

MICROBIAL SURVEILLANCE OF ACUTE AND CHRONIC DACRYOCYSTITIS IN A TERTIARY CARE HOSPITAL

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ABSTRACT: BACKGROUND: Dacryocystitis acute or chronic poses a constant threat to cornea and orbital soft tissue if neglected revealing the importance of the condition. Infection with microbes in these patients can cause severe morbidity. Hence it is important to know the pathogen wise in management of the condition. Our study was determined to know the bacterial and fungal etiology of both acute and chronic dacryocystitis and their invitro antibacterial susceptibility and resistance to commonly used antibacterial agents. **METHODS:** This hospital based study was conducted during March 2011 to March 2013. Patients with suffering with acute and chronic dacrocystitis were included in the study. Specimens were collected from these patients, processing, isolation, identification and antibiogram of the isolates were done as per standard procedures. **RESULTS:** A total of 298 patients were included in the study based upon the inclusion criteria. Out of 298 patients 126(42.29%) presented with acute dacryocystitis and 172(57.71%) were with chronic dacryocystitis. Single eye involvement was noticed in 184 (61.75%) cases and 114 (38.25%) presented with involvement of both eyes. Out of 298 cases pure growth was seen in 255(85.57%) and 43(14.43%) yielded no growth on culture. On observation more percentage of culture positivity was noticed in chronic cases (164 of 172, 95.34%) and less in acute cases (91 of 126, 72.23%) and the difference was also statistically significant. Single isolate was found in 218 cases, two/three isolates were recovered from 37 cases. All cases of polymicrobial growth were observed in chronic dacryocystitis. Staphylococcus aureus as the most common gram positive pathogen (43/77, 55.84% in acute, 34/77, 44.16% in chronic dacryocystitis) followed by Staphylococcus epidermidis (38/64, 59.37% in acute, 26/64, 40.63% in chronic dacryocystitis), Streptococcus pneumoniae(10/12, 83.34% in acute, 2/12, 16.67% in chronic dacryocystitis) and least Micrococcus sp (6/6,100% in acute dacryocystitis). Pseudomonas aeruginosa was the common pathogen (14/67, 20.9% in acute, 53/67, 79.1% in chronic dacryocystitis) followed by Escherichia coli (11/53, 20.75% in acute, 42/53, 79.24% in chronic dacryocystitis), Klebsiella pneumonia (4/22,18.18% in acute, 18/22, 81.82% in chronic dacryocystitis) and last Haemophilus influenza (2/11, 18.18% in acute, 9/11, 81.82% in chronic dacryocystitis). Candida albicans was isolated from two cases of chronic Dacryocystitis. Analysis of the antibiotic sensitivity clearly indicated amikacin as choice of drug against all common pathogens except Streptococcus pneumoniae. In case of Streptococcus pneumoniae Cloxacillin still remains as a good choice. **CONCLUSION:** We highlighted the spectrum of pathogens in acute and chronic dacrocystitis. Our study indicates that Staphylococcus spp as the most common pathogen followed by Pseudomonas aeruginosa in dacryocystitis. Tobramycin, Amikacin, Bacitracin as suitable therapeutic options in both acute and chronic dacryocystitis. Bacterial species isolated from chronic dacryocystitis shows more resistance than one from acute cases. The present study may help the

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clinician to choose appropriate rationale antibiotic which provide broader coverage of common ocular pathogens.

KEYWORDS: Dacrocystitis, Antibiogram, Drug sensitivity, Emergence of pathogens.

INTRODUCTION: Inflammation of lacrimal sac which occurs due to obstruction of nasolacrimal duct is called as Dacryocystitis.⁽¹⁾ The causes for obstruction of the duct are many which may be further classified as Primary congenital or acquired nasolacrimal duct obstruction (idiopathic inflammatory stenosis) or secondary to trauma, neoplasia, infection, inflammation or mechanical obstruction (secondary acquired nasolacrimal drainage obstruction). Closed nasolacrimal drainage system leads to stagnation of tears in the sac and acts as reservoir of infection further complicated by inflammation termed as Dacryocystitis.⁽¹⁾ Based upon the duration of condition, clinical signs and symptoms the condition is further classified as Acute Dacryocystitis and Chronic Dacryocystitis. Dacryocystitis acute or chronic poses a constant threat to cornea and orbital soft tissue if neglected revealing the importance of the condition.

