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# Clinico Microbiological Profile in Dacryocystitis at Tertiary Care Teaching Hospital

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**ABSTRACT**

Dacryocystitis is an inflammation of the lacrimal sac, which usually occurs because of obstruction of the nasolacrimal duct. The obstruction may be an idiopathic in ammatory stenosis (primary acquired nasolacrimal duct obstruction) or may be secondary to trauma, infection inflammation, neoplasm or mechanical obstruction (secondary acquired lacrimal drainage obstruction). Obstruction of the nasolacrimal duct leading to stagnation of tears in a pathologically closed lacrimal drainage system can result in dacryocystitis. The microbiology of dacryocystitis may differ in acute and chronic infections. Acute dacryocystitis is often caused by Gram negative rods.In chronic dacryocystitis, mixed bacterial isolates are more commonly found with the predominance of *Streptococcus pneumoniae* and *Staphylococcus* spp. This is a prospective study, we included patients with dacryocystitis in the department of ophthalmology and microbiology at tertiary care teaching hospital over a period of 1 year. Patients were diagnosed as acute or chronic dacryocystitis based on their history, signs and symptoms. Chronic dacryocystitis was diagnosed as persistent epiphora and regurgitation of mucoid or mucopurulent material on pressure over the sac area or during irrigation of the lacrimal drainage system. Besides that when the lacrimal sac area showed manifestation of pain, redness and swelling, it would be diagnosed as acute dacryocystitis. Nasolacrimal duct obstruction (NLDO) was diagnosed according to the lacrimal passage irrigation test results. A total of 70 patients with dacryocystitis were enrolled in the study, which included 21 males (30%) and 49 females (70%). The least age group were under 10 years (1.4%) and maximum were 51 60 years (28.5%). In this population, 27 patients had right side involvement and 29 of them had left side dacryocystitis. In addition, there were 14 patients with bilateral dacryocystitis. In terms of type, 21 patients (30%) were encountered with acute dacryocystitis and 49 of them (70%) had chronic form. In this study, the dominant strain in the culture media was considered as an effective microbial agent in the pathogenesis of dacryocystitis and antibiogram was performed on this dominant strain. It was also assumed that if two strains with equal colony count were found in the medium both of them must be introduced as causative agents of dacryocystitis and antibiogram must be performed for each of them separately but this situation did not occur in any of our patients. The most common bacterial isolate in dacryocystitis, prevailing in this geographical area is Staphylococcus (gram positive) followed by Pseudomonas, Pneumococcus and Staph epidermidis. Combination of Vancomycin and 3rd generation cephalosporin can be used as empirical therapy when the culture reports are awaited.

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**Key Words**
Dacryocystitis, lacrimal sac, inflammation, culture, sensitivity

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## INTRODUCTION

Dacryocystitis is an inflammation of the lacrimal sac, which usually occurs because of obstruction of the nasolacrimal duct[1]. The obstruction may be an idiopathic in ammatory stenosis (primary acquired nasolacrimal duct obstruction) or may be secondary to trauma, infection inflammation, neoplasm or mechanical obstruction (secondary acquired lacrimal drainage obstruction)[2]. Obstruction of the nasolacrimal duct leading to stagnation of tears in a pathologically closed lacrimal drainage system can result in dacryocystitis[3].

The microbiology of dacryocystitis may differ in acute and chronic infections. Acute dacryocystitis is often caused by gram-negative rods[4]. In chronic dacryocystitis, mixed bacterial isolates are more commonly found with the predominance of *Streptococcus pneumoniae* and *Staphylococcus* spp.[5]. Fungal infections caused by *Candida albicans* and *Aspergillus* spp. occur infrequently[6]. During the past 20 years, there have been only a few studies on the bacteriology of chronic dacryocystitis. According to them, coagulase-negative *staphylococci* (CoNS) and *Staphylococcus aureus* are the most frequently isolated organisms in lacrimal sac infections[7].

