



**A STUDY ON BACTERIAL ISOLATES FROM DACRYOCYSTITIS PATIENTS IN A
TERTIARY CARE TEACHING HOSPITAL KOLKATA, WEST BENGAL**

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ABSTRACT

Background: Dacryocystitis is one of the most common diseases of eye occurring due to inflammation of the lacrimal sac. It can be of two types: congenital and acquired. Acquired dacryocystitis can be divided into two groups: acute and chronic. Congenital dacryocystitis seen in new born are due to obstruction of the nasolacrimal duct by epithelial debris which produces hindrance in the flow of lacrimal fluid which encourages microbial growth. On the other hand, acute dacryocystitis is more common in women of middle age. Poor hygiene, pond bathing might be the source of infection causing acute infection in nasolacrimal duct resulting in swelling, inflammation, epiphora, and accumulation of pus. **Study design:** Fifty nine clinically diagnosed patients of dacryocystitis of all age groups and of both sexes were used for the study. Specimens were collected with the help of ophthalmologist. All specimens were subjected to gram staining followed by culture. Antibiotic susceptibility testing was done by Kirby-Bauer disc diffusion method as per CLSI guidelines. **Result:** Females are more affected than male and highest number of dacryocystitis cases are found among people in the age group of 46 – 60 years. Out of 59 cases of dacryocystitis 9 bacterial isolates were found of which 4 isolates were gram positive and 5 isolates were gram negative organisms. Antibiotic susceptibility tests shows that gram positive isolates were sensitive to vancomycin, oxacillin, linezolid and clindamycin followed by trimethoprim/sulfamethoxazole and gentamicin. Gram negative organisms were mostly sensitive to cefepime followed by amikacin, ceftazidime and piperacilin. **Conclusion:** The present study revealed that chronic dacryocystitis is the predominant clinical entity found mostly in elderly women. The causative organisms though varied show a predominance of *Pseudomonas* in our study.

KEYWORDS: Dacryocystitis, *Pseudomonas aeruginosa*, MSSA.

INTRODUCTION

Dacryocystitis is one of the most common diseases of the eye. It is an important cause of ocular morbidity both in children and adult.^[1] Dacryocystitis is an inflammation of the lacrimal sac. It may be congenital and acquired. Acquired dacryocystitis are of 2 categories: acute and chronic.^[2] Congenital dacryocystitis develop due to obstruction of the nasolacrimal duct, the block usually being due to the presence of epithelial debris or a membranous occlusion of the lower third of nasolacrimal duct. Blockage of the duct leads to stasis of the lacrimal fluid which harbors many organisms leading to infection. The obstruction may be unilateral or bilateral and is seen after birth, with the mother complaining of epiphora and discharge from the eyes of the child. The treatment, if started early, is easy and effective resulting in over a 90% cure rate. If the child is seen within 6 months after

birth, the mother is instructed to perform sac massage and frequent installation of antibiotic drops. If this treatment is not successful and the epiphora is persistent even after 4 weeks of proper treatment, probing of the nasolacrimal duct is performed under general anesthesia. It may sometimes be necessary to perform several probing in order to open the nasolacrimal duct. However, if probing also fail to open the block, dacryocystorhinostomy is performed when the child reaches the age of three years.^[3] Acute dacryocystitis occurs more often in women and patient complains of tearing and pain followed by acute onset of swelling in the lacrimal sac fossa region with oedema spreading over the lower lid and cheek. *Streptococcus* species are the most commonly isolated organisms in acute dacryocystitis. It is treated by systemic antibiotics, systemic anti-inflammatory drugs and local hot

compresses.^[4] Chronic dacryocystitis may present with a variety of symptoms, including unilateral tearing and intermittent milky discharge that accumulates in the inner canthus.^[5] A non-tender mass in the medial canthus that is reducible by finger pressure is a common complaint. The most common organisms cultured in chronic dacryocystitis include *Staphylococcus aureus*, *Pneumococcus*, β -haemolytic *Streptococcus*, *Pseudomonas*, *Klebsiella* and other *Enterobacteriaceae*. Definitive treatment of chronic dacryocystitis is achieved with dacryocystorhinostomy.^[6] If treatment is started early, progression to chronicity or the period of chronicity can be reduced and microbial resistance can be reduced by administering the antibiotics for which the organisms are susceptible.^[7] During the past years there have been only a few studies conducted on the bacteriology of dacryocystitis and the information available is meager. Hence this study is being undertaken.