The bacterial etiology of dacryocystitis is variable either in congenital, acute or chronic cases. A review of literature of different studies from Sattler (1885) to Reddy and Reddy (1955) and further many studies reveals that lacrimal sac harbors many bacteria.⁽²⁾ These may be Gram positive, gram negative organisms, rare acid fast organisms and a few fungi. In cases of Acute Dacryocystitis Gram negative pathogens are common^(1,3) Chronic Dacryocystitis is associated with mixed bacterial isolates with predominant *Streptococcus pneumoniae* and *Staphylococci*.⁽⁴⁾ Documented studies regarding fungal pathogens in dacryocystitis are very few and mentions *Candida* and *Aspergillus* infections are rare. Many of the studies during the last years mentions Coagulase negative staphylococci and *Staphylococcus aureus* as the most common causative agents in lacrimal sac infections.^(5,6) However pathogens implicated in dacryocystitis or other eye infections are variable from place to place depending upon the local climate conditions. Hence it is important to know the pathogens region wise in management of the condition. Our study was determined to know the bacterial and fungal etiology of both acute and chronic dacryocystitis and their invitro antibacterial susceptibility and resistance to commonly used antibacterial agents.

MATERIALS AND METHODS: A prospective study was conducted in Narayana general Hospital in Dept of Ophthalmology along with Central microbiology laboratory for a period of one year from March 2011 to March 2013. The study was approved by the Ethical committee. All the patients who attended the Outpatient department of Ophthalmology were examined by slit-lamp biomicroscope and cases identified as dacryocystitis were categorized as acute or chronic dacryocystitis based upon signs and symptoms.⁽⁷⁾

INCLUSION CRITERIA: Acute dacryocystitis: Cases with pain, redness and swelling in the sac area, tearing or discharge in conjunctiva and tender swelling in the sac area included as acute dacryocystitis.⁽⁷⁾

CHRONIC DACRYOCYSTITIS: Persistent epiphora and regurgitation of mucoid or mucopurulent material on pressure over the sac area or regurgitation of mucopurulent discharge on irrigation of sac included as chronic dacryocystitis.⁽⁷⁾

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Specimens were collected as per the standard instructions. In cases of acute dacryocystitis conjunctival swab moistened with broth wiped across the lower conjunctival cul-de-sac, pus discharge following rupture or following irrigation of the sac was also collected. In cases of chronic dacryocystitis muroid or mucopurulent discharge obtained after syringing of the sac was collected. Surgically excised lacrimal sacs were also collected and sent for microbiological analysis. However cases with no regurgitation of pus, muroid discharge after irrigation done preoperatively or by applying pressure over sac area like encysted pyoceles or mucoceles or insufficient material were not taken into consideration.

EXCLUSION CRITERIA: Children less than 5 years of age, all cases of pseudoepiphora or epiphora due to causes other than nasolacrimal duct obstruction were excluded.

All the specimens received were inoculated directly on 5% sheep blood agar, MacConkey agar, Chocolate agar and Sabourad's dextrose agar. The material was smeared on a clean glass slide and performed Gram stain, Acid-fast stain and Modified Kinyoun's staining and also observed for fungal elements by performing 10% KOH wet mount. All the media were incubated at appropriate standard temperatures and observed daily for growth until 48hrs – 7 days. Absence of growth within 7 days of incubation was discarded. The growth was considered significant if demonstrated in more than one medium or the growth was consistent with microscopy findings or same organism recovered from different specimens.^(7,8,9) The identification of the bacteria was done by microscopy, staining and biochemical tests using standard laboratory criteria.⁽⁹⁾

Standardized bacterial inoculums conforming to 0.5 McFarland's standards was prepared and antibiotic sensitivity was performed on Muller-Hinton agar. Defibrinated sheep blood (5 – 10% v/v) was added for testing streptococci and other fastidious bacteria. Antibiotic discs obtained from Hi media Ltd, Mumbai were placed on Muller-Hinton agar and incubated at 37°C for 24-48hrs and the results were interpreted as resistant or sensitive based upon the charts of the manufacturer. *S. aureus* ATCC 25923, *S. pneumoniae* ATCC 49619, *Haemophilus influenzae* ATCC 49241, *Pseudomonas aeruginosa* ATCC 27853, *Escherichia coli* ATCC 25922 were used as quality control strains. In case of sensitivity on blood agar the zone of hemolysis around each antibiotic disc was measured.