There are distinct patterns of geographical variation in terms of aetiology according to the local climate in infective keratitis and also in microbial conjunctivitis[8,5,9,10-12]. Hence, an understating of the region-wise aetiological agents is important in the management of these diseases. The purpose of this study was to identify the bacterial aetiology and to determine the *in vitro* antibacterial susceptibility and resistance of bacterial pathogens to commonly used antibacterial agents and an attempt was also made to compare the spectrum of bacterial pathogens and their susceptibility in both acute and chronic dacryocystitis.

## MATERIALS AND METHODS

This is a prospective study, we included patients with dacryocystitis in the department of ophthalmology and Microbiology at tertiary care teaching hospital over a period of 1 year. This study was approved by the ethics committee of hospital and performed in accordance with the tenets of the Declaration of Helsinki. Written informed consents were obtained from all participants.

Patients were diagnosed as acute or chronic dacryocystitis based on their history, signs and symptoms. Chronic dacryocystitis was diagnosed as persistent epiphora and regurgitation of mucoid or mucopurulent material on pressure over the sac area or during irrigation of the lacrimal drainage system.

Besides that, when the lacrimal sac area showed manifestation of pain, redness and swelling, it would be diagnosed as acute dacryocystitis. Nasolacrimal duct obstruction (NLDO) was diagnosed according to the lacrimal passage irrigation test results.

All cases of epiphora caused by lacrimal disease other than NLDO, patients with any history of maxillofacial surgery, maxillofacial trauma or maxillofacial tumor and patients who had received any topical or systemic antibiotics in the past one week ahead of their microbiologic culture were excluded[7].

**Sample Collection and Microbiologic Culture:** To collect the samples, a lacrimal probe would be placed to the lacrimal sac through the lower lacrimal ductile. Then the probe core within the probe would be removed. After that, a sterile syringe would be attached to the hollow lacrimal probe to aspirate the lacrimal sac secretion. Once the samples were collected, they were sown immediately in transport medium. Transport medium were delivered to the laboratory within 15 min at room temperature. Samples from transport medium were planted in sheep blood agar, eosin methylene blue, USP alternatives, Sabouraud's dextrose agar and chocolate agar. Reproduction was checked intermittently. Clinically significant growths in samples taken from flora regions were reported. Strains were identified by manual biochemical reaction methods and/or instruments.

**Data Analysis:** The Chi-square test (SPSS software 19.0, IBM Corp., Armonk, NY, USA) was used for comparing ratio differences between groups. Statistical significance was defined as a $p<0.05$.

## RESULTS

A total of 70 patients with dacryocystitis were enrolled in the study, which included 21 males (30%) and 49 females (70%) in Table 1.

The least age group were under 10 years (1.4%) and maximum were 51-60 years (28.5%) in Table 2. In this population, 27 patients had right-side involvement and 29 of them had left-side dacryocystitis. In addition, there were 14 patients with bilateral dacryocystitis in Table 3.

In terms of type, 21 patients (30%) were encountered with acute dacryocystitis and 49 of them (70%) had chronic form.

In this study, the dominant strain in the culture media was considered as an effective microbial agent in the pathogenesis of dacryocystitis and antibiogram was performed on this dominant strain. It was also assumed that if two strains with equal colony count

were found in the medium both of them must be introduced as causative agents of dacryocystitis and antibiogram must be performed for each of them separately but this situation did not occur in any of our patients. *Staphylococcus aureus*, *S. epidermidis* and *S. pneumoniae* were the most prevalent microorganisms in patients with acute dacryocystitis, while *S. epidermidis*, *Pseudomonas* spp., *S. aureus* and *C. albicans* were common species in those with chronic type in Table 5.

