Bacteriological Profile and Antibiogram of Acute Dacryocystitis in a Rural Tertiary Healthcare Centre, Maharashtra, India

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ABSTRACT

BACKGROUND

Dacryocystitis is one of the most frequent diseases of the efferent lacrimal system. It is the infection or inflammation of the lacrimal sac. This is usually because of nasolacrimal duct obstruction. Acute dacryocystitis can cause severe morbidity and rarely mortality in patients. This study wanted to identify the aerobic bacterial aetiology, and demonstrate the antibiogram of bacterial isolates of acute dacryocystitis.

METHODS

A retrospective record-based study was conducted in Rural Tertiary Healthcare Centre. Clinical Data of 89 patients was collected from medical records of 2014 to 2018 documents. Data of bacterial isolates and their antibiogram were retrieved from records in the Department of Microbiology.

RESULTS

The most common aerobic Gram-positive bacteria were *Staphylococcus aureus* (29.8 %) and Coagulase Negative staphylococcus (23.3 %). The most common Gram-negative bacteria were pseudomonas spp. (19.4 %) and klebsiella spp. (12.9 %).

CONCLUSIONS

The knowledge of bacterial profile in different geographic region, different age group will help to develop and implement treatment protocol.

KEY WORDS

Acute Dacryocystitis, Bacterial Profile, Antibiogram

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BACKGROUND

Eye and vision are vital to human beings. Vision is not only conveyance of pictures but also access window to express one's own self to the world. Loss of vision or disease of the eye totally upsets the tranquillity of one's life.[1] Dacryocystitis is the most frequent disease of the efferent lacrimal system. Dacryocystitis is the inflammation of the lacrimal sac which is usually because of nasolacrimal duct obstruction. The Obstruction of the lacrimal canal leads to a stagnation of tears and creates a favourable environment to microbes. It builds up material within the sac leading to an exacerbated infection and more stasis. The normal flora of the eye and nose acts as an endogenous opportunistic pathogen, which causes infection of the lacrimal sac. Infection in dacryocystitis can spread to the anterior orbit causing marked oedema of the eyelids or can develop into a pre-septal or orbital cellulitis.[2] Acute dacryocystitis can cause severe morbidity and rarely mortality. Chronic disease of dacryocystitis is associated with chronic wearing-tearing, thickening of the lacrimal drainage system, and accumulation of germs, usually the majority of patients harbour multiple microorganisms. It is a constant risk to the cornea and orbital tissue. Complications of dacryocystitis include fistula, corneal ulcer, and orbital cellulitis; moreover, it causes social issues due to long-lasting epiphora.[3-5] As many as 30 % of newborn infants are believed to have closure of nasolacrimal duct at birth.[6] If not treated carefully and aggressively, new born infants may complicate to orbital cellulitis (because the orbital septum is formed poorly in infants), brain abscess, meningitis, sepsis, and death. The treatment of lacrimal duct obstruction (LDO) in adults is surgery, either external or endonasal dacryocystorhinostomy (DCR), or occasionally silicone intubation. Walland and Rose reported a fivefold risk of soft tissue infection after open lacrimal surgery without systemic antibiotic prophylaxis. They have concluded that, postoperative soft tissue infection represents a significant risk of failure in lacrimal surgery. Knowledge of the bacteriology of LDO contributes significantly to the choice of prophylactic antimicrobial agents.[7] Bacterial profile varies in different geographic area and also changes their antibiotic susceptibility pattern time to time. This study intended to identify the aerobic bacterial aetiology and to demonstrate the antibiogram of bacterial isolates in acute dacryocystitis. It is necessary to update the local data of Bacterial profile and antibiogram that will help in implementation of Antibiotic stewardship programme in healthcare Centre.

METHODS

After ethical clearance from institutional ethical committee, a retrospective record-based study was conducted in Rural Tertiary Healthcare Centre, located in Western Maharashtra, India. Clinical Data of 89 patients was collected from medical records between November 2014 and March 2018. Patients of all age group, of either sex, attending the Outpatient department of Ophthalmology were considered as study population. These patients were clinically diagnosed as suffering from acute dacryocystitis by the ophthalmologist. Data of bacterial isolates and their antibiogram were retrieved from records in the Department of Microbiology.

Specimen Collection

After cleaning with normal saline swab, pressure was applied on medial epicanthetic fold, the regurgitate pus or serosanguinous fluid was collected by sterile swab. Two sterile cotton swabs moistened with physiological saline were used for collection of discharge from the lacrimal punctum. All aseptic precautions were taken while sample collection procedure (ensuring that the lid margin or conjunctiva was not touched).