RESULTS: A total of 298 patients were included in the study based upon the inclusion criteria. Out of 298 patients 126 (42.29%) presented with acute dacryocystitis and 172 (57.71%) were with chronic dacryocystitis. Single eye involvement was noticed in 184 (61.75%) cases and 114 (38.25%) presented with involvement of both eyes. Out of 298 cases pure growth was seen in 255 (85.57%) and 43 (14.43%) yielded no growth on culture. On observation more percentage of culture positivity was noticed in chronic cases (164 of 172, 95.34%) and less in acute cases (91 of 126, 72.23%) and the difference was also statistically significant. [Table-1]

Of the total 298 cases females were more common with 194 (65.10%) and males were 104 (34.90%). In our study we noticed that acute dacryocystitis was more common in males (44.23%) than females (41.24%) whereas chronic dacryocystitis was more common in females (58.76%) than males (55.77%). Out of 298 patients 32 (10.74%) were in between the age group of 5-30 years, 188 (63.08%) were between 31-60 years and 78 (26.18%) in between 61-80 years. In depth analysis revealed that out of total 126 cases of acute dacryocystitis 20 (15.87%) were between 5-30 years,

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82(65.07%) between 31-60years and 24 (19.04%) between 61-80years. In cases of chronic dacryocystitis 12 (7%) were between 5-10 years, 106 (61.60%) in between 31-60 years and 54 (31.40%) in between 61-80 years. Data of the study clearly shows 31-60 years as the most common age group in both acute and chronic dacryocystitis. [Table-1]

Microbiological analysis of the study was done. A total of 314 isolates were grown from 255 culture positive cases. Single isolate was found in 218 cases, two/three isolates were recovered from 37 cases. All cases of polymicrobial growth were observed in chronic dacryocystitis. Of the total study gram positive pathogens (159) were more common than gram negative pathogens (153) and 2 fungi was isolated from chronic dacryocystitis. Analysis of the findings of our study clearly indicates *Staphylococcus aureus* as the most common gram positive pathogen (43/77, 55.84% in acute, 34/77, 44.16% in chronic dacryocystitis) followed by *Staphylococcus epidermidis* (38/64, 59.37% in acute, 26/64, 40.63% in chronic dacryocystitis), *Streptococcus pneumoniae*(10/12, 83.34% in acute, 2/12, 16.67% in chronic dacryocystitis) and least *Micrococcus sp* (6/6,100% in acute dacryocystitis). In gram negative pathogens *Pseudomonas aeruginosa* was the common pathogen(14/67, 20.9% in acute, 53/67, 79.1% in chronic dacryocystitis) followed by *Escherichia coli*(11/53,20.75% in acute, 42/53, 79.24% in chronic dacryocystitis), *Klebsiella pneumoniae* (4/22, 18.18% in acute, 18/22, 81.82% in chronic dacryocystitis) and last *Haemophilus influenza* (2/11, 18.18% in acute, 9/11, 81.82% in chronic dacryocystitis). *Candida albicans* was isolated from two cases of chronic dacryocystitis. [Table-2]

The antibiotic sensitivity of the isolates was performed as per standard guidelines and analyzed as per manufacturer's instructions. Gram positive isolates exhibited maximum sensitivity to Cloxacillin, Gentamicin, Amikacin and bacitracin. All the gram negative isolates exhibited maximum sensitivity to tobramycin (100%). *Escherichia coli* showed maximum sensitivity to Amikacin (95%), gentamicin (92%), bacitracin (94%) and maximum resistance was exhibited to Chloramphenicol (56%) and tetracycline (40%). *Klebsiella pneumoniae* exhibited maximum sensitivity to amikacin (92%) and gentamicin (87%) followed by bacitracin (86%), Ofloxacin (85%) and maximum resistance to chloramphenicol (44%) and tetracycline (38%). *Haemophilus influenzae* showed maximum sensitivity to amikacin (92%), bacitracin (89%), Neomycin (86%) and maximum resistance to tetracycline (45%) and chloramphenicol (34%). Analysis of the antibiotic sensitivity clearly indicated amikacin as choice of drug against all common pathogens except *Streptococcus pneumoniae*. In case of *Streptococcus pneumoniae* Cloxacillin still remains as a good choice.