MATERIALS AND METHODS

This study is carried out in the department of microbiology, in a tertiary care teaching hospital in Kolkata, eastern India from May 2011 to July 2011. Clinically diagnosed cases of dacryocystitis attending ophthalmology out-patient department were taken for the study. Clinical history of all the patients like age, sex, occupation and socioeconomic status of patient, nature and duration of symptoms, was included. Patients who had received either topical or systemic antibiotics for the past one week from their visit to the hospital were excluded. After clinical diagnosis of dacryocystitis by ophthalmologist, specimens were collected with the help of ophthalmologist. The surrounding area is aseptically cleaned to avoid contamination from the surface microorganisms and samples were collected in two sterile cotton swabs from lacrimal sac. It is collected either by applying pressure over the lacrimal sac and allowing the purulent material to reflux through the lacrimal punctum or by irrigating the lacrimal drainage system with sterile saline called as Lacrimal Syringing and collecting the sample from the refluxing material ensuring that the lid margins or the conjunctiva were not touched. Another sample was collected from the conjunctival sac. In cases of acute lacrimal abscess on chronic dacryocystitis pus was drained and taken for culture.

All specimens were subjected to gram staining followed by culture. The specimens were inoculated into Nutrient agar, Blood agar and MacConkey agar and incubated at 37°C for 18-24 hours. Each different type of colony on the media were identified by biochemical tests such as catalase, oxidase, indole production, methyl red, voges-proskauer, citrate utilization, urease hydrolysis, triple sugar iron (TSI) agar and carbohydrate fermentation (glucose, lactose, manitol, sucrose) tests. The specific tests like inulin fermentation, optochin sensitivity test and bile solubility test was used to identify *Streptococcus pneumoniae*. Slide and tube coagulase test was used to

identify *Staphylococcus aureus*. Antimicrobial susceptibility testing was done by Kirby-Bauer disc diffusion method as per CLSI guidelines. Antibiotic discs obtained commercially (manufacturer- Hi-media laboratories, Mumbai) used were Amikacin (30mcg), Clindamycin (2mcg), Ciprofloxacin (RC, 5mcg), Cefepime (30mcg), Ceftazidime (30mcg), Erythromycin (15mcg), Gentamicin (10mcg), Imipenem (10mcg), Levofloxacin (5mcg), Linezolid (30mcg), Oxiccillin (1mcg), Piperacillin (PC, 100mcg), Trimethoprim-sulfamethoxazole (30mcg), Vancomycin (5mcg).

RESULTS AND ANALYSIS

In the present study 59 clinically diagnosed patients of dacryocystitis of all age groups and of both sexes were studied over a period of 3 months (May 2011 to July 2011). Out of 59 cases under the study, it is observed that the females were affected more i.e., 44(74.58%) as compared to males 15(25.42%). The male to female ratio was 1: 2.93. In congenital dacryocystitis, females are more (10.17%) as compared to males (3.39%). In acquired dacryocystitis, females are more (64.40%) as compared to males (22.04%).

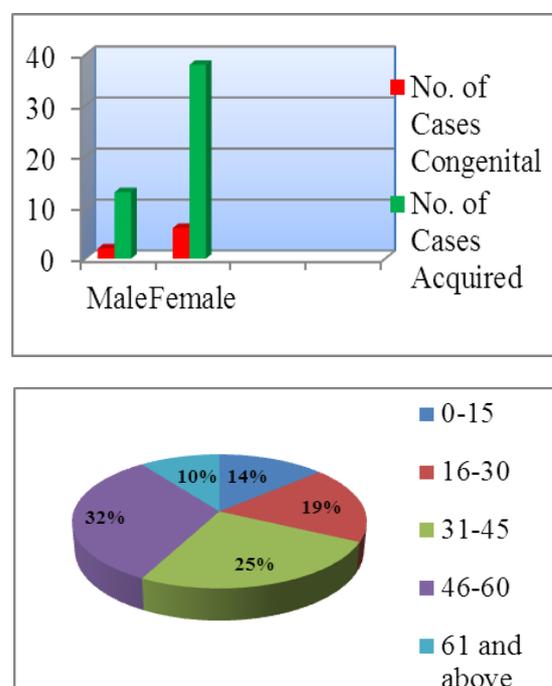


Fig No. 1: Graphic representation of distribution of dacryocystitis cases according to sex and age.

