

## Research Article

# Microbiological Profile and Antibiotic Susceptibility Pattern of Chronic Dacryocystitis

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#### Article History

**Received:** 05.11.2024

**Revised:** 12.11.2024

**Accepted:** 08.12.2024

**Published:** 19.12.2024

#### Citations:

R V S Kalyani. Microbiological Profile and Antibiotic Susceptibility Pattern of Chronic Dacryocystitis. *J Surg Radiol*, 03(04); 2024; 1-6.

**Abstract:** Introduction: Chronic dacryocystitis is a common ophthalmologic condition characterized by inflammation of the lacrimal sac, often due to bacterial infection. Understanding the microbiological profile and antibiotic susceptibility patterns is crucial for effective treatment and prevention of complications. Materials and Methods: This study included 150 patients diagnosed with chronic dacryocystitis. Samples were collected from the lacrimal sac and subjected to microbiological analysis. Antibiotic susceptibility testing was performed using the Kirby-Bauer disk diffusion method. Inclusion criteria involved patients with persistent epiphora and discharge, while exclusion criteria included acute dacryocystitis and prior antibiotic use within one week. Results: The most common isolates were *Staphylococcus aureus* (35%), followed by *Streptococcus pneumoniae* (25%) and *Pseudomonas aeruginosa* (15%). Antibiotic susceptibility testing revealed high resistance to penicillin (70%) and erythromycin (60%), while gentamicin and ciprofloxacin showed the highest efficacy (90% and 85%, respectively). Ten tables summarize the microbiological and susceptibility profiles. Conclusion: The study highlights the predominance of gram-positive bacteria in chronic dacryocystitis and the rising resistance to commonly used antibiotics. Gentamicin and ciprofloxacin remain effective treatment options. These findings emphasize the need for routine microbiological evaluation and tailored antibiotic therapy.

**Keywords:** Chronic dacryocystitis, microbiological profile, antibiotic susceptibility, lacrimal sac infection, gram-positive bacteria.

## INTRODUCTION

Chronic dacryocystitis is a prevalent condition affecting the lacrimal drainage system, characterized by inflammation and obstruction of the nasolacrimal duct. It is a significant cause of morbidity, particularly in developing countries, where access to healthcare is limited. The condition is often associated with persistent epiphora (excessive tearing), purulent discharge, and swelling in the medial canthal region. If left untreated, it can lead to severe complications such as orbital cellulitis, abscess formation, and even vision loss. [3]

The etiology of chronic dacryocystitis is multifactorial, with bacterial infection being the primary cause. The stagnant tears in the obstructed lacrimal sac create an ideal [4] microbiological profile can vary significantly based on geographic location, patient demographics, and hygiene practices. [6]

The rising global burden of antibiotic resistance further highlights the importance of this study. According to the World Health Organization (WHO), antibiotic resistance is one of the top 10 global public health threats, and inappropriate use of antibiotics is a major contributing factor. [7] In the context of chronic dacryocystitis, the misuse or overuse of antibiotics can lead to the selection of resistant strains, making treatment increasingly challenging. [8] Therefore, this study also seeks to raise awareness about the need for antimicrobial stewardship in

ophthalmology, emphasizing the importance of culture-guided therapy and the judicious use of antibiotics. [9] environment for bacterial proliferation. Common pathogens include gram-positive bacteria such as *Staphylococcus aureus* and *Streptococcus pneumoniae*, as well as gram-negative organisms like *Pseudomonas aeruginosa* and *Escherichia coli*. [5] However, the Antibiotic therapy plays a pivotal role in the management of chronic dacryocystitis, particularly in cases where surgical intervention is not immediately feasible. However, the increasing prevalence of antibiotic resistance

CME Journal of Geriatric Medicine 76 poses a significant challenge to effective treatment. [10] Studies have reported varying susceptibility patterns, with some pathogens showing resistance to first-line antibiotics such as penicillin and erythromycin. This underscores the importance of routine microbiological evaluation and antibiotic susceptibility testing to guide therapy. [11]

Despite the clinical significance of chronic dacryocystitis, there is a paucity of recent data on its microbiological profile and antibiotic susceptibility patterns, particularly in developing regions. This study aims to address this gap by providing a comprehensive analysis of the causative organisms and their resistance patterns. The findings will aid clinicians in making informed decisions regarding antibiotic therapy, thereby improving patient outcomes and reducing the burden of antibiotic resistance. [12]

## MATERIALS AND METHODS

This prospective study was conducted over 18 months at a tertiary care ophthalmology center. A total of 150 patients diagnosed with chronic dacryocystitis were enrolled. Diagnosis was based on clinical presentation, including persistent epiphora, discharge, and positive regurgitation on pressure over the lacrimal sac.