DISCUSSION: Dacryocystitis is one of the many common infections of the eye. Multiple factors play a role in acquiring infection of the lacrimal system. The nasolacrimal system is lined by mucus lining contiguous with conjunctiva and nasal mucous lining that contain plenty of normal bacterial flora. The function of the lacrimal system is to secrete the tears and excretion of them by the nasolacrimal duct normally. Any of the conditions which may be nasal or ocular which cause obstruction of the nasolacrimal duct Eg: Deviated nasal septum, congenital blockage, trauma may result in stagnation of the tears, desquamated cells and mucoid secretions superior to site of obstruction. Stases of the secretions provide a good nidus and environment for the bacterial infections.^(1,10) 3-6% of new born suffer with congenital blockage of nasolacrimal duct, but this may occur in any age group. In congenital blockage mostly the nasal end of the duct is blocked by epithelial debris or imperforate mucosal membrane resulting from incomplete canalization of embryonic duct.⁽¹²⁾ Acquired

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nasolacrimal duct obstruction primary or secondary usually occurs due to obliteration of lumen in middle aged with a female preponderance of 3:1 ratio.⁽⁵⁾ Similarly in our study also the most common age group was between 31-60 years than 6-30 and >60 years. The overall female to male ratio in our study was 1.9:1 and females were significantly more in chronic dacryocystitis (58.76%) than acute dacryocystitis (41.24%).

The spectrum of bacterial pathogens as well as their proportion, antibiotic susceptibility is variable from region to region which are dependent upon many environmental and other factors. In our study the overall culture positivity was 85.57% with more in chronic dacryocystitis (95.34%) than acute dacryocystitis (72.23%). The gram positive pathogens accounted for (50.64%), gram negative pathogens (48.72%) and fungi (0.64%). Genus *Staphylococcus* was the commonest isolate (88.68%) in the study with *S.aureus* (54.61%) and *S.epidermidis* (45.39%). The findings of the study concurs with the findings and incidences of *Staphylococcus* of Thicker and Buffam⁽⁶⁾ (73%), Huber-Spitz et al⁽¹³⁾ (51%), and Coden et al⁽⁶⁾ (49%), Sainju et al⁽¹⁴⁾ and Bharathi et al.⁽¹⁵⁾ *Streptococcus pneumoniae* accounted for 7.54% of total gram positive isolates with 83.34% isolates in acute dacryocystitis and 16.66% in cases of chronic dacryocystitis which is higher than Huber- Spitz et al⁽¹³⁾ (2%), Coden et al (2.3%),⁽⁶⁾ Hartikainen et al⁽⁴⁾ (5%) but less than Bharathi et al.⁽¹⁵⁾ In our study *Micrococci* sp was isolated from acute dacryocystitis (3.77%) but not in cases of chronic dacryocystitis, however studies reporting *Micrococci* as pathogen in acute dacryocystitis are limited, but repeated isolation confirms their pathogenicity. Gram Negative pathogens in our study accounted to 48.73% with 20.26% isolates from acute dacryocystitis and 79.74% from chronic dacryocystitis indicating that gram negative pathogens are common in chronic dacryocystitis. *Pseudomonas aeruginosa* was the common pathogen with (67/ 153) 43.8% of all total gram negative pathogens followed by *Escherichia coli* (53/153) 34.64%, *Klebsiella pneumoniae* (22/153) 14.38% and last *Haemophilus influenza* (11/153) 7.19%. Findings of our study parallels with findings of Huber-Spitz et al,⁽¹³⁾ Coden et al,⁽⁶⁾ Bharathi et al⁽¹⁵⁾ and Briscoe et al.⁽¹⁶⁾ However Hartikainen et al⁽⁴⁾ reported *H. influenzae* as the predominant pathogen in his study.

