bacterial agents and differences in the microbial profiles of acute and chronic forms [7]. Understanding the bacteriology of dacryocystitis is essential for selecting effective antimicrobial agents, reducing unnecessary antibiotic use, and mitigating the risk of antimicrobial resistance [4, 8]. Identifying the antibiogram of microorganisms involved in lacrimal sac infections aids in choosing appropriate

antimicrobial therapies, promoting prompt recovery, and reducing the risk of secondary ocular infections. This study was conducted to address these critical aspects of dacryocystitis and its management based on culture and sensitivity.

### Material and Methods

This cross-sectional study was conducted in the Department of Ophthalmology, in coordination with the Department of Microbiology, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional Ethical approval was obtained for the study. Written consent was obtained from all the participants of the study after explaining the nature of the study in the vernacular language.

### Inclusion criteria

1. Patients with a history of persistent watering and/or discharge from the eye over an extended period, accompanied by a blockage in the lacrimal passage, confirmed by a regurgitation test and syringing.
2. Patients with acute or chronic dacryocystitis
3. Males and Females
4. Aged > 10 years
5. Available for follow-up appointments
6. Willing to participate in the study voluntarily

### Exclusion criteria

1. History of previous sac surgery
2. recent antibiotic therapy,
3. diabetes mellitus,
4. patients under 10 years of age,
5. Those who did not consent to participate.

Chronic dacryocystitis was defined as a history of persistent watering and/or discharge from the eye over an extended period, accompanied by a blockage in the lacrimal passage, confirmed by a regurgitation test and syringing. Acute dacryocystitis was characterized by symptoms of pain, redness, and swelling in the lacrimal sac area. Patients meeting these criteria were enrolled after informed consent. Following the clinical diagnosis of dacryocystitis, samples were collected under

strict aseptic conditions. These included spontaneous discharge, discharge obtained after applying pressure over the lacrimal sac, discharge from spontaneously ruptured abscesses, discharge during syringing, material collected following incision and drainage, or surgically excised lacrimal sacs during dacryocystorhinostomy. Specimens were sent to the microbiology laboratory for gram staining, culture, and sensitivity testing.

**Processing of Specimens:** Samples were inoculated onto blood agar, nutrient agar, and MacConkey agar using an inoculation loop and incubated at 37°C for 24-48 hours. Any microbial growth observed was identified using standard microbiological techniques. Antibiotic susceptibility patterns were assessed using the Kirby-Bauer disc diffusion method on Muller-Hinton Agar (MHA).

**Statistical Methods:** All the statistical data was refined and uploaded to an MS Excel spreadsheet and analyzed by SPSS version 22 in Windows format. The continuous variables were represented as mean, standard deviation, and percentages, and the categorical variables were calculated by Pearson chi-square test with values of significance  $p < 0.05$ .

### Results

A total of 50 cases of dacryocystitis were included in the study out of which 12(24%) were acute cases and 38(76%) were chronic cases. Out the cases females were 34(68%) and males were 16(32%). Out of the female cases, 7 cases were acute and 29 cases were chronic dacryocystitis. The >40-50 age group had the highest prevalence of both acute (25%) and chronic (34.2%) dacryocystitis cases (Table 1). The >60 age group had a significant proportion of chronic cases (21%). The data suggests a potential increase in the risk of dacryocystitis with advancing age, especially for chronic cases. Older adults may have weakened immune systems, reduced tear production, and other age-related factors that increase their susceptibility to dacryocystitis.

**Table 1: Demographic profile of study patients (50) of acute and chronic dacryocystitis.**

Age Group	Acute cases (12)		Chronic (38)		Total cases	Percentage
	Frequency	%	Frequency	%	Frequency	%
10-20	0	0	0	0	0	0
>20-30	2	16.7	2	5.2	4	8
>30-40	3	25.0	6	15.8	9	18
>40-50	3	25.0	13	34.2	16	32
>50-60	3	25.0	9	23.7	12	24
>60	1	8.3	8	21.0	9	18

The majority of cases (both acute and chronic) in this study fall into the lower socioeconomic class of

acute cases. This suggests a potential link between socioeconomic status and the risk of dacryocystitis. Lower socioeconomic classes may have poorer

access to preventive healthcare and medical care, which can lead to delayed diagnosis and treatment of dacryocystitis. People in lower socioeconomic classes may be more likely to experience

nutritional deficiencies, which can weaken the immune system and increase susceptibility to infections like dacryocystitis (Table 2).

