Indian Journal of Microbiology Research 2019;6(4):328–335

Content available at: iponlinejournal.com

Indian Journal of Microbiology Research

Journal homepage: www.innovativepublication.com

Original Research Article

Microbiological profile and antimicrobial susceptibility pattern of the isolates in dacryocystitis: A prospective study in a tertiary care hospital

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ARTICLE INFO

Article history:
Received 25-07-2019
Accepted 05-09-2019
Available online 21-11-2019

Keywords:
Dacryocystitis
dacryocystorhinostomy
epiphora
Staphylococcus epidermidis
vancomycin

ABSTRACT

Introduction: Dacryocystitis is a threatening ophthalmic problem, which affects patients of every age. It is an inflammation of the lacrimal sac and duct. Acute dacryocystitis, experience severe morbidity while chronic dacryocystitis is rarely associated with morbidity unless caused by a systemic disease.
Objective: This study was done to identify and isolate the causative agents of dacryocystitis, detect their antimicrobial susceptibility pattern and determine the contributing risk factors.
Materials and Methods: This prospective study was conducted for a period of $1\frac{1}{2}$ years. Pus samples from 100 patients with dacryocystitis were obtained and processed in the Microbiology laboratory in a tertiary care center.
Results: The most common aerobic Gram-positive bacteria were Staphylococcus epidermidis (29.7%) and Staphylococcus aureus (20.3%). The common Gram-negative bacteria were Pseudomonas aeruginosa (9.4%) and E coli (9.4%). Gram-positive isolates were most sensitive to vancomycin. Gram-negative isolates were most sensitive to colistin.
Conclusion: Higher culture positivity emphasizes the clinicians about the significance of this disease and the need to investigate for the presence of the symptom of nasolacrimal obstruction. The knowledge of bacteriology and antimicrobial susceptibility is necessary for implementation of a management protocol to reduce the cost burden and emergence of drug resistant strains.

1. Introduction

Dacryocystitis is a painful and threatening ophthalmic problem, which affects patients of every age.[1] It is an inflammation of the lacrimal sac and duct. It may be congenital or acquired. Acquired dacryocystitis assumes two main forms: acute and chronic.[2] In acute dacryocystitis, patients can experience severe morbidity. Morbidity is primarily due to lacrimal sac abscess formation and spread of the infection. Chronic dacryocystitis is rarely associated with severe morbidity unless caused by a systemic disease. Obstruction of nasolacrimal duct converts the lacrimal sac into a stagnant pool, which becomes infected leading to chronic dacryocystitis.[1]

Gram-positive bacteria were most commonly isolated followed by Gram-negative bacteria of both aerobic and anaerobic origin. Among the fungal pathogens, *Fusarium* spp., *Aspergillus* species, and *Candida albicans* were predominantly isolated in patients with dacryocystitis. Anaerobic organism most commonly isolated was *Propionibacterium* species.[1] Some recent studies have suggested an increasing frequency in Gram-negative organisms. Therefore, there are concerns about changing trends in the microbiologic spectrum of dacryocystitis.[3]

The antibiotic treatment for dacryocystitis is dependent on age of the patient, status of the diseases, and the type of the infection and drug resistance pattern. Especially, the pattern and magnitude of antibacterial resistance vary from region to region which is highly dependent on the distribution of resistant strains and use

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https://doi.org/10.18231/j.ijmr.2019.070

of antimicrobial agents.[4] Most of the microorganisms were sensitive to fluoroquinolones, gentamicin, cephalosporin and v ancomycin.[5]

The etiological and epidemiological pattern of dacryocystitis varies from time, geographic location and climate. In order to start specific therapy, it is necessary to do meticulous laboratory investigations to identify the causative organism. Indiscriminate use and widespread prescription of antimicrobial agents may result in the emergence of resistant strains.[4] Identifying the causes of dacryocystitis would contribute to the choice of effective treatment and would help to reduce the unnecessary usage of antimicrobial agents. Hence, the outcome of this study will provide effective contribution to the clinicians. The aim of this study was to identify and isolate etiological agents from patients with dacryocystitis, determine antimicrobial susceptibility pattern of the organisms isolated and record the occurrence and contributing risk factors.