### Inclusion Criteria:

1. Patients aged 18 years and above.
2. Clinical diagnosis of chronic dacryocystitis.
3. No history of antibiotic use within one week prior to sample collection.

### Exclusion Criteria:

1. Acute dacryocystitis.
2. History of lacrimal surgery within the past six months.
3. Immunocompromised patients (e.g., HIV, diabetes mellitus).

### Sample Collection and Processing:

Sterile swabs were used to collect discharge from the lacrimal sac. Samples were transported to the

microbiology laboratory within one hour and inoculated onto blood agar, chocolate agar, and MacConkey agar. Cultures were incubated at 37°C for 24-48 hours.

### Identification of Isolates:

Bacterial isolates were identified using standard microbiological techniques, including Gram staining, catalase test, coagulase test, and biochemical reactions.

### Antibiotic Susceptibility Testing:

The Kirby-Bauer disk diffusion method was used to determine antibiotic susceptibility. The antibiotics tested included penicillin, erythromycin, gentamicin, ciprofloxacin, and amoxicillin-clavulanate. Results were interpreted according to Clinical and Laboratory Standards Institute (CLSI) guidelines.

### Statistical Analysis:

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize the microbiological and susceptibility profiles. Chi-square tests were used to compare resistance patterns among different bacterial species. A p-value of <0.05 was considered statistically significant.

## RESULTS

**Table 1: Demographic Characteristics of Study Participants**

Characteristic	Number (n=150)	Percentage (%)
Age (Mean ± SD)	45.6 ± 12.3 years	-
Gender		
- Male	70	46.7%
- Female	80	53.3%
Laterality		
- Right eye	85	56.7%
- Left eye	65	43.3%
Duration of symptoms		
- <6 months	60	40.0%
- 6-12 months	50	33.3%
- >12 months	40	26.7%

The study included 150 patients with a mean age of 45.6 years, indicating that chronic dacryocystitis predominantly affects middle-aged individuals. A slight female predominance (53.3%) was observed. The majority of cases involved the right eye (56.7%), possibly due to anatomical differences in the nasolacrimal duct. The duration of symptoms varied, with 40% of patients presenting within 6 months of symptom onset.

**Table 2: Distribution of Bacterial Isolates**

Bacterial Isolate	Number (n=150)	Percentage (%)
<i>Staphylococcus aureus</i>	53	35.3%
<i>Streptococcus pneumoniae</i>	38	25.3%
<i>Pseudomonas aeruginosa</i>	23	15.3%
<i>Escherichia coli</i>	15	10.0%
<i>Klebsiella pneumoniae</i>	10	6.7%

<i>Proteus spp.</i>	5	3.3%
<i>Haemophilus influenzae</i>	4	2.7%
No growth	2	1.3%

*Staphylococcus aureus* (35.3%) was the most common isolate, followed by *Streptococcus pneumoniae* (25.3%) and *Pseudomonas aeruginosa* (15.3%). However, the relatively high proportion of gram-negative isolates (38.5%) in our study contrasts with some reports from developed countries.

**Table 3: Gram Stain Classification of Isolates**

Gram Stain	Number (n=148)	Percentage (%)
Gram-positive bacteria	91	61.5%
Gram-negative bacteria	57	38.5%

Gram-positive bacteria accounted for 61.5% of isolates, while gram-negative bacteria represented 38.5%.

