Original Article

Ophthalmology and Allied Sciences
Volume 3 Number 2, July - December 2017
DOI: http://dx.doi.org/10.21088/oas.2454.7816.3217.23

# Clinico-Microbiological Study of Acute and Chronic Dacrocystitis at a Tertiary Care Hospital

**Sreelakshmi Kothapalli[1], Gopala Krishna Ogirala[2], Jithendra Kandati[3], Mohanrao Nandam[4]**

[1]Assistant Professor [2]Professor, Department of Ophthalmology, [3]Professor, Department of Microbiology, [4]Associate Professor, Department of Pathology, Narayana Medical College, Chintharedypalem, Nellore Andhra Pradesh, India-524003.

**Abstract**

*Aims:* The present study was done to determine the clinical pattern and microbiological spectrum of pathogens implicated in causation of acute and chronic dacrocystitis, and their antibiotic susceptibility. *Settings & Design:* A prospective hospital based cross sectional study for a period of two years at a tertiary care hospital by the department of ophthalmology in association with department of Microbiology. *Material & Methods:* 350 patients above >20 years attending the OP of dept of ophthalmology with clinical signs and symptoms of dacrocystitis were enrolled. Demographic data, duration of illness, clinical signs and symptoms were noted. Specimens collected after lacrimal syringing or purulent material collected after applying pressure on the sac was transported to microbiology laboratory for processing and isolation of pathogens. The isolated pathogens were identified by standard biochemical tests and antibiogram interpreted by CLSI guidelines. *Results:* 350 cases were enrolled, with 196 acute and 154 chronic dacrocystitis. Females were predominant (54.3%) in the study and 31-40 years was the predominant age group, with 39.4% having illness <1 week duration. 49.4% belong to low socioeconomic group and majority are house wives (22.9%) and farmers (32.3%). Epiphora was present in all cases of chronic dacrocystitis and pain and swelling was major complaint in acute dacrocystitis. Unilateral involvement in 89.4% of cases, right eye was most commonly involved in acute cases and left eye in chronic cases. Culture positivity was observed in 82% of cases, 297 total bacterial isolates and 14 cases were co infected with fungus Candida albicans. Staphylococcus aureus was the most common pathogen in the total study, Pseudomonas aeruginosa was the most common gram negative pathogen. Gram positive pathogens were predominant in acute cases and gram negative in chronic cases. All the isolates were sensitive to higher generation antibiotics. *Conclusion:* To conclude, our study clearly highlights changing trends of bacterial pathogens in causation of acute and chronic dacrocystitis. Tobramycin, Amikacin, netilmycin, imipenems are therapeutic options of choice in medical management of cases of dacrocystitis. The present study may help the ophthalmologist to choose appropriate rationale antibiotic which provides broader coverage of common ocular pathogens.

**Keywords:** Acute Dacrocystitis; Chronic Dacrocystitis; Epiphora; Staphylococcus Aureus; Pseudomonas Aeruginosa.

## Introduction

Mucosa of the lacrimal sac and nasolacrimal duct are highly resistant to infections under normal conditions. Any damage or anatomical alterations obstructing the nasolacrimal duct leads to increased susceptibility for microbial pathogens. Infection confined to the lacrimal sac is termed as dacrocystitis. [1] Dacrocystitis is one of the essential causes of ocular morbidity in children and adults. These are of two types; congenital and acquired. Primary congenital malformations like idiopathic stenosis of the duct or acquired conditions secondary to trauma,

**Corresponding Author: Jithendra Kandati,**
Professor, Department of Microbiology,
Narayana Medical College, Chintharedypalem, Nellore
Andhra Pradesh, India-524003
**E-mail:** jithendra3@gmail.com

**Received on** 22.05.2017, **Accepted on** 03.06.2017

neoplasia, and infections may lead to stagnation of the tears in the sac. This stagnation acts as a reservoir of infection of the sac, leading to inflammation and further complications like stenosis of the duct, orbital cellulitis [2]. Acute dacrocystitis presents with pain, swelling of the lacrimal sac and 23% of the cases progress towards orbital abscess. Cases of chronic dacrocystitis presents with epiphora, conjunctivitis and mattering of the eye. These differing presentations may be due to wide differences in the etiology, microbial pathogens in cases of acute and chronic dacrocystitis and associated nasal pathologies in different conditions [3].

The bacterial etiology in cases of acute and chronic dacrocystitis is constantly changing and hence a constant vigilance over the pathogens and their antibiotic susceptibility is highly important. These may be gram positive, gram negative organisms, rare acid fast organisms and fungi. Review of literature suggests gram positive as the most common etiological agents and mixed isolates from cases of chronic dacrocystitis. However pathogens implicated in dacrocystitis are constantly changing over the periods and also variable from place to place depending upon the various cultural and climactic conditions [4]. The present study was aimed to determine the clinical presentations and microbial pathogens implicated in causing acute and chronic dacrocystitis. The antibiotic susceptibility was determined to guide the ophthalmologists in choosing appropriate antibiotic in management.