**Table 2: Socioeconomic class distribution of cases included in the study**

Socio-economic class	Acute cases	Chronic cases	Total	Percentage of acute	Percentage of chronic
Upper	0	1	1	0	2.6
Upper middle	1	2	3	8.3	5.3
Middle	2	7	9	16.7	18.4
Lower middle	1	8	9	8.3	21.1
Lower	8	20	28	66.7	52.6

Table 3 shows Lateralization: Both eyes were almost equally affected, with a slight predominance of left-eye involvement (56%). Symptoms: Watering: This was the most common symptom, particularly in chronic cases (100%). Discharge: While

less common in acute cases (16.7%), it was prevalent in chronic cases (57.9%). Swelling, Pain, and Tenderness: These symptoms were primarily associated with acute dacryocystitis, with all acute cases presenting with these signs.

**Table 3: Clinical profile of cases of dacryocystitis included in the study**

	Acute cases (12)		Chronic (38)		Total	Percentage
	Frequency	%	Frequency	%		
Right eye	5	41.7	15	39.5	22	44%
Left eye	7	58.3	23	60.5	28	56%
<i>Symptoms</i>						
Watering	6	50.0	38	100.0	89	89.0
Discharge	2	16.7	22	57.9	47	47.0
Swelling	12	100.0	11	14.28	34	34.0
Pain	12	100.0	0	0	23	23.0
Tenderness	12	100.0	0	0	23	23.0

Table 4 shows the clinical findings in the cases of the study. Fistula formation was predominantly seen in chronic cases (52.6%), indicating a potential complication of long-standing dacryocystitis. Acute cases were primarily characterized by red

eye, lid swelling, pain, and tenderness. Chronic cases often present with watering, discharge, and complications like fistula formation, corneal ulcer, and endophthalmitis.

**Table 4: Clinical findings in cases with dacryocystitis**

	Acute cases (12)		Chronic (38)		Total cases	Percentage
	Frequency	%	Frequency	%	Frequency	%
Fistula	0	0.0	2	52.6	2	4
Red eye	2	16.7	4	10.5	6	12
Lid swelling	4	33.3	0	0.0	9	18
Endophthalmitis	0	0.0	1	2.6	1	2
Blepharitis	1	8.3	2	5.3	3	6
Headache	1	8.3	0	0.0	1	2
photophobia	0	0.0	2	5.3	2	4
Corneal ulcer	0	0.0	2	5.3	2	4

The microbiological culture of the samples revealed that out of 12 cases of acute dacryocystitis 6 were positive (50%). Similarly, in the chronic cases out of 38 cases 28(73.7%) were positive cases the remaining samples in both were found to be negative for bacteriological examination. Bacteriological Findings in Dacryocystitis are given in Table 5.

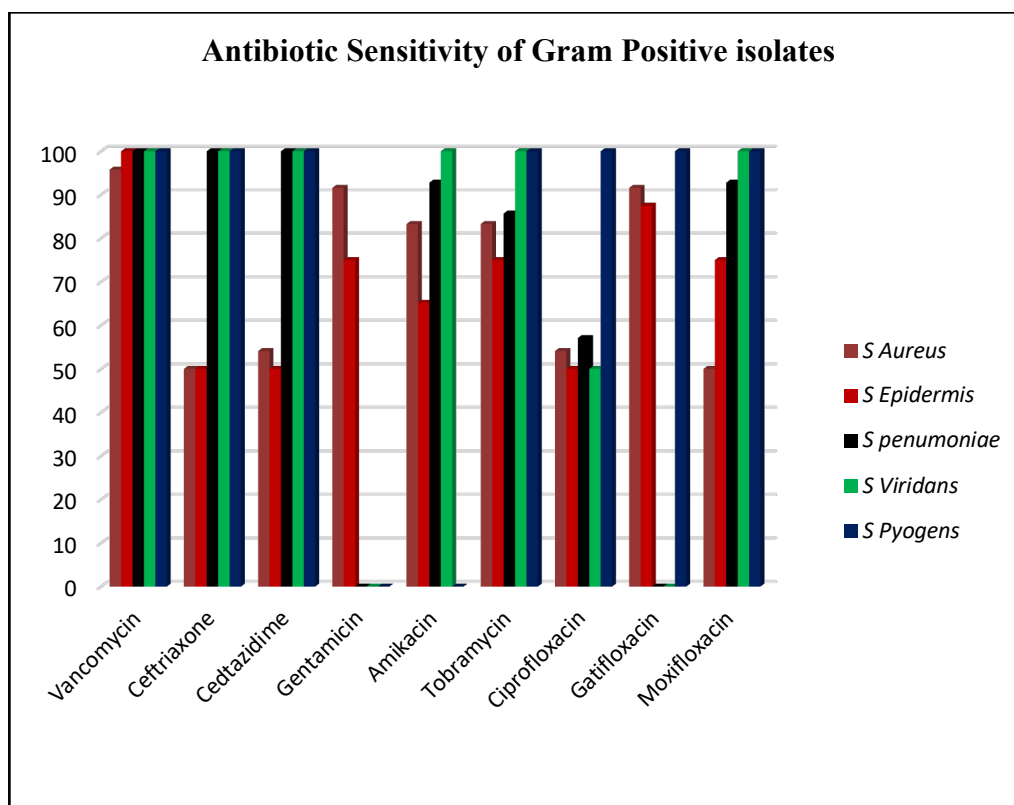
*Staphylococcus aureus* was the most common organism isolated in both acute and chronic cases with a total prevalence of 24%. *Staphylococcus pneumonia* 14% was also frequently isolated, particularly in chronic cases. *Pseudomonas aeruginosa* was the most common gram-negative organism isolated in 1% of all cases.