Specimen Processing

Specimens received in Microbiology were processed as per standard method i.e., primary smears for microscopy, culture on routine media for aerobic bacteria and for Sabouraud's Dextrose Agar for fungal isolations. A positive culture was defined as a growth of the same organism on more than two solid phase media or confluent growth on one solid medium and smear results consistent with cultures. A standardized protocol was followed for each ocular specimen for the evaluation of significant microbiological features.

Identification and Antibiotic Susceptibility Test

Aerobic bacteria were further processed as per manufacturer guidelines to identify the isolates and their antibiotic susceptibility testing by VITEX 2 automated system. Gram positive ID card (21342) and Gram-negative ID card (21341) were used for respective bacterial isolate. AST card N280 for LF and N281 for Non-lactose fermenter (NLF) isolates were used for antibiotic susceptibility test.

RESULTS

Total No of Cases (%)	Bacteria culture Positive (%)	Culture Negative (%)
89	77 (86.5)	11 (12.5) 4.4

Table 1. Distribution of Acute Dacryocystitis Cases (N = 89)

Table no 1 shows there were total of 89 clinically diagnosed cases of acute dacryocystitis. Out of which 77 (86.5 %) were confirmed cases by Microbiological culture.

Age (Years)	No. of Cases	%
18 - 28	04	4.4
29 - 39	04	6.7
40 - 50	30	33.7
51 - 61	44	49.4
> 61	05	5.6

Table 2. Age Distribution of Acute Dacryocystitis (N = 89)

Table No 2 shows maximum no of cases in the age group of 51 - 61 years followed by age group 40 - 50 years. Prevalence of acute dacryocystitis was more among females i.e., 52.8 % which was higher than males i.e., 47.1 % Among these 77 culture proven cases, 45 (58.4 %) were gram positive bacteria and 32 (41.5 %) were gram negative bacteria.

Name of Isolates	No. of Organism	%
Gram positive organisms		
Staphylococcus Aureus	23	29.8
Coagulase-negative staphylococci	18	23.3
Streptococcus viridans	03	3.8
Streptococcus pneumoniae	01	1.2
Gram negative organisms		
pseudomonas spp	15	19.4
klebsiella spp	10	12.9
E.coli	07	9
Total culture positive	77	

Table 3. Distribution of Isolates among the Culture Positive Cases (N = 77)

Antibiotics	*Staphylococcus aureus* (N = 23) Susceptibility %	Coagulase Negative staphylococcus (N = 18) Susceptibility %	*Streptococcus viridans* (N = 3) Susceptibility %	*Streptococcus pneumonia* (N = 1) Susceptibility %
Cefoxitin	17 (73.9)	16 (88.8)	3 (100)	1 (100)
benzylpenicillin	16 (69.5)	6 (33.3)	3 (100)	1 (100)
Oxacillin	18 (78.2)	7 (38.8)	3 (100)	1 (100)
gentamicin	17 (73.9)	10 (55.5)	3 (100)	1 (100)
ciprofloxacin	15 (65.2)	10 (55.5)	3 (100)	1 (100)
levofloxacin	16 (69.5)	10 (55.5)	3 (100)	1 (100)
clindamycin	16 (69,5)	17 (94,4)	3 (100)	1 (100)
erythromycin	15 (65.2)	14 (77.7)	3 (100)	1 (100)
linezolid	23 (100)	18 (100)	3 (100)	1 (100)
daptomycin	23 (100)	18 (100)	3 (100)	1 (100)
teicoplanin	23 (100)	18 (100)	3 (100)	1 (100)
vancomycin	23 (100)	18(100)	3 (100)	1 (100)
tetracycline	23 (100)	18 (100)	3 (100)	1 (100)
tigecycline	23 (100)	18 (100)	3 (100)	1 (100)
Nitrofurantoin	15 (65.2)	9 (50)	3 (100)	1 (100)
trimethoprim-sulfamethoxazole	16 (69.5)	11 (61.1)	3 (100)	1 (100)

Table 4. Antibiogram of Gram Positive Isolates.(N = 45)