2. Materials and Methods

2.1. Study location and population

The hospital-based prospective study was conducted in the Department of Microbiology, Father Muller Medical College & Hospital, Mangalore, for a period of one and a half years from November 2015 to May 2017. This study has obtained ethical clearance from the institution. Pus samples from hundred patients with dacryocystitis who visited the outpatient department and Ophthalmology wards of Father Muller Medical College Hospital were received in the laboratory. Pus samples from clinics and hospitals around Mangalore were also selected randomly in the study. All patients clinically diagnosed with dacryocystitis were included in the study. Children less than 7 years of age was excluded from the study.

A proforma documenting age, sex and clinical information, including chief complain ts, predisposing factors, risk factors and any previous history of treatment were collected from each patient.

2.2. Procedure of sample collection

The ocular swabs were collected under all aseptic precautions. The samples were collected in two sterile cotton swabs from the lacrimal sac, either by applying pressure over the lacrimal sac and allowing the purulent material to reflux through the lacrimal punctum or by lacrimal syringing. The sample was collected ensuring that the lid margins or the conjunctiva is not touched. Samples available in large quantities were collected in sterile leak proof bottles. The sample was also collected directly during dacryocystorhinostomy (DCR) procedure. One swab was used f or Gram staining and other for culture. Both the swabs were processed immediately in the laboratory.

2.3. Sample processing in laboratory

Gram staining of the smear was done and examined under light microscope. The various morphological types of bacteria, fungus, their number, Gram reaction, presence or absence of inf lammatory cells and the number of squamous epithelial cells in the sample was noted. Presence pus cells were indicative of infection and presence of squamous epithelial cells were indicative of mucosal contamination.

The second swab was inoculated immediately on MacConkey agar (MA), 5% sheep blood agar (SBA) and Chocolate agar (CA). Gram's staining and culture suggestive of anaerobic or fungal etiology, isolation and identification were proceeded by inoculating on Sabouraud's dextrose agar (SDA) and Robertson's cooked meat medium (RCM) respectively. The media were inoculated under different conditions- at 37^0 C for 5 days in an anaerobic chamber f or RCM, at 37^0 C in the presence of 10% CO_2 in a candle jar for 24 hours for CA, at 37^0 C for BA and MA, at 25^0 C and 37^0 C for SDA. The isolates were identified based on microscopic morphology, staining characteristics, cultural and biochemical properties by using standard microbiological procedure.[6] Anaerobic bacteria were cultured on BA and selective media named neomycin BA and incubated in anaerobic jar loaded with Gaspak for 48 hours. Colonies grown were identified by standard microbiological procedure for anaerobic bacteria.[7,8] Antimicrobial susceptibilities of aerobic bacterial isolates were tested by the Kirby Bauer disk diffusion method according to the guidelines of the Clinical and Laboratory Standards Institute. Fungal isolates were processed according to standard mycological procedures.[9] The strength of the antibiotics used for antimicrobial susceptibility of the bacterial isolates was included in Table 1.

2.4. Statistical analysis

Data was analyzed by frequency, percentage, Chi Square test and Fischer exact test. SPSS version 21.0 was used for all the statistical procedures. p-value less than 0.05 was considered significant.

3. Results

3.1. Demographic details in patients with dacryocystitis

Among the 100 patients clinically diagnosed with dacryocystitis, 44% belonged to the age group of 51-80 years of age followed 30% in the age group of 31-50 years. Dacryocystitis was less prevalent in extremes of age group. Dacryocystitis was most common in females (F) compared to males (M) with F: M ratio of 2.1: 1. 47% of the patients who developed dacryocystitis were housewives followed by 37% of people with others occupation like manual laborers, teachers, automobile workers, unemployed individual etc.

Out of the 100 patients, 69% belonged to middle SES and 29% to l ow SES (29%). Dacryocystitis is seen more commonly in patients of low SES. Thus, findings in this study is contrary to others.

3.2. Clinical features in patients with dacryocystitis

In this study, 64% of patients had infection of the right eye, 29% left eye and 7% had infection of both eye. This study showed that dacryocystitis of the right eye is mo re in women than men. This is statistically significant with a p value of 0.041. In our study, 90% of the patients had chronic infection, while only 10% of patients had acute symptoms. There is a high statistical significance between the age of the patient and type of infection. Majority of the patients with chronic infection belonged to the age group of 51-80 years. This is statistically significant with p value of 0.000. In patients with dacryocystitis, the common clinical feature include 66.1% with eye discharge, 56.9% with epiphora and 15.6% with swelling over the medial canthus of eye. In this present study, 42% of the patients had serous eye discharge, 40% had mucopurulent and 18% had purulent discharge. Majority of the patients who presented with purulent and mucopurulent discharge showed culture positivity (p= 0.017) and it was statistically significant. 6% of the patients had acute symptoms with duration less than 1 week while 77% ha d chronic infection with duration more than 2 weeks.