**Table 5: Bacteriological examination of sac contents in the cases of the study**

	Acute cases (12)		Chronic (38)		Total cases	Percentage
	Frequency	%	Frequency	%	Frequency	%
Gram Positive	4	33.3	21	55.2	25	50
<i>S. aureus</i>	2	16.7	10	26.3	12	24
<i>S. epidermidis</i>	1	8.3	3	34.2	4	8
<i>S. pneumoniae</i>	1	8.3	6	15.8	7	14
<i>S. pyrogens</i>	0	0.0	1	2.6	1	2
<i>S viridans</i>	0	0.0	1	2.6	1	2
Gram Negative	2	16.7	7	18.4	9	18
<i>P. aeruginosa</i>	2	16.7	5	13.1	7	14
<i>Hemophilus</i>	0	0.0	0	0.0	0	0
<i>Proteus</i>	0	0.0	1	2.6	1	2
<i>Klebsiella</i>	0	0.0	1	2.6	1	2

Figure 1 shows the antimicrobial susceptibility of gram-positive isolates of dacryocystitis cases. *Staphylococcus aureus* showed High susceptibility to vancomycin (95.8%) and gentamicin (83.3%). Moderate susceptibility to ciprofloxacin (54.1%). *Staphylococcus epidermidis* showed High susceptibility to vancomycin (100%) and moderate susceptibility to most other antibiotics. *Streptococcus*

*pneumoniae* was found to have a high susceptibility to vancomycin, ceftriaxone, and ceftazidime. Variable susceptibility to other antibiotics, including gentamicin and ciprofloxacin. *Streptococcus viridians* and *Streptococcus pyogenes*: High susceptibility to most antibiotics tested, including vancomycin, ceftriaxone, ceftazidime, and gentamicin.



**Figure 1: Antibiotic sensitivity pattern of Gram-positive isolates in the cases of the study**

Figure 2 presents the antimicrobial susceptibility pattern of gram-negative isolates. *Pseudomonas aeruginosa* shows high susceptibility to beta-lactam antibiotics (ceftazidime and cefepime). Moderate susceptibility to aminoglycosides (gen

tamicin, amikacin, and tobramycin). Variable susceptibility to fluoroquinolones (ciprofloxacin, gatifloxacin, and moxifloxacin). *Klebsiella spp.* and *Proteus spp.* High susceptibility to all tested antibiotics.

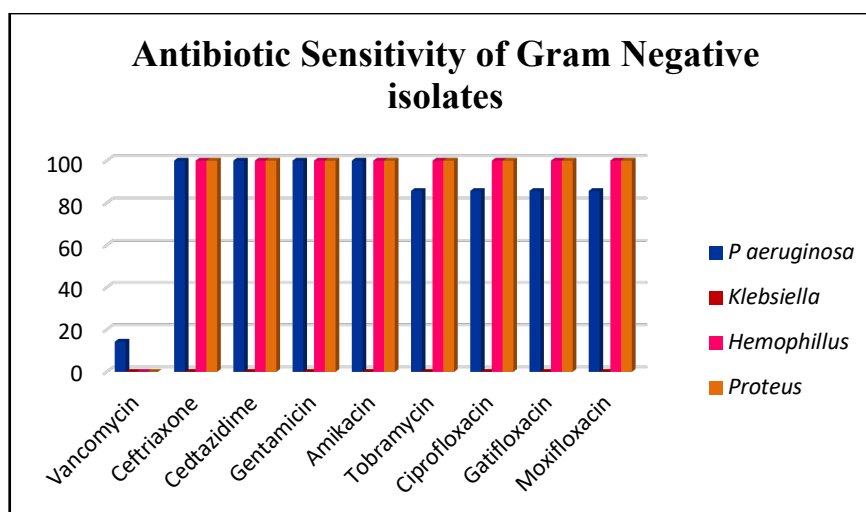


Figure 2: Antibiotic sensitivity pattern of Gram-negative isolates in the cases of the study