This series of study shows highest number of dacryocystitis cases among people in the age group of 46 – 60 years (32.20%). Next common age groups in sequence are 31 – 45 years (25.42%). The occurrences in 61 and above are 10.18%, 16 – 30 years 18.64% and 0 – 15 years is 13.56%. The youngest among the case studied was 5 years old and the oldest being 76 years. Among the total number of 59 cases the left eye affected was 29(49.15%) and that of right eye 20(33.89%) and bilateral 10(16.97%) cases. These statistics show that on the whole left eye is more affected than the right. As

regards the incidence of the left eye affected in female population was 26/44 cases, as against 13/44 cases having right eye affection. But when male to female ratio was compared, the proportion of females having left eye affected was 8.7 times that of males having left eye affected whereas the right eye affection is 1.9 times and bilateral is of 1 times affection.

Table 1: Distribution of dacryocystitis cases according to sex and eye affected.

Sl. No.	Eye affected	Unilateral cases		Bilateral cases
		Right	Left	
1	Males	7 (11.86%)	3 (5.08%)	5 (8.47%)
2	Females	13 (22.03%)	26 (44.06%)	5 (8.47%)
Total		20 (33.89%)	29 (49.15%)	10 (16.97%)

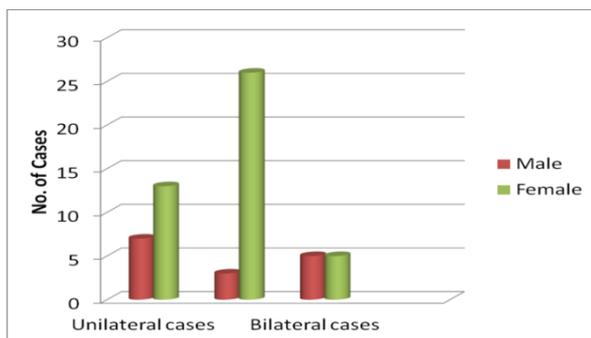


Fig No. 2: Distribution of dacryocystitis cases according to sex and eye affected.

Table2: Distribution of dacryocystitis cases according to spectrum of gram-positive organisms.

Sl. No.	Organisms	No. of Cases		Total No. (%)
		Congenital (8)	Acquired (51)	
1	<i>Staphylococcus aureus</i> (MSSA)	0	3	3 (5.08)
2	<i>Streptococcus pneumoniae</i>	0	1	1 (1.69)
Total		0	4	4 (6.78)

Table 3: Distribution of dacryocystitis cases according to spectrum of gram-negative organisms.

Sl. No.	Organisms	No. of Cases		Total No. (%)
		Congenital (8)	Acquired (51)	
1	<i>Pseudomonas aeruginosa</i>	1	3	4 (6.77)
2	<i>Acinetobacter baumannii</i>	0	1	1 (1.69)
Total		1	4	5 (8.47)

All the types of dacryocystitis i.e., 51 cases of acquired dacryocystitis and 8 cases of congenital dacryocystitis showed a preponderance of gram-negative organisms. Methicilin Sensitive *Staphylococcus aureus* (MSSA) was the predominant gram-positive organism in chronic dacryocystitis. *Pseudomonas aeruginosa* was the most common gram-negative isolate in both acute and

Chronic dacryocystitis was most common clinical entity encountered in the present study comprising of 33(55.93%) cases while 18(30.51%) patients had acute dacryocystitis. Congenital dacryocystitis constitutes the third most common clinical presentation 8(13.56%) in this study.