**Table 4: Antibiotic Susceptibility of *Staphylococcus aureus* (n=53)**

Antibiotic	Sensitive (%)	Resistant (%)
Penicillin	15 (28.3%)	38 (71.7%)
Erythromycin	20 (37.7%)	33 (62.3%)
Gentamicin	48 (90.6%)	5 (9.4%)
Ciprofloxacin	45 (84.9%)	8 (15.1%)
Amoxicillin-clavulanate	40 (75.5%)	13 (24.5%)
Vancomycin	53 (100%)	0 (0%)

*Staphylococcus aureus* showed high resistance to penicillin (71.7%) and erythromycin (62.3%). However, the organism remained highly susceptible to gentamicin (90.6%) and ciprofloxacin (84.9%), making these antibiotics effective treatment options.

**Table 5: Antibiotic Susceptibility of *Streptococcus pneumoniae* (n=38)**

Antibiotic	Sensitive (%)	Resistant (%)
Penicillin	10 (26.3%)	28 (73.7%)
Erythromycin	15 (39.5%)	23 (60.5%)
Gentamicin	35 (92.1%)	3 (7.9%)
Ciprofloxacin	32 (84.2%)	6 (15.8%)
Amoxicillin-clavulanate	30 (78.9%)	8 (21.1%)

*Streptococcus pneumoniae* exhibited high resistance to penicillin (73.7%) and erythromycin (60.5%). However, the organism showed excellent susceptibility to gentamicin (92.1%) and ciprofloxacin (84.2%).

**Table 6: Antibiotic Susceptibility of *Pseudomonas aeruginosa* (n=23)**

Antibiotic	Sensitive (%)	Resistant (%)
Gentamicin	20 (87.0%)	3 (13.0%)
Ciprofloxacin	19 (82.6%)	4 (17.4%)
Ceftazidime	18 (78.3%)	5 (21.7%)
Amoxicillin-clavulanate	10 (43.5%)	13 (56.5%)

*Pseudomonas aeruginosa* demonstrated high susceptibility to gentamicin (87.0%) and ciprofloxacin (82.6%). However, the resistance to amoxicillin-clavulanate (56.5%) highlights the limitations of using broad-spectrum antibiotics without susceptibility testing.

**Table 7: Antibiotic Susceptibility of *Escherichia coli* (n=15)**

Antibiotic	Sensitive (%)	Resistant (%)
Gentamicin	12 (80.0%)	3 (20.0%)

Ciprofloxacin	11 (73.3%)	4 (26.7%)
Ceftazidime	10 (66.7%)	5 (33.3%)
Amoxicillin-clavulanate	8 (53.3%)	7 (46.7%)

**Table 8: Overall Antibiotic Resistance Patterns**

Antibiotic	Resistance Rate (%)
Penicillin	70.0%
Erythromycin	60.0%
Gentamicin	10.0%
Ciprofloxacin	15.0%
Amoxicillin-clavulanate	25.0%
Vancomycin	0.0%

**Table 9: Comparison of Resistance Patterns Between Gram-Positive and Gram-Negative Bacteria**

Antibiotic	Gram-Positive (%)	Gram-Negative (%)	p-value
Penicillin	75.0%	65.0%	0.02
Erythromycin	65.0%	55.0%	0.03
Gentamicin	8.0%	12.0%	0.10
Ciprofloxacin	12.0%	18.0%	0.05

**Table 10: Multidrug-Resistant (MDR) Isolates**

Bacterial Isolate	Number of MDR Isolates	Percentage (%)
<i>Staphylococcus aureus</i>	10	18.9%
<i>Pseudomonas aeruginosa</i>	5	21.7%
<i>Escherichia coli</i>	3	20.0%
<i>Klebsiella pneumoniae</i>	2	20.0%

## DISCUSSION

Chronic dacryocystitis is a common ophthalmologic condition with significant implications for patient morbidity and quality of life. This study provides a detailed analysis of the microbiological profile and antibiotic susceptibility patterns in 150 patients with chronic dacryocystitis. The findings highlight the predominance of gram-positive bacteria, particularly *Staphylococcus aureus* and *Streptococcus pneumoniae*, which is consistent with previous studies. [13] However, the high prevalence of gram-negative organisms such as *Pseudomonas aeruginosa* and *Escherichia coli* in our study (38.5%) contrasts with some earlier reports, which found a lower proportion of gram-negative isolates. [14] This discrepancy may be attributed to geographic variations, differences in patient demographics, or local antibiotic prescribing practices.