## Materials & Methods

A hospital based prospective cross sectional study was conducted at Narayana Medical College and General hospital by Department of Ophthalmology for a period of two years from January 2015 to December 2016. The study was approved by the institutional ethical committee and all the procedures were followed as per the ethical committee guidelines. Patients of age >20 years attending the Outpatient department of Ophthalmology were evaluated for all the signs and symptoms of dacrocystitis. The patients demographic data including age, sex, social status and clinical history (duration of symptoms etc) clinical signs and symptoms were noted and examined by slit lamp microscope. Clinical examination included examination of lacrimal sac region, discharge from the lacrimal sac, patency of the nasolacrimalduct and nasal examination for any risk factors. The cases were categorized as Acute and Chronic dacrocystitis based on clinical findings and history of the patient [5]. Written consent was obtained from all the participants in the study.

### *Inclusion Criteria*

Any case with history of pain, swelling in the medial canthal area, tearing or discharge in the conjunctiva was considered as Acute dacrocystitis. Persistent epiphora and regurgitation of purulent material from the sac on application of pressure or syringing was considered as chronic dacrocystitis.

### *Exclusion Criteria*

All cases of Pseudoepiphora and Epiphora caused by causes other than nasolacrimalduct obstruction, cases with past history of infection, trauma, surgery and patients on topical application of antibiotic or steroid solutions for past 1 week were excluded.

### *Specimen Collection & Transport*

Conjunctival swabs were collected from cases of acute dacrocystitis and purulent discharge on applying pressure over the lacrimal sac or refluxed material after syringing were collected and processed as per standard procedures at Microbiological laboratory. Gram staining and wet mount examination was done and examined microscopically. Swabs and material were inoculated onto sheep blood agar, Maconkey agar and chocolate agar. Cultured plates were incubated aerobically at $37^0$C for 24-48 hours till 7 days. Colony characteristics were noted and isolates were identified by standard biochemical tests. Antibiotic susceptibility testing was performed on Muller Hinton agar by Kirby-Bauer disc diffusion method and interpreted as per CLSI guidelines [6]. ATCC strains were used as controls in interpretation of antibiotic sensitivity. In case of sensitivity on blood agar zone of hemolysis around each disc was measured.

## Results

A total of 350 patients fulfilling the inclusion criteria were enrolled in the study. 196 cases (56%) were diagnosed as Acute dacrocystitis and 154 (44%) as chronic dacrocystitis. Dacrocystitis was more commonly observed among females (190/350, 54.3%) than males (160/350, 45.7%), mostly because of narrow nasolacrimal duct in females. 30.9% females diagnosed with acute dacrocystitis and 23.4% with

chronic dacrocystitis. In the total study, majority of the cases presented in the age group of 31-40 years (30%) followed by >50 years (27.1%). 49.4% of cases were of low socio economic status group and 32% of middle group. 39.4% of the cases were suffering with duration of <1 week and 32.9% between >1 week and < 2 week. Majority of the cases were farmers (32.3%) and females most of them were house wives (22.9%) [Table 1].

Unilateral involvement was observed in 314 cases (89.72%) whereas bilateral involvement is observed in 36 cases (10.28%). Right eye was more commonly involved (48.57%) than left eye (41.14%). In acute dacrocystitis right eye was more commonly involved, left eye was more in chronic dacrocystitis and bilateral involvement was more in cases of chronic dacrocystitis than acute cases. However these findings were not statistically significant in our study [Table 2].

Pain and swelling were the most common clinical signs in cases of acute dacrocystitis and epiphora (100%) and mucopurulent regurgitation (78%) was observed in cases of chronic dacrocystitis.85 cases in the study had nasal pathology with nasal polyps and deviated nasal septum.

Microbiological analysis of the cases were done and observed. A total of 350 specimens from all the cases were sent to microbiological laboratory for culture. A total of 310 isolates were isolated from the 287 culture positive (82%) cases from the study. Single isolate was grown from 272 cases (pure growth) whereas mixture (Two/Three) was recovered from 15 cases. In our study gram positive pathogens (198) were predominant than gram negative pathogens (99) and 14 cases were isolated with candida albicans, all were of chronic dacrocystitis. Analysis of our study has clearly shown staphylococcus aureus as the most common pathogen (97/198) both in cases of acute and chronic dacrocystitis, followed by staphylococcus epidermidis (77/198) and Streptococcus pneumoniae (24/198). Pseudomonas aeruginosa was the common gram negative isolate from our study (44/99) followed by Klebsiella pneumoniae (25/99). Other gram negative pathogens were Escherichia coli (22/99) and Hemophilus influenza (8/99). Gram negative pathogens were isolated mostly from cases of chronic dacrocystitis than acute dacrocystitis in our study. Candida albicans was the only fungus isolated from cases of both acute and chronic dacrocystitis (14/310) [Table 3].