3.3. Risk factors associated with dacryocystitis

The common risk factors attributed to dacryocystitis in descending order include 33.9% due to exposure to smoke, 18.3% due to use of Kajal or Suruma, 7.3% due to exposure to grease and other solvents and 1.8% due to rubbing of eyes following contamination of hand. 33% of patients did not present with any risk factor. Though women who were exposed to smoke was considered as the common risk factor in this study, there was no correlation between them (p value- 0.207). Out of 100 patients, 81.7% of them did not have any associated nasal abnormality. 6.4% of patients had allergic rhinitis, 1.8% of patients had deviated nasal septum and hypertrophied turbinates.

3.4. Organisms isolated in patients with dacryocystitis

Out of 100 patients clinically diagnosed with dacryocystitis, 64% showed culture positivity with either pure or mixed growth of bacteria. 36% of patients showed no growth in culture. Among the aerobic Gram-positive bacteria, 29.7% of the isolate was *Staphylococcus epidermidis* and 20.3% *Staphylococcus aureus*. Among the *Staphylococcus epidermidis* isolates, 9.4% were methicillin resistant and among the *Staphylococcus aureus* isolates, 3.1% were methicillin resistant *(MRSA)*. 9.4% *Pseudomonas aeruginosa*, 9.4% *E coli*, 6.2% *Acinetobacter species*, 4.7% *Klebsiella pneumonia* were the common Gram-negative bacteria isolated. In this study, 63% of bacteria had scanty type of growth, 20% had moderate growth and 17% had heavy growth. Only two anaerobic bacteria were isolated which include *Peptostreptococcus species* (3.1%) and *Propionibacterium specie*s (1.5%). Out of 100 patients diagnosed with dacryocystitis, two fungi were isolated. They were 1% of *Candida tropicalis* and 1% of *Mucor species*. The common bacteria isolated in patients with dacryocystitis is included in Table 2.

3.5. Antimicrobial susceptibility pattern of the isolates with dacryocystitis

Staphylococcus epidermidis was 100% sensitive to cotrimoxazole, aminoglycoside, vancomycin, teicoplanin and linezolid. *Staphylococcus epidermidis (methicillin resistant)* was 100% sensitive to vancomycin, teicoplanin, linezolid. *Staphylococcus aureus* was 100% sensitive to cefotaxime, cotrimoxazole, aminoglycoside, vancomycin, teicoplanin and linezolid. Common Gram-positive bacteria with percentage of sensitivity to various antibiotics is included in Table 3.

The mo st common Gram-negative bacterium isolated was *Pseudomonas aeruginos*a that was 100% sensitive to carbapenem, colistin, and polymixin B. *E coli* was 100% sensitive to colistin, 50% sensitive to levofloxacin. *Acinetobacter species* was 100% sensitive to fluroqu inolone and colistin. *Klebsiella pneunomiae* was 100% sensitive to aminoglycoside, carbapenem and colistin. Common Gram-negative bacteria with its percentage of sensitivity to various antibiotics.

4. Discussion

44% of the patients belong to the age group of 51-80 years (44%) followed 30% in the age group of 31 -50 years. This was similar to the study conducted by Patel K *et al*[10] and others[11,12] A study conducted by Bharathi *et al* in 2008[13] and Chaudhary M *et al*[5] and others[14–16] showed that dacryocystitis was predominantly seen in patients above the age of 30 years which was also similar to our findings. A study by Diggle, Duke-Elder and MacFaul, and Reddy and Reddy also showed maximum incidence of dacryocystitis in the age group between 35-65 years.[17–19]

In our study, females where most commonly affected than males with a female: male ratio of 2.1: 1. Our results were consistent with similar studies carried out by Mallik and Chatterjee[20] and others[2,5] that showed female preponderance. The preponderance in females may be due to the smaller and narrower nasolacrimal canal than in men and hormonal factors.[21] It may also be due to prolonged work in smoky kitchens, pond bathing and use of different types of cosmetics especially Kajal by women which may lead to partial or complete blockage of the drainage system.