In our study the pathogens and their predominance recovered from Acute dacryocystitis were totally different from those recovered from chronic dacryocystitis. *Staphylococcus aureus* was the predominant pathogen in acute cases and *Pseudomonas aeruginosa* from chronic cases. Findings of our study correlate with the findings of studies of Brook and Frazier⁽¹⁷⁾ in USA, and Sun et al⁽¹⁸⁾ from China. Analysis of invitro susceptibility of the pathogens indicates that in β -lactam group Cloxacillin can be administered against *Staphylococcus*. Among aminoglycosides, Amikacin has better activity than gentamicin against both gram positive and gram negative pathogens except *S. pneumoniae* which shows slightly resistance against both. In fluoroquinolone group Ofloxacin has better efficacy than ciprofloxacin against both gram positive and negative pathogens. Frequent usage of Ciprofloxacin in the community has reduced the sensitivity against the pathogens. Data indicated tobramycin as the best therapeutic drug in cases of dacryocystitis caused by Gram negative pathogen and bacitracin in both type of pathogens. Our data revealed that more drug resistant pathogens were recovered from chronic cases than acute cases due to inappropriate usage or irrational usage of topical applications prophylactically or long duration administration pre or post operatively. Emergence of resistance in these pathogens is a concern which needs to be curtailed.

The present study highlights the aerobic bacterial pathogens in cases of acute and chronic dacryocystitis and their antibiotic resistance patterns. Anaerobic pathogens were not included in the

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study due to technical difficulties. The limitation in our study also includes that Kirby-Bauer disc diffusion method employed with the disc concentrations are not suitable because ocular antibacterial level achievable by topical administration may be considerably higher than the level attained at the ocular tissue by systemic administration.

CONCLUSION: Our study indicates that *Staphylococcus* spp as the most common pathogen followed by *Pseudomonas aeruginosa* in dacryocystitis. Tobramycin, Amikacin, Bacitracin as suitable therapeutic options in both acute and chronic dacryocystitis. Bacterial species isolated from chronic dacryocystitis shows more resistance than one from acute cases. The present study may help the clinician to choose appropriate rationale antibiotic which provide broader coverage of common ocular pathogens.

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Acute dacryocystitis		Chronic dacryocystitis	TOTAL
Cases	126 (42.29%)	172(57.71%)	298
male	46(44.23%)	58(55.77%)	104(34.9%)
female	80(41.24%)	114(58.76%)	194(65.1%)
Age wise distribution of cases			
5-30 years	20 (62.5%)	12(37.5%)	32(10.74%)
31-60yrs	82 (43.62%)	106(56.38%)	188(63.08%)
61-80yrs	24(31.77%)	54(69.23%)	78(26.18%)
Percentage of culture positivity			
Positive growth	91(72.23%)	164(95.34%)	255(85.57%)
Sterile	35(27.77%)	8(4.64%)	43(14.43%)

TABLE 1: Demographic variables of the study

Gram positive organisms	Number (%)	Acute	Chronic
Staphylococcus aureus	77	43(55.84%)	34(44.16%)
Staphylococcus epidemidis	64	38(59.37%)	26(40.63%)
Streptococcus pneumoniae	12	10(83.34%)	2(16.67%)
Micrococcus sp	6	6(100%)	NI
Gram negative organisms *[NI : Not isolated]			
Pseudomonas aeruginosa	67	14(20.9%)	53(79.1%)
Escherichia coli	53	11(20.75%)	42(79.24%)
Klebsiella pneumoniae	22	4(18.18%)	18(81.82%)
Haemophilus influenza	11	2(18.18%)	9(81.82%)
Fungi			
Candida albicans	2	NI	2(100%)

TABLE 2: Distribution of pathogens from Acute & chronic dacryocystitis

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ANTIBIOTIC	S.aureus	S.epidermidis	S.pneumoniae	P.aeruginosa	E.coli	k.pneumoniae	H.influenzae
Chloramphenicol	65	62	71	55	44	56	66
Tetracycline	56	61	53	56	60	62	55
Ciprofloxacin	78	82	74	75	78	82	73
Oflaxacin	87	89	88	85	88	85	84
Cloxacillin	89	88	91	NI	NI	NI	NI
Gentamycin	89	91	76	91	92	87	82
Amikacin	92	92	77	91	95	92	92
Tobramycin	NI	NI	NI	100	100	100	100
Bacitracin	83	82	83	91	94	86	89
Neomycin	NI	NI	NI	82	80	80	86

TABLE 3: SUSCEPTIBILITY % OF ISOLATED PATHOGENS TO ANTIBIOTICS USED IN SENSITIVITY TESTING

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