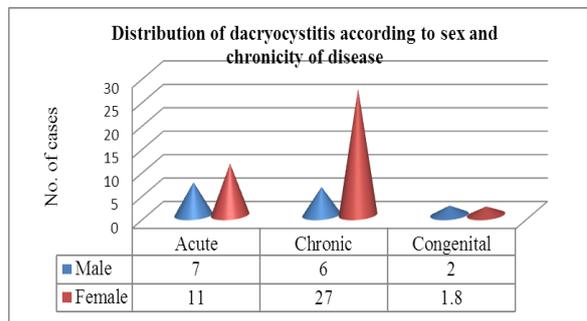


Fig No. 3: Distribution of dacryocystitis cases according to sex and chronicity of disease.

Out of 59 samples collected with a clinical diagnosis of dacryocystitis, there were 9 bacterial isolates altogether, 4 of which were of gram-positive bacteria, (45%) and 5 isolates were gram-negative bacteria (55%). The most frequent gram- positive isolate were Methicilin Sensitive *Staphylococcus aureus* (MSSA), which represented 3(5.08%) of total samples, followed by *Streptococcus pneumoniae* 1(1.69%). The most frequent gram-negative isolate were *Pseudomonas aeruginosa*, which represented 4(6.77%) of the total samples followed by *Acinetobacter baumannii* 1(1.69%).

congenital dacryocystitis. Out of 59 cases 9 patients have an active habit of pond bathing in which 3 have acute dacryocystitis and 6 have chronic dacryocystitis. In these cases, 2 acute cases are culture positive for *Pseudomonas aeruginosa* and 3 chronic cases are culture positive for *Staphylococcus aureus* (2) and *Acinetobacter baumannii*(1).

Table 4: Antibiotic susceptibility pattern of *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Isolates	Ciprofloxacin	Clindamycin	Erythromycin	Gentamicin	levofloxacin	Linezolid	Oxacillin	Trimethoprim/ Sulfamethoxazole	Vancomycin
<i>S.aureus</i> (3)	0 (0%)	3 (100%)	3 (100%)	1 (33.3%)	0 (0%)	3 (100%)	3 (100%)	2 (66.6%)	3 (100%)
	Amikacin	Ciprofloxacin	Cefepime	Ceftazidime	Gentamicin	levofloxacin	Piperacilin	Imipenem	Trimethoprim/ Sulfamethoxazole
<i>P. Aeruginosa</i> (4)	2 (50%)	1 (25%)	3 (75%)	2 (50%)	1 (25%)	1 (25%)	2 (50%)	1 (25%)	0 (0%)

The antibiotic susceptibility test shows that gram-positive isolates were most sensitive to vancomycin, oxacillin, linezolid, erythromycin and clindamycin (100%), followed by trimethoprim/sulfamethoxazole (66.6%) and gentamicin (33.3%). Ciprofloxacin and levofloxacin were resistant to all gram positive isolates. The gram-negative organisms were most sensitive to cefepime (75%), followed by amikacin, ceftazidime and piperacilin (50%). The least sensitive antibiotics were ciprofloxacin, gentamicin, levofloxacin and imipenem (25%). Trimethoprim/sulfamethoxazole was resistant to all gram negative isolates.

DISCUSSION

Dacryocystitis is one of the most common diseases of the eye. It is an important cause of ocular morbidity both in children and adult.^[1] Hence it requires special attention regarding the initiation of appropriate treatment at the earliest. In the present study, 59 clinically diagnosed cases of dacryocystitis attending ophthalmology out-door department in a tertiary care teaching hospital, Kolkata were studied. The pattern of relative incidence of various factors varies in different studies.

The present study shows that the infection is common in females 44(74.58%) as compared to males 15(25.42%). The male to female ratio was 1:2.93. In congenital dacryocystitis, females were 6 and males were 3 and ratio of 1:0.5 which correlates with the study of Kuchar A *et al*^[8] i.e., 1:0.74. Males were predominant in congenital dacryocystitis in some studies like Ghose *et al*^[1] female and male ratio 1:2 and Usha *et al*^[7] female and male ratio is 1:1.2. In acquired dacryocystitis, female to male ratio in the present study was 2.92:1 which correlates with the studies of Badhu *et al*^[9] 2.1:1, Machin *et al*^[10] 2.7:1 and Morgan *et al*^[5] 2:1. Brook *et al*^[4] observed males more than females (female: male = 0.63:1). The predilection in females may be due to the smaller nasolacrimal canal diameter in females than men and hormonal factors. Most of the females come from middle and lower income group working with wood and dried cow