### Discussion

Dacryocystitis is a fairly frequent pathology of the lacrimal apparatus all over the world and is characterized by inflammation of the lacrimal sac. This work examines new trends in bacteriology and antibiotic susceptibility concerning dacryocystitis. Chronic dacryocystitis was recorded as more common than the acute form in this study (76% vs. 24%) this result is in concordance with other similar studies in this field [9, 10]. However, the results have been inconclusive as other research has shown [11, 12] that the difference could be attributed to geographical differences, cohort sizes, and distribution of etiopathogenic factors. As the present work also noted, there was a higher prevalence of dacryocystitis in middle-aged patients between 30–60 years old, followed by studies [13, 14]. This age-related distribution probably results from atony of the lacrimal sac with age, resulting in ineffective tear drainage; chronic irritation and inflammation; and compromised immune ability to counter microbial penetration. A higher prevalence of dacryocystitis was noted among females (68%), corroborating findings from other studies [12, 15, 16]. Females are more susceptible due to the anatomical structure of the bony nasolacrimal canal, which is narrower and flatter against the nasal floor compared to males, predisposing them to canalicular obstruction. Additionally, as many patients belong to lower socioeconomic groups, the condition may be linked to poor hygiene practices, as noted in other studies [13, 17]. In this study, the primary symptom in chronic dacryocystitis was watering, whereas pain, swelling, and tenderness were more commonly associated with acute dacryocystitis. Similar symptoms, with varying prevalence, have been reported in other studies [18, 19]. The left eye was more frequently affected than the right eye (1.25 times), a finding consistent with other studies [20, 21]. This could be attributed to the larger angle between the nasolacrimal duct and the lacrimal

fossa on the right side, which makes the left side more prone to obstruction and infection. Conjunctivitis was present in 12% of patients with dacryocystitis, likely due to the accumulation of toxic debris on the ocular surface, including toxins produced by normal flora, which are not cleared effectively due to tear stasis. Similar findings, albeit with varying prevalence, have been documented in other studies [13, 14]. Organisms were more frequently isolated in samples from acute dacryocystitis (75% of cases) compared to chronic dacryocystitis (65.8% of cases). Gram-positive organisms (50%) were more prevalent than Gram-negative organisms (18%). Among Gram-positive bacteria, *Staphylococcus aureus* (24%) was the predominant pathogen, while *Pseudomonas* (14%) was the most common Gram-negative organism. These results align with findings from other studies [10, 14, 15, 17], though the prevalence varied. The overall susceptibility profile of the antimicrobials used in the current study revealed that vancomycin has 100% sensitivity to all the Gram-positive organisms tested while fluoroquinolones and cephalosporins have moderate sensitivity. If Gram-negative bacteria are implicated all the tested antibiotics including tobramycin, gentamycin, amikacin, fluoroquinolones and cephalosporin excluding vancomycin were also highly active. These findings bear consonance with other similar studies made elsewhere in India [22, 23]. However, misuse and over-prescription of antibiotics are still major issues, because antibiotic susceptibility patterns are affected by bacterial resistance stemming from random use of the drugs.

### Conclusion

The most commonly isolated bacterial pathogen in dacryocystitis in this region was *Staphylococcus* (Gram-positive), followed by *Pseudomonas*, *Pneumococcus*, and *Staphylococcus epidermidis*. Vancomycin showed the highest efficacy against Gram-positive bacteria, while third-generation

cephalosporins, gentamycin, and amikacin were most effective against Gram-negative bacteria. Hence, a combination of these antibiotics may be used as empirical therapy pending culture and sensitivity results.