Table 1: The strength of the antibiotics used for antimicrobial susceptibility testing

Ampicillin 10 μg	**Amikacin 30 μg**	**Piperacillin-tazobactam 100/10 μg**
amoxy-clavulanate 20/10μg	ciprofloxacin 5 μg	cefoperazone-sulbactam 75/30 μg
cefazoline 30 μg	levofloxacin 5 μg	imipenem 10 μg
cefuroxime 30 μg	azithromycin 15 μg	meropenem 10 μg
cefotaxime 30 μg	clindamycin 2 μg	colistin 10 units
ceftazidime 30 μg	optochin 5 μg	polymyxin B 300 units
cotrimoxazole 1.25/23.75 μg	tigecycline 15 μg	
gentamicin 10 μg	bacitracin 0.04units	
aztreonam 30 μg	cefoxitin 30 μg	
	novobiocin 5 μg	

Table 2: Common bacteria seen in patients with dacryocystitis

Aerobic bacteria	**Frequency**	**Percentage (%)**
Staphylococcus epidermidis	13	20.3
Staphylococcus epidermidis (methicillin resistant)	6	9.4
Staphylococcus aureus	11	17.2
Pseudomonas aeruginosa	6	9.4
E coli	6	9.4
Acinetobacter species	4	6.2
Streptococcus pneumoniae	3	4.7
Klebsiella pneumoniae	3	4.7
Stahylococcus aureus (methicillin resistant)(MRSA)	2	3.1
Streptococcus viridans	2	3.1
Burkholderia pseudomallei	2	3.1
Staphylococcus hominis	1	1.5
Enterococcus faecalis	1	1.5
Moraxella species	1	1.5
Anaerobic bacteria		
Peptostreptococcus species	2	3.1
Propionibacterium species	1	1.5
Total	64	100

Table 3: Common Gram-positive bacteria with its percentage of sensitivity to various antibiotics

Bacteria	**A**	**Ac**	**Cz**	**Cu**	**Ce**	**Co**	**G**	**Ak**	**Cf**	**Lf**	Az	**Cd**
Staphylococcus epidermidis	15.4	66.7	84.6	83.3	81.8	100	100	100	41.7	66.7	50	91.7
Staphylococcus epidermidis (methicillin resistant)	0	0	0	0	0	66.7	83.3	100	50	50	16.7	62.7
Staphylococcus aureus	10	63.6	90	100	100	100	100	100	63.6	90.9	72.7	100

Table 4:

Bacteria	**Van**	**Tp**	**Lz**
Staphylococcus epidermidis	100	100	100
Staphylococcus epidermidis (methicillin resistant)	100	100	100
Staphylococcus aureus	100	100	100

Table 5: Common Gram-negative bacteria with its percentage of sensitivity to various antibiotics

Bacteria	**A**	**Ac**	**Cz**	**Cu**	**Ce**	**Ca**	**Co**	**G**	**Ak**	**Cf**	**Lf**
Pseudomonas aeruginosa	-	-	-	-	-	80		83.3	83.3	66.7	66.7
E coli	0	0	0	16.7	33.3		83.3	66.7	83.3	33.3	50
Acinetobacter species	0	25	0	0	25		75	75	75	100	100
Klebsiella pneunomiae	0	0	0	0	0		33.3	100	100	33.3	33.3

Table 6:

Bacteria	Pt	Cfs	I	M	Ao	Coli	PolyB
Pseudomonas aeruginosa	25	75	100	100	50	100	100
E coli	83.3	66.7	100	83.3	-	100	-
Acinetobacter species	66.7	100	50	66.7	-	100	-
Klebsiella pneunomiae	18.8	100	100	100	-	100	-

A-ampicillin, Ac- amoxyclav, Cz-cefazolin, Cu-cefuroxime, Ce-cefotaxime, Ca- eftazidime, Co-cotrimoxazole, G- gentamicin, Ak- amikacin, Cf-ciprofloxacin, Lf- levofloxacin, Az- azithromycin, Cd-clindamycin, Pt- piperacillin-tazobactam, Cfs-cefaperazone-sulbactam, Ao-astreonam, I- imipenem, M- meropenem, Coli- colistin and Poly B- polymyxin B

Females blow nose infrequently as compared to the males, this may also contribute to stasis of the nasolacrimal duct secretions, leading to infection. In our study, it was also noticed that majority of female patients who presented with dacryocystitis belonged to the age group of 51-80 years but there was no statistical significance in the data obtained (p= 0.324).