dung for cooking which gives away lot of smoke particles which settled down in conjunctival sac and enter nasolacrimal duct through tears and block nasolacrimal duct. Kajal artificially prepared in house may have been contaminated with organisms, when applied on the margin of the lids may infect the lacrimal sac. Females blow the nose infrequently when compared to the males, which causes stagnation of nasolacrimal duct secretions and leading to infection. Apart from the special case in dacryocystitis in the new born which depends on developmental anomalies, the disease affects preferentially adults over 40 years of age, being relatively rare in children and adolescents, the highest incidence being in fifth decade but it also occurs in advanced age. In this study the highest occurrence was in the age group 46-60 years (32.20%). This correlates well within the limits of study conducted by Chaudhry *et al*^[11] and by Hartikainen *et al*^[12]. Excessive secretion of tears leading to stagnation with a tendency to atony of the sac, thus resulting eventually in chronic irritation, inflammation and weakening of resistance to organism attack. Females of low socio-economic class working in the houses are more exposed to smoke which leads to excessive secretion of tears and accumulation of small particles in the conjunctival sac.

In our study involvement of eye is mainly unilateral (83.05%) either right or left and some bilateral (16.95%) cases. This correlates well with the study of Ghose *et al.*,^[1] (90%:10%), Sun *et al.*,^[13] (90.1%: 9.9%) and Machin *et al.*,^[10] (91.3%: 8.7%). Noda *et al.*,^[14] noticed 52.3% of unilateral dacryocystitis and 47.7% of bilateral dacryocystitis. Brook *et al.*,^[4] study showed only unilateral cases and no bilateral cases. There is a relatively high incidence of disease on left side (40%) as compared to right side (32%). This correlates well with Brook *et al.*,^[4] studies in which left lacrimal sac was involved in 36 patients (58%). In Usha *et al.*,^[7] study, right lacrimal sac was involved in 76(40%) patients and left lacrimal sac was infected in 60(33%). In general the disease has predilection to left side especially in females because of narrow bony canal. In many instances, the nasolacrimal duct and lacrimal fossa formed a greater angle on the right side than the left side. Chronic dacryocystitis was the most frequently encountered clinical type 33(55.93%) and acute dacryocystitis was 18(30.81%) in the present study. Congenital dacryocystitis encountered was (13.56%). In Campolattaro *et al.*^[15] study, chronic dacryocystitis was 36(67%) and acute dacryocystitis was 18(33%). This is probably because acute dacryocystitis invariably leads to chronic dacryocystitis.

In the present study the main presenting feature is epiphora with mucous or mucopurulent discharge (57.63%) followed by epiphora with mucous or mucopurulent discharge and swelling, redness (28.81%). Least frequent complaint in this study is epiphora only (13.56%). Whereas the study conducted by Hartikainen *et al.*^[12] which showed epiphora in 52.7% and purulent discharge in 47.4%. In a study by Machin *et al.*^[10] showed mucopurulent discharge in 26.4%, mucocele in 4.8% and epiphora in 52%. Study by Shiva reddy *et al.*^[16] showed epiphora in 80%, purulent discharge in 75% and mucocele or swelling in 25%. Kuchar *et al.*^[8] study showed more cases with purulent discharge (68.1%) and with epiphora (31.9%). Epiphora is the commonest nature of discharge probably because it is the mode of presentation of many causes of dacryocystitis.

In this study out of 59 cases of dacryocystitis, 9 bacterial isolates were obtained. Single organisms were isolated in 15 (23.42%) of the cases and mixed organisms in 1 (1.69%). Whereas studies of Kundu *et al.*^[2](82.5% and 10.5%), Sainju *et al.*^[17] (81.82% and 18.18%) and Usha *et al.* (88.3% and 11.7%). Hartikainen *et al.*^[12] had a higher percentage of mixed organisms (48%) than other studies. Chaudry *et al.*^[11] study showed multiple organisms (66.1%) more than single organisms (33.9%) in culture which is probably related to the duration of the disease.