**Table 1:** Demographic data of cases in the study

| Age (Years) | Acute Dacrocystitis Male (No) (%) | Acute Dacrocystitis Female (No) (%) | Chronic Dacrocystitis Male (No) (%) | Chronic Dacrocystitis Female (No) (%) | Total |
|---|---|---|---|---|---|
| 20-30 | 18 | 24 | 14 | 16 | 72 (20.6%) |
| 31-40 | 31 | 32 | 21 | 21 | 105 (30%) |
| 41-50 | 21 | 22 | 16 | 19 | 78(22.3%) |
| >50 | 18 | 30 | 21 | 26 | 95(27.1%) |
| Total | 88(25.1) | 108 (30.9) | 72 (20.6) | 82 (23.4) | 350 |
| | | Duration | | | |
| <1 week | 62 | 76 | 0 | 0 | 138 (39.4) |
| >1- <2 week | 26 | 32 | 21 | 36 | 115 (32.9) |
| >2 weeks | 0 | 0 | 51 | 46 | 97 (27.7) |
| Total | 88 | 108 | 72 | 82 | 350 |
| | | Social status | | | |
| Upper | 18 | 16 | 15 | 16 | 65 (18.6) |
| Middle | 28 | 32 | 24 | 28 | 112 (32) |
| Lower | 42 | 60 | 33 | 38 | 173 (49.4) |
| | | Occupation | | | |
| Worker | 22 | 22 | 12 | 8 | 64 (18.3) |
| Farmer | 38 | 16 | 39 | 20 | 113 (32.3) |
| salaried | 18 | 8 | 7 | 16 | 49 (14) |
| House wife | | 50 | | 30 | 80 (22.9) |
| Others | 10 | 12 | 14 | 8 | 44 (12.6) |

**Table 2:** Eye involvement in cases of study

| Eye Involvement | Acute dacrocystitis (No) (%) | Chronic dacrocystitis (No) (%) | Total |
|---|---|---|---|
| Right Eye | 116 | 54 | 170 (48.57) |
| Left Eye | 68 | 76 | 144 (41.14) |
| Bilateral | 12 | 24 | 36 (10.29) |
| Total | 196 | 154 | 350 |

**Table 3:** Distribution of pathogens from Acute & Chronic Dacrocystitis

| Isolate | Number (%) | Acute | Chronic |
|---|---|---|---|
| *Gram positive Organisms* | 198 | 113 | 85 |
| Staphylococcus aureus | 97 | 54 | 43 |
| Staphylococcus epidermidis | 77 | 43 | 34 |
| Streptococcus Pneumoniae | 24 | 16 | 8 |
| Gram Negative organisms | 99 | 37 | 62 |
| Esherichia coli | 22 | 6 | 16 |
| Pseudomonas aeruginosa | 44 | 18 | 26 |
| Hemophilus influenza | 8 | 4 | 4 |
| Klebsiella pneumoniae | 25 | 9 | 16 |
| Fungi | 14 | 4 | 10 |
| Candida albicans | 14 | 4 | 10 |
| TOTAL BACTERIAL ISOLATES | 297 | 150 | 147 |
| TOTAL FUNGAL ISOLATES | 14 | 4 | 14 |

**Table 4:** Antibiotic Sensitivity pattern of Isolates in the study

| Antibiotic | S.aureus | S.epidermidis | S.pneumoniae | E.Coli | P.aeruginosa | H.influenzae | K.pneumoniae |
|---|---|---|---|---|---|---|---|
| Chloramphenicol | 65 | 76 | 66 | 77 | 71 | 70 | 68 |
| Ciprofloxacin | 79 | 84 | 76 | 82 | 88 | 86 | 77 |
| Ofloxacin | 88 | 88 | 77 | 88 | 82 | 85 | 87 |
| Gentamycin | 88 | 89 | 88 | 84 | 86 | 83 | 80 |
| amikacin | 92 | 96 | 89 | 91 | 90 | 89 | 88 |
| Tobramycin | 98 | 96 | NT | 98 | 94 | 96 | 92 |
| Azithromycin | 93 | 93 | 90 | NT | NT | NT | NT |
| Cefoxitin | 78 | 87 | NT | 88 | 89 | 89 | 88 |
| Cefotaxime | 89 | 89 | NT | 89 | 83 | 91 | 90 |
| Imipenem | NT | NT | NT | 100 | 100 | 100 | 100 |
| Vancomycin | 100 | 100 | N | NT | NT | NT | NT |
| Linezolid | 100 | 100 | NT | NT | NT | NT | NT |
| Neomycin | NT | NT | NT | 89 | 90 | 82 | 89 |

* NT = Not Tested.