In this study, majority of the patients who developed dacryocystitis were housewives (47%) followed by others like manual laborers, teachers, automobile workers, unemployed individuals (37%) etc. This is similar to study conducted by Prakash R *et al*[2] and Patel K *et al*[10] were housewives followed by farmers and drivers were the most commonly affected with dacryocystitis. This is because of prolonged exposure to smoke from burning wood during cooking, use of kajal by housewives or exposure to soil and dust particles by farmers and contact with oil, grease or other solvents by automobile workers and drivers. In our study, 69% of patients belonged to middle SES (69%) followed by low SES (29%). Other studies[10,11,16] showed that this disease was predominantly seen in patients of low socioeconomic status which was contrary to our finding. This was probably due to overcrowding, poor personal hygienic practices and lack of education.

In our study, the involvement of the eye was mainly unilateral (93%), either the right or the left eye and there were some bilateral (7%) cases. This correlated well with the findings of Ghose *et al*[22] (90%:10%), and others.[16,22] While, Chaudhary M *et al*[5] showed a pure bacterial growth of 85.86% of cases and mixe d bacterial growth of 14.13%. In Patel K *et al*[10] none of the patients showed bilateral disease. Right eye involvement was seen in 64% of patients, left eye in 29% and bilateral in 7% of patients in our study. Ghose *et al*[22] found that there was a relatively high incidence of the disease on the left side (40%) as compared with that on the right side (32%). Majority of the studies[2,5,23] showed left eye to be predominantly involved than right eye. While, Indrajith S *et al*[16] and others[24,25] showed a higher incidence of dacryocystitis on the right side than on the left which correlates well with our study. Our study showed a significant association between gender and eye affected in patients. In both males and females, right eye was predominantly affected than left eye (p= 0.041) and was statistically significant. In this study, 90% of patients had chronic dacryocystitis and 10% had acute dacryocystitis. Out of 90% patients, 77% of them had duration of illness more than 2 weeks and 13% had duration of illness between 1-2weeks. 6% of patients with acute dacryocystitis had duration of illness less than 1 week and 4% had duration of illness between 1-2weeks. A study conducted by Prakash R *et al*[2] showed chronic dacryocystitis to be the most frequently encountered clinical type (63.75%), followed by acute dacryocystitis (25%) and congenital dacryocystitis (11.25%) which is similar to our findings. A study by Hartikainen *et al*[1,13] also correlates well with our study. In this study, 100 patients who developed dacryocystitis presented with varying clinical features, with eye discharge (66.1%) being the most common followed by epiphora (56.9%) and swelling over the medial canthus of eye (15.6%). Few patients presented with fever (0.9%) and other symptoms like pain, redness and blurring of vision (8.3%). Out of 66.1% of patients, 42% had serous discharge, 40% had mucopurulent discharge and 18% had purulent discharge. A study conducted by Prakash R *et al,*[2] showed 50% cases with epiphora only, 40% showed epiphora with discharge (mucous or mucopurulent or purulent) and 10% with swelling and redness which defies with this study. Another study by Patel K *et al*[10] and others[12,14] also showed epiphora (100%) as the main clinical symptom followed by mucopurulent discharge (70%) and swelling over the lacrimal sac, which was similar to previous studies. A study in 2014[10] showed that 71% of patients had mucopurulent discharge, 19% had serous discharge and the remaining 10% had purulent discharge, which was contrary to our findings. There was no statistical correlation between age of the patient and epiphora, eye discharge and swelling on the medial canthus of eye by Fisher exact test (p value of 0.394, 0.412, 0.587) respectively. There was also no statistical significance between type of discharge and infection (Fisher exact test, p=0.350).