Bacterial isolates have been changing from time to time and from place to place. Out of 9 isolates cultured from 59 samples, gram-positive organisms were 4(45%) and

gram-negative organisms were 5(55%). The study of Bareja U *et al.*^[18] shows out of 90 isolates *Streptococcus pneumoniae* were 33(28.9%) and *Pseudomonas aeruginosa* were 5(4.4%). Studies by Kuchar *et al.*^[8] and Usha *et al.*^[7] showed *Streptococcus pneumoniae* (36.4% and 32.7%) and *Haemophilus influenzae* (19.2% and 31.3%) respectively. In acquired dacryocystitis, most common gram-negative isolates are *Pseudomonas aeruginosa*. This correlates with studies of Briscoe *et al.*^[19] (13% and 22%), Sainju *et al.*^[16] (34.1% and 7.6%) and Brook *et al.*^[4] (15.95% and 5.3%). In other studies like Shamna *et al.*^[20] *Streptococcus pneumoniae* was common (42%) followed by *Haemophilus influenzae* and *Acinetobacter* (8%), whereas Hartikainen *et al.*^[12] stated that *Staphylococcus epidermidis* (26.9%) was the commonest followed by *Haemophilus influenzae* (3.8%).

The antimicrobial sensitivity pattern varies from community to community. This is because of emergence of resistant strains as a result of indiscriminate use of antibiotics. The gram-positive isolates were most sensitive to vancomycin, oxacillin, linezolid and clindamycin (100%), followed by trimethoprim/sulfamethoxazole (66.6%) and gentamicin (33.3%). Ciprofloxacin and levofloxacin were resistant to all gram positive isolates. The gram-negative organisms were most sensitive to cefepime (75%), followed by amikacin, ceftazidime and piperacilin (50%). The least sensitive antibiotics were ciprofloxacin, gentamicin, levofloxacin and imipenem (25%). Trimethoprim/sulfamethoxazole was resistant to all gram negative isolates. In a study by Kuchar *et al.*,^[8] of congenital dacryocystitis, ofloxacin and tetracycline turned out to be the most effective single agents (84.9%) to all gram-positive and gram-negative isolates. These were followed by chloramphenicol (83.6%), bacitracin and ciprofloxacin (61.6%) and norfloxacin (60.3%). Ghose *et al.*,^[1] showed that the most effective single antibiotic against all organisms was tobramycin (100%), followed by gentamicin (97%) and vancomycin (97%). Briscoe *et al.*,^[19] revealed that gram-negative isolates were sensitive to ceftazidime (95%), ciprofloxacin (86%) and cefuroxime (50%), with a sensitivity of less than 30% to cefalexin and ampicillin. *Pseudomonas aeruginosa* were sensitive to ceftazidime (100%), ciprofloxacin (86%), ampicillin (20%) and cephalixin (14%). Sun *et al.*,^[13] studies sensitivity tests revealed that levo-ofloxacin and amikacin were the most effective antibiotics. In Usha *et al.*,^[7] studied that gram-positive organisms exhibited a high rate of sensitivity to chloramphenicol, vancomycin and ofloxacin.

CONCLUSION

Chronic dacryocystitis is the most common mode of dacryocystitis than acute dacryocystitis and majority of patients shown serous discharge. Number of female patients of middle age and above had higher cases of dacryocystitis than men. Left eye was more infected than right eye. *Pseudomonas aeruginosa* is commonest

organism isolated in congenital as well as in acute dacryocystitis. In acute form infection may come from pond bathing and poor hygiene whereas *Staphylococcus aureus* is more common in chronic form. Most effective antibiotics for gram-positive bacteria were vancomycin, oxacillin, linezolid and clindamycin, followed by gentamicin and trimethoprim/sulfamethoxazole. On the other hand cefepime followed by amikacin, ceftazidime and piperacilin were promising against gram-negative bacteria. Significant association was found between the sex and nature of discharge, sex and chronicity of disease in dacryocystitis but not in the age and sex. Most of the chronic dacryocystitis cases are asymptomatic and in few cases where organisms can be isolated most show multiple drug resistance. Further research is needed to reveal the unknown facts of chronic dacryocystitis.

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