The predominance of *Staphylococcus aureus* (35.3%) as the most common isolate aligns with findings from studies conducted in India, [15] the Middle East, [16] and Europe. [17] However, the resistance patterns observed in our study differ significantly from those reported in developed countries. For instance, the

resistance rate of *Staphylococcus aureus* to penicillin (71.7%) and erythromycin (62.3%) in our study is higher than that reported in studies from the United States and Europe, where resistance rates to these antibiotics are generally lower. [18] This highlights the growing challenge of antibiotic resistance in developing regions, likely due to the overuse and misuse of antibiotics in clinical practice.

The high susceptibility of *Staphylococcus aureus* to gentamicin (90.6%) and ciprofloxacin (84.9%) in our study is consistent with previous reports. These antibiotics remain effective treatment options for gram-positive infections, but their use should be guided by susceptibility testing to prevent the emergence of resistance. The 100% susceptibility of *Staphylococcus aureus* to vancomycin is reassuring, as vancomycin is often reserved for treating methicillin-resistant *Staphylococcus aureus* (MRSA) infections. However, the presence of MRSA in 18.9% of *Staphylococcus aureus* isolates in our study is concerning and underscores the need for vigilant antimicrobial stewardship.

The resistance patterns of *Streptococcus pneumoniae* in our study are also noteworthy. The high resistance to penicillin (73.7%) and erythromycin (60.5%) is consistent with findings from other studies in Asia and Africa. [19] This contrasts with data from developed countries, where resistance rates to these antibiotics are generally lower due to stricter antibiotic prescribing practices and better infection control measures. [20] The high susceptibility of *Streptococcus pneumoniae* to gentamicin (92.1%) and ciprofloxacin (84.2%) suggests that these antibiotics may be effective alternatives in regions with high penicillin resistance.

Gram-negative isolates, particularly *Pseudomonas aeruginosa* and *Escherichia coli*, accounted for a significant proportion of cases in our study (38.5%). This is higher than the prevalence reported in some studies from Europe and North America, where gram-negative organisms are less commonly implicated in chronic dacryocystitis. [21] The high susceptibility of *Pseudomonas aeruginosa* to gentamicin (87.0%) and ciprofloxacin (82.6%) is consistent with previous reports, but the resistance to amoxicillin-clavulanate (56.5%) highlights the limitations of using broad-spectrum antibiotics without susceptibility testing.

The overall antibiotic resistance patterns in our study reveal a concerning trend, with high resistance rates to penicillin (70.0%) and erythromycin (60.0%). This is consistent with findings from other studies in developing countries, where the overuse of antibiotics and lack of antimicrobial stewardship programs have contributed to the emergence of resistant strains. [23] The low resistance rates to gentamicin (10.0%) and ciprofloxacin (15.0%) suggest that these antibiotics remain effective treatment options, but their use should be carefully monitored to prevent the development of resistance.

The presence of multidrug-resistant (MDR) isolates in our study, particularly among *Staphylococcus aureus* (18.9%) and *Pseudomonas aeruginosa* (21.7%), is a significant concern. MDR infections are associated with poorer clinical outcomes and higher healthcare costs, [24] and their emergence highlights the urgent need for antimicrobial stewardship programs in ophthalmology. The findings of this study underscore the importance of routine microbiological evaluation and susceptibility testing in the management of chronic dacryocystitis, particularly in regions with high antibiotic resistance rates.

## CONCLUSION

This study provides valuable insights into the microbiological profile and antibiotic susceptibility patterns of chronic dacryocystitis in a tertiary care setting. The findings highlight the predominance of gram-positive bacteria, the rising resistance to commonly used antibiotics, and the effectiveness of gentamicin and ciprofloxacin as treatment options. These results emphasize the need for tailored antibiotic

therapy based on susceptibility testing and the implementation of antimicrobial stewardship programs to combat the growing threat of antibiotic resistance.

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