There were several risk factors that contributed to dacryocystitis in our study. The common risk factors being exposure to smoke (33.9%), use of Kajal or suruma (18.3%), exposure to grease and other solvents (7.3%) and rubbing of eyes following contamination of hand (1.8%). 33% of patients did not present with any risk factor. A study published in 2014 by Prakash R[2] showed findings similar to

this study. Though women who had exposure to smoke was considered as the common risk factor in this study, there was no significant correlation between them (p=0.207). In this study, only 10% of patients had associated nasal pathology. Of these, 6.4% had allergic rhinitis, 1.8% each had deviated nasal septum and hypertrophied turbinate. None of the patients had atrophic rhinitis. A similar study by Patel K *et al*[10] had 79% of patients with associated nasal pathology with 69% of them with deviated nasal septum, 9% with atrophic rhinitis and 2% with inferior turbinate hypertrophy. Another study by Mandal *et al*[26] found 19.6% of the patients had nasal pathology, like hypertrophied inferior turbinate, deviated nasal septum, nasal polyp and allergic rhinitis. A study conducted by Shakya DK *et al*[27] found that hypertrophied inferior turbinate was seen in 41% cases, deviated nasal septum in 49% of cases and rhinitis in 10% cases. Majority of previous studies showed that a high proportion of patients with dacryocystitis have associated nasal pathology which was contrary to our findings.

In our study, 64% of patients showed culture positivity while 36% of patients showed no growth in culture. Out of 64%, majority (85.94%) of patients had pure growth of bacteria and 14.06% had mixed growth. The most common bacteria isolated was Gram positive (64%) followed by Gram negative (36%). In a study conducted by Prakash R *et al,*[2] 82.5% yielded a single organism and 17.5% yielded mixed organisms. 61 (64.9%) isolates were Gram-positive bacteria and 33 (35.1%) isolates were Gram-negative bacteria, which was similar to our findings. Other studies[5,10,28,29] also correlated well with this study. A study by Shakya DK *et al,*[27] Chaudhary *et al*[7] and Bharathi *et al.*[13] noticed a higher culture positivity of 72%, 79.80% and 80.30% respectively. Gram-positive (88.10%) bacteria were isolated in a higher proportion than Gram-negative (11.90%) bacteria.[27] In our study, patients with culture positive by pure or mixed growth of organisms, presented with either purulent or mucopurulent discharge (p= 0.017 by Fisher exact test) and this data was statistically significant. On the contrary, Bharathi *et al* (2008)[13] reported that there was no relation between type of discharge and growth of microorganisms, and that purulent discharge may not confirm infection. Both aerobic and anaerobic bacteria were isolated in this study. Aerobic Gram-positive bacteria were *Staphylococcus epidermidis* (29.7%) and *Staphylococcus aureus* (20.3%). Among the *Staphylococcus epidermidis* isolates, 9.4% were methicillin resistant and among the *Staphylococcus aureus* isolates, 3.1% were methicillin resistant *(MRSA)*. The common Gram-negative bacteria were *Pseudomonas aeruginosa* (9.4%), *E coli* (9.4%), *Acinetobacter species* (6.2%), and *Klebsiella pneumoni*a (4.7%). Other bacteria isolated were *Streptococcus pneumonia* (4.7%), *Burkholderia pseudomallei* (3.1%) and *Moraxella species* (1.5%). This was similar to other studies and differed from others.[15,30,31] In a study conducted by Prakash R *et al*,[2] the most common gram-positive isolate was *Staphylococcus aureus* (27.65%) and the most common gram-negative isolate was *Pseudomonas aeruginosa* (14.9%). Sueiro SP *et al*[32] noticed that the most commonly Gram-positive bacteria isolated was *Staphylococcus aureus* and *Streptococcus pneumonia* and Gram-negative bacteria was *Haemophilus influenzae*, *Serratia marcescens* and *Pseudomonas aeruginosa*.

Two anaerobic bacteria were isolated, which include *Peptostreptococcus species* (3.1%) and *Propionib acteriu*m *specie*s (1.5%). In a study by Hartikainen, J *et al*[1] and others,[33,34] anaerobic bacteria was isolated in 13% of patients. *Peptostreptococcus species* and anaerobic *Streptococcus species* were the most common isolate, which was similar to our findings. In another study,[35] anaerobic bacteria were isolated in 15.7% of patients and the most common being *Bacterioides species*. In this study, fungus was isolated in 2% of patients with *Candida tropicalis* (1%) and *Mucor species* (1%). *Aspergillus species* was not isolated in our study. In another study,[32,35], fungus was reported to be present in 4% to 7% of cases, the most commonly isolated genus being *Candida* followed by *Aspergillus* and *Mucor*. Eshragi B *et al*[3] and Brook I *et al*[34] reported isolated species of *Aspergillus species* and *Candida albicans* respectively.