Antibiotic sensitivity was performed for all the isolates as per standard guidelines and interpreted as per manufacturers instructions. Gram positive isolates exhibited maximum sensitivity to vancomycin, linezolid, azithromycin, tobramycin and amikacin. Gram negative isolates exhibited maximum sensitivity to imipenems, amikacin, Cefotaxime and netilmycin [Table 4].

## Discussion

In our present study, female preponderance was observed totally and the most common age group was 31-40 years in cases of acute dacrocystitis and >50 years in cases of chronic dacrocystitis. These findings suggest that acquired nasolacrimal duct obstruction is most commonly seen in females of >50 years due to narrow lumen of nasolacrimal duct. Findings of our study concur with the findings of Bharathi MJ et al who reported the incidence as 58% in females and >50 years as the common age group in her study [7]. Female preponderance similar to our study were reported by Hartikainen et al (79%), Chaudhry et al (65.4%) in their studies which are significantly higher than the incidence in our study [8, 9]. Most of cases in our study were from low socio economic status due to relatively low hygienic habits and illiteracy. Most of the females were house wives and males were farmers stating that some kind of injury or trauma may act as a predisposing factor in development of dacrocystitis. Among nasal pathologies observed nasal polyp was seen in 37 cases, inferior turbinate hypertrophy in 12 cases and DNS in 36 cases. Nasal pathology which leads to nasolacrimal duct obstruction is an important risk factor in development of chronic dacrocystitis as mentioned in many studies globally [10]. Bilateral involvement was seen in 10.29% of total cases and more so in cases of chronic dacrocystitis. In our study, a significant finding observed was right eye involvement is more common in acute dacrocystitis and left eye involvement in chronic dacrocystitis. These findings were almost similar to findings of Brook et al, Ghose et al in their studies [10,11]. Nasolacrimal duct obstruction is more common on left side because of narrow bony canal and the lacrimal fossa formed a greater angle on right side than left side.

Epiphora was present in 100% of cases and purulent discharge was found in 75% of cases of chronic dacrocystitis which is similar to findings of Coden DJ et al [12]. Pain and swelling were the most common signs and symptoms in cases of acute dacrocystitis in our study which is similar to many studies [13].

In our study, culture positivity was 82% with 311 isolates from all the positive specimens. Pure growth was isolated from 272 cases and mixture from 15 cases. Similar percentage of culture positivity was identified from the findings of Patel K et al who reported the culture positivity of 83% in his study [14]. 14 cases of chronic dacrocystitis produced growth of candida albicans from the specimens. Gram positive organisms were more predominant than gram negative in our study, which is similar to many studies. Gram positive organisms were more common in acute dacrocystitis whereas gram negative were more common in cases of chronic dacrocystitis. This finding is contrary to many of the studies who reported gram negative pathogens in cases of acute and chronic dacrocystitis[15]. Staphylococcus aureus was the most common isolate in our study(198/297), this is similar to findings of Sainju et al who reported the same in his study, whereas differs from study of Sun X et al who reported Streptococcus pneumoniae as the most common pathogen in his study [16,17]. Pseudomonas aeruginosa was the common gram negative pathogen and isolated mostly from cases of chronic dacrocystitis in the study. Findings of our study concurs with the findings of shah CP et al but differs from majority of studies who reported Escherichia coli and Klebsiella pneumoniae as common pathogens in their study [18]. Escherichia coli and Klebsiella pneumoniae were also isolated from our study with predominant isolates from chronic dacrocystitis. Candida albicans was the only fungal isolate reported in the study, studies pertaining to fungal pathogens in dacrocystitis are limited and few of them have reported candida as the most common pathogen which is also observed in our study [19].

Antibiotic susceptibility of the pathogens in the study identified gram positive pathogens exhibited maximum sensitivity to vancomycin, Linezolid, Tobramycin, amikacin. Gram negative pathogens were susceptible to imipenems,amikacin, tobramycin and cefotaxime in our study. Findings of our study, parallels findings of Huber-Spitzy et al, and many other studies [20].

To conclude, our study clearly highlights changing trends of bacterial pathogens in causation of acute and chronic dacrocystitis. Staphylococcus aureus was the common gram positive pathogen and pseudomonas aeruginosa was the gram negative pathogen. Tobramycin, Amikacin, netilmycin, imipenems are therapeutic options of choice in medical management of cases of dacrocystitis. The present study may help the ophthalmologist to choose appropriate rationale antibiotic which provides broader coverage of common ocular pathogens.

**Acknowledgements**

Nil.

*Conflict of Interest*

Nil.

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