Table 1: Distribution of gender

| Gender | Frequency | Percentage |
|---|---|---|
| Male | 21 | 30 |
| Female | 49 | 70 |
| Total | 70 | 100 |

Table 2: Distribution of age group

| Age group (years) | Frequency | Percentage |
|---|---|---|
| <10 | 1 | 1.4 |
| 11-20 | 7 | 10.0 |
| 21-30 | 11 | 15.7 |
| 31-40 | 14 | 20.0 |
| 41-50 | 17 | 24.2 |
| 51-60 | 20 | 28.5 |
| Total | 70 | 100.0 |

Table 3: Distribution of involvement of dacryocystitis

| Involvement of dacryocystitis | Frequency | Percentage |
|---|---|---|
| Right-side | 27 | 38.5 |
| Left-side | 29 | 41.5 |
| Bilateral | 14 | 20.0 |
| Total | 70 | 100.0 |

Table 4: Distribution of type of dacryocystitis

| Type of dacryocystitis | Frequency | Percentage |
|---|---|---|
| Acute | 21 | 30 |
| Chronic | 49 | 70 |
| Total | 70 | 100 |

The most sensitive antibiotics used against prevalent bacteria were ciprofloxacin (80%), ceftriaxone (75.7%), vancomycin (70%), chloramphenicol (61.4%), gentamicin (55.7%) and erythromycin (51.4%) in Table 6.

Also, the most common isolated microorganisms and the most sensitive antibiotics of patients with dacryocystitis have been listed in two age groups (under and above 10 years) for clinical use and empirical therapy. Susceptibility test for Ceftriaxone, Ciprofloxacin, Vancomycin, Gentamicin, Chloramphenicol and Erythromycin in Table 7.

## DISCUSSIONS

Dacryocystitis or inflammation of lacrimal sac has been known to be a common disease of the eye worldwide. This study attempts to evaluate the changing trend in bacteriology and antibiotic sensitivity of dacryocystitis. In present study chronic dacryocystitis was found to be more common than acute (70 vs. 30%) which is similar to the finding observed in different studies[9]. However studies have reported different results, this difference can be due to the different geographical location, different sample size and difference in distribution of etiological factors.

In our study, dacryocystitis was found to be more common in middle age group (30-60 years) which is similar to other studies[9]. This age distribution could be attributed to a tendency of atony of the sac with age which in turn leads to stagnation of tears, resulting

Table 5: Frequency of isolated microorganisms in patients with dacryocystitis according to the condition of the disease, along with the most sensitive antibiotics Type of dacryocystitis

| Strains | Acute | Chronic | Total | Most sensitive antibiotics |
|---|---|---|---|---|
| *Staphylococcus epidermidis* | 7 (24.2%) | 10 (24.4%) | 17 (24.3%) | Vancomycin |
| *Staphylococcus aureus* | 10 (34.5%) | 4 (9.8%) | 14 (20%) | Chloramphenicol |
| *Streptococcus pneumoniae* | 5 (17.3%) | 3 (7.3%) | 8 (11.4%) | Vancomycin |
| *Haemophilus influenzae* | 4 (13.8%) | 3 (7.3%) | 7 (10%) | Ciprofloxacin |
| *Pseudomonas* spp. | 1 (3.4%) | 7 (17.1%) | 8 (11.4%) | Ciprofloxacin |
| *Candida* spp. | 0 (0%) | 5 (12.2%) | 5 (7.2%) | - |
| *Streptococcus viridans* | 0 (0%) | 3 (7.3%) | 3 (4.3%) | Erythromycin Vancomycin |
| *Escherichia coli* | 1 (3.4%) | 2 (4.9%) | 3 (4.3%) | Ciprofloxacin Gentamicin |
| *Aspergillus* | 0 (0%) | 3 (7.3%) | 3 (4.3%) | - |
| *Diphtheroids* | 0 (0%) | 1 (2.4%) | 1 (1.4%) | Vancomycin |
| *Streptococcus pyogenes* | 1 (3.4%) | 0 (0%) | 1 (1.4%) | Sensitive to all |
| Total | 29 (100%) | 41 (100%) | 70 (100%) | |