### References

1. Taylor RS, Ashurst JV. Dacryocystitis. [Updated 2023 Sep 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470565/?report=classic> [Accessed on May 20th 2024]
2. Jacobs, H.G. Symptomatic epiphora. *Brit. J. Ophthalmol.* 1959; 43:415.
3. Mal R, Banerjee AR, Biswas MC, Mondal A, Kundu PK, Sasmal NK. Clinico-bacteriological study of chronic Dacryocystitis in adults. *J Indian Med Assoc.* 2008;106(5):296-98.
4. Mandal R, Banerjee AR, Biswas MC, Mondal A, Kundu PK, Sasmal NK. Clinicobacteriological study of chronic dacryocystitis in adults. *J Indian Med Assoc.* 2008 May;106(5):296-8. PMID: 18839635.
5. Ali MJ, Joshi SD, Naik MN, Honavar SG. Clinical profile and management outcome of acute dacryocystitis: two decades of experience in a tertiary eye care center. *Semin Ophthalmol.* 2015 Mar; 30 (2): 118-23.
6. Sun X, Liang Q, Luo S, Wang Z, Li R, Jin X. Microbiological analysis of chronic dacryocystitis. *Ophthalmic and Physiological Optics.* 2005; 25 (3): 261-63.
7. Amin RM, Hussein FA, Idriss HF, Hanafy NF, Abdallah DM. Pathological, immunohistochemical, and microbiological analysis of lacrimal sac biopsies in patients with chronic dacryocystitis. *International journal of ophthalmology.* 2013;6(6):817-26.
8. Sethi V, Mittal HK, Tuli R. Chronic dacryocystitis: An insight into bacteriology and antimicrobial sensitivity pattern. *Oman J Ophthalmol.* 2024 Jun 27;17(2):192-197.
9. Prakash R., Girish Babu R.J., Nagaraj E.R., Prashanth H.V., Jayashree S. Shah. A bacteriological study of dacryocystitis. *Journal Of Clinical and Diagnostic Research* 2012; 6(4):652-655.
10. Bharathi MJ, Ramakrishnan R, Maneksha V, Shivakumar C, Nithya V, Mittal S. Comparative bacteriology of acute and chronic dacryocystitis. *Eye (Lond).* 2008 Jul; 22(7):953-60.
11. Shah CP, Santani D. A comparative bacteriological profile and antibiogram of dacryocystitis. *Nepal J Ophthalmol.* 2011 Jul-Dec;3(2):134-39.
12. Eshraghi B, Abdi P, Akbari M, Fard MA. Microbiologic spectrum of acute and chronic dacryocystitis. *International journal of ophthalmology.* 2014; 7 (5):864.
13. Reddy PS, Reddy B. Dacryocystitis; a clinicopathological study. *J Indian Med Assoc.* 1955 Mar 1;24 (11):413-6.
14. Kalaivani K. Microbial Study of Chronic Dacryocystitis in Adults. *International Journal of Ocular Oncology and Oculoplasty.* 2017;3(2):133-136.
15. Khatoon J, Rizvi SAR, Gupta Y, Alam MS. A prospective study on the epidemiology of dacryocystitis at a tertiary eye care center in Northern India. *Oman J Ophthalmol.* 2021 Oct 20;14(3):169-172.
16. Mills, David M. Bodman, Marc G. Meyer, Dale R. Morton, Asa D. III for the ASOPRS Dacryocystitis Study Group. The Microbiologic Spectrum of Dacryocystitis: A National Study of Acute Versus Chronic Infection. *Ophthalmic Plastic & Reconstructive Surgery* 2007; 23(4): 302-306.
17. Patel K, Magdum R, Sethia S, Lune A, Pradhan A, Misra RN. A Clinico-Bacteriological Study of Chronic Dacryocystitis. *Sudanese Journal of Ophthalmology.* 2014; 6(1):1-5.
18. Bharathi, M., Ramakrishnan, R., Maneksha, V. et al. Comparative bacteriology of acute and chronic dacryocystitis. *Eye* 2008; 22, 953-960.
19. Tian X, Sun H, Huang Y, Sui W, Zhang D, Sun Y, Jin J, He Y, Lu X. Microbiological isolates and associated complications of dacryocystitis and canaliculitis in a prominent tertiary ophthalmic teaching hospital in northern China. *BMC Ophthalmol.* 2024 Feb 5;24(1):56
20. Malik SR, Gupta AK, Chatterjee S, Bhardwaj OP, Saha M. Dacryocystography of normal and pathological lacrimal passages. *Br J Ophthalmol.* 1969 Mar; 53 (3): 174-9.
21. Mandal R, Banerjee AR, Biswas MC, Mondal A, Kundu PK, Sasmal NK. Clinico bacteriological Study of Chronic Dacryocystitis in Adults. *Journal Of the Indian Medical Association.* 2008;106(5):296-8.
22. Ali MJ, Motukupally SR, Joshi SD, Naik MN. The microbiological profile of lacrimal abscess: two decades of experience from a tertiary eye care center. *Journal of ophthalmic inflammation and infection.* 2013;3(1): 57.

23. Ahuja S, Chhabra AK, Agarwal J. Study of Bacterial Spectrum In Patients Of Chronic Dacryocystitis, At A Tertiary Care Centre In

Northern India. J Community Med Health Educ 2017; 7:536.