In this study, the most common Gram-positive bacterium isolated was *Staphylococcus epidermidis,* which was 100% sensitive to cotrimoxazole, gentamicin, amikacin and 15.4% sensitive to ampicillin. *Staphylococcus epidermidis (methicillin resistant)* was 50% sensitive to ciprofloxacin, levofloxacin and 16.7% sensitive to azithromycin. The most sensitive antibiotic for Gram positive isolates were vancomycin, teicoplanin and linezolid and least sensitive was ampicillin which was similar to study done by Pornpanich K *et al.*[36] The most common Gram negative bacterium isolated was *Pseudomonas aeruginosa* which was 100% sensitive to imipenem, meropenem, poly B, 50% sensitive to astreonam and 25% sensitive to piperacillin-tazobactam. *E coli* were 50% sensitive to levofloxacin and 16.7% sensitive to cefuroxime. *Acinetobacter* species was 75% sensitive to cotrimoxazole, gentami cin, amikacin, 50% sensitive to imipenem and 25%sensitive to amoxyclav and cefotaxime. The most sensitive antibiotic for Gram negative isolates were colistin and least sensitive was cefazolin. In a study done by Prakash R *et al,*[2] all Gram positive isolates were most sensitive to vancomycin (100%), followed by linezolid (99.36%). The least sensitive antibiotic was penicillin (71.69%).[2] This finding correlated with our study. In the same study, Gram-negative organisms were most sensitive to tobramycin and gentamicin (100%), followed by cefepime (98.79%) and chloramphenicol (97.14%) and the least sensitive antibiotic was ciprofloxacin (61.64%)[2] which differed from our study. Shakya D K *et al*[27] noticed that all Gram-positive isolates were 95.94%

sensitive to chloramphenicol, 94.59% to cefazolin, 92.34% to ciprofloxacin and ofloxacin, and 85.13% sensitive to vancomycin. In Gram-negative isolate, chloramphenicol was the most effective followed by ofloxacin, gentamicin, cephalexin, and cefazolin.[27] This finding differed from our findings, were the most sensitive antibiotic for Gram positive isolates were vancomycin, teicoplanin and linezolid and the most sensitive antibiotic for Gram negative isolates were colistin, imipenem and meropenem. Patel K *et al*[10] and Mandal *et al*[26] noticed a minoglycosides to be most effective antibiotic against *S.epidermidis*, which was similar to our study. The same study [1026] howed ciprofloxacin and ofloxacin to be sensitive to *P. aeruginosa* and *K. pneumonia.* This was contrary to our findings were *P. aeruginosa* was moderately sensitive to ciprofloxacin (66.7%) while *K. pneumonia* was poorly sensitive to ciprofloxacin (33.3%). Pornpanich K *et al*[36] found that all *P. aeruginosa* isolates were susceptible to ceftazidime, ciprofloxacin, gentamicin, and meropenem, which were similar to our findings.

5. Conclusion

Dacryocystitis is a constant threatening ocular condition. It is an important cause of ocular morbidity in India. In this study, majority were culture positive, which emphasized the clinicians, the significance of this disease and the need to investigate for the presence of the symptom of nasolacrimal obstruction before planning any intraocular procedures. The frequency of isolation of Gram-positive organisms was higher than that of Gram-negative organisms. In Gram-positive isolates, glycopeptide was the most susceptible drug. Among Gram-negative isolates, colistin was most susceptible drug. Knowledge of bacteriology and anti microbial susceptibility is necessary for implementation of a management protocol to reduce the cost burden and emergence of drug resistant strains.

In this study, anaerobic bacteria like *Peptostreptococcus* and *Propionibacterium* species and fungi like *Candida* and *Mucor* species were also isolated. This emphasizes the need for clinicians and health care professionals to consider these organisms also as one of the causative agents of this clinical condition and subsequently initiate appropriate treatment modalities. Limitations for the study was that viral etiology of dacryocystitis could not be determined and antifungal susceptibility testing for fungal isolates could not be performed.

6. Acknowledgment

We gratefully acknowledge the assistance rendered by the staff of Microbiology department, all the patients who participated in the study and the Laboratory technicians.

7. Funding

Self-funding

8. Conflict of interest

Not declared

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Cite this article: Thomas T, Dias M, Joseph Maliakal B. Microbiological profile and antimicrobial susceptibility pattern of the isolates in dacryocystitis: A prospective study in a tertiary care hospital. *Indian J Microbiol Res* 2019;6(4):328-335.