Table 6: Distribution of susceptibility and antibiotic resistance of isolated microorganisms in dacryocystitis

| Antibiotics | Sensitive | Nonsensitive (intermediate or resistant) | Total |
|---|---|---|---|
| Ciprofloxacin | 56 (80%) | 14 (20%) | 70 (100%) |
| Ceftriaxone | 53 (75.7%) | 17 (24.3%) | 70 (100%) |
| Vancomycin | 49 (70%) | 21 (30%) | 70 (100%) |
| Chloramphenicol | 43 (61.4%) | 27 (38.6%) | 70 (100%) |
| Gentamicin | 39 (55.7%) | 31 (44.3%) | 70 (100%) |
| Erythromycin | 36 (51.4%) | 34 (48.6%) | 70 (100%) |

Table 7: The most common isolated microorganisms and the most sensitive antibiotics of patients with dacryocystitis according to the age groups

| Age groups | Most common isolated microorganisms | Most sensitive antibiotics |
|---|---|---|
| <10 years | *Pseudomonas* spp. and *Haemophilus influenzae* | Ciprofloxacin vancomycin |
| >10 years | *Staphylococcus epidermidis* and *Staphylococcus aureus* | Ciprofloxacin vancomycin |

eventually in chronic irritation, inflammation and the decreased immune protection against microbial invasion.

In present study, females (70%) were found to be more prone to develop dacryocystitis compared to males which is similar finding observed in other studies[10]. Females are more predisposed for dacryocystitis as bony nasolacrimal canal is narrower and flatter against the nasal floor in females than in males which may result in canalicular obstruction. As many patients come from lower social economic group, the disease could be linked to lower level of hygiene as was also seen in other studies[11]. In present study, watering was found to be the main symptom in chronic dacryocystitis while pain, swelling, tenderness were the main presenting symptoms in patients with acute dacryocystitis. Similar symptoms were reported in few other studies though their prevalence varied from study to study.

In present study, left eye was more commonly involved than righteye (1.27 times) similar to finding of studies which may be attributed to a greater angle formed between nasolacrimal duct and the lacrimal fossa on the right side than on the left side which in turn leads to predilection of the left side to get obstructed and infected.

Conjunctivitis was found frequently among patients with dacryocystitis (12%). This may be attributed to building up of toxic debris on the surface of the eye, including the toxins produced by organisms normally inhabiting the ocular surface, which was unable to get cleared because of stasis of tear flow. Similar findings but with different prevalence were reported by few other studies[10]. In present study, organisms are grown more in samples collected from chronic dacryocystitis (72.72% of cases) rather than acute dacryocystitis (47.83% of case). The gram positive are predominant organisms (72.86%) in comparison to gram negative organisms (27.14%).

Among the Gram positive organisms, *Staph aureus* (37.14%) is the predominating organism while *Pseudomonas* (20%) *predominates* among gram negative organisms. Similar observations were made by other studies though their prevalence varied from study to study.

In present study, we found that Vancomycin is highly active against all gram positive organisms, while fluoroquinolones and cephalosporins shown moderate sensitivity. However except Vancomycin all antibiotics (Tobramycin, gentamycin, amikacin, fluoroquinolones and cephalosporins) were found to be very active against gram negative bacteria. These findings are congruent with the results quoted by other studies from India[1,13].

Antibiotic misuse and/or overuse in the recent times is a cause of concern. Indiscriminate use of antibiotics leads to a varied antimicrobial sensitivity from community to community because of emergence of resistant strains which in turn cause changing trends of antibiotic susceptibility of micro-organism.

## CONCLUSION

The most common bacterial isolate in dacryocystitis, prevailing in this geographical area is *Staphylococcus* (gram positive) followed by *Pseudomonas*, *Pneumococcus* and *S. epidermidis*. Antibiotic susceptibility of gram positive bacteria is best for vancomycin and that of gram negative bacteria is for 3rd generation cephalosporin, gentamycin and amikacin. Thus, the combination of two can be used as empirical therapy when the culture reports are awaited.

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