Antibiotics	Pseudomonas spp. (N = 15) Susceptibility %	Klebsiella spp. (N = 10) Susceptibility %	*E. coli* N = 7 Susceptibility %
ampicillin	NT	2 (20)	1 (14.2)
amoxicillin / clavulanic Acid	NT	8 (80)	6 (85.7)
piperacillin / tazobactum	6 (40)	8 (80)	6 (85.7)
cefuroxime	NT	6 (60)	1 (14.2)
ceftriaxone	NT	5 (50)	1 (14.2)
cefoperazone / sulbactum	6 (40)	7 (70)	3 (42.8)
cefepime	5 (33.3)	5 (50)	6 (85.7)
ertapenem	6 (40)	7 (70)	6 (85.7)
imipenem	5 (33.3)	7 (70)	6 (85.7)
meropenem	8 (53.3)	7 (70)	6 (85.7)
amikacin	5 (33.3)	7 (70)	6 (85.7)
gentamicin	7 (46.6)	7 (70)	6 (85.7)
Nalidixic Acid	10 (66.6)	7 (70)	4 (57.1)
ciprofloxacin	8 (53.3)	7 (70)	2 (28.5)
tigecycline	11 (73.3)	9 (90)	4 (57.1)
nitrofurantoin	12 (80)	10 (100)	5 (71.4)
colistin	12 (80)	10 (100)	6 (85.7)
trimethoprim-sulfamethoxazole	NT	6 (60)	3 (42.8)
ticarcillin / clavulanic Acid	11 (73.3)	8 (80)	6 (85.7)
ceftazidime	11 (73.3)	8 (80)	6 (85.7)
doripenem	12 (80)	8 (80)	7 (100)
levofloxacin	11 (73.3)	8 (80)	5 (71.4)

Table 5. Antibiogram of Gram-Negative Isolates (N = 32)

*NT- Not Tested, as it was in AST panel for particular group of organisms in automated system.

Table No. 3 shows distribution of organisms and species among the gram-positive bacteria and gram-negative bacteria. Out of total 77 culture positive cases, *Staph aureus* accounts for 29.8 %, Coagulase negative staphylococcus 23.3 %, pseudomonas spp. 19.4 %, klebsiella spp. 12.9 %, *E. coli* 9 %, *Streptococcus viridans* 3.8 % and *Streptococcus pneumonia* 1.2 %.

Table No. 4 shows % of susceptibility pattern of individual gram-positive organisms to different antibiotics which are routinely used in clinical practice. Most of the gram-positive isolates were 100 % susceptible to linezolid, daptomycin, teicoplanin, vancomycin, tetracycline, tigecycline, followed by around 55 % susceptibility to aminoglycosides like amikacin, gentamicin and to quinolones like ciprofloxacin, levofloxacin etc.

Table No. 5 shows susceptibility pattern of gram-negative organisms to various antibiotics. Amongst these gram-negative organisms, pseudomonas spp. have shown resistance to Cephalosporin group of antibiotics. However, pseudomonas spp. have shown maximum susceptibility to tigecycline 73.3 %, nitrofurantoin 80 %, colistin 80 %.

Table No. 5 shows susceptibility pattern of klebsiella spp. Maximum no of klebsiella isolates were susceptible to nitrofurantoin, colistin (100 %), ticarcillin / clavulanic Acid, ceftazidime, Doripenem, levofloxacin (80 %) followed by ertapenem, imipenem, meropenem, amikacin, gentamicin, nalidixic Acid, ciprofloxacin (70 %). *E. coli* isolates were 85.5 % susceptible to cefepime, ertapenem, piperacillin / tazobactam, imipenem, meropenem, amikacin and gentamicin.

DISCUSSION

The acute dacryocystitis is associated with severe morbidity and primarily related to the lacrimal sac abscess and its spread. It usually presents as a preseptal infection, but also it is rarely associated with orbital cellulitis. The microbiological isolate pattern of dacryocystitis may differ in its acute and chronic infections. In severe acute dacryocystitis, single infection may predominate, often involving gram negative rods.[7] Regarding bacterial origin, generally gram-positive organisms are most common.[8] However, Briscoe et al. stated that higher isolation percentage of Gram-negative bacteria particularly pseudomonas were detected and showed increasing resistance to the commonly used antibiotics. The emergence of rare but highly resistant Gram-negative microorganisms may also indicate a new picture in lacrimal sac infections.[9] Present study revealed, out of total 89 clinically diagnosed cases, 77 (86.5 %) were culture positive cases of Acute dacryocystitis by microbiological culture.

Maximum no of cases belonged to age group of 51 - 61 years. Among these 77 culture proven cases, 45 (58.4 %) were gram positive bacteria and 32 (41.5 %) were gram negative bacteria. Out of total 77 culture positive cases *Staph. aureus* accounts for 29.8 %, Coagulase negative staphylococcus 23.3 %, pseudomonas spp. 19.4 %, klebsiella spp. 12.9 %, *E. coli* 9 %, *Streptococcus viridans* 3.8 % and *Streptococcus pneumonia* 1.2 %. Most of the gram-positive isolates were susceptible to linezolid, daptomycin, teicoplanin, vancomycin, tetracycline, tigecycline (i.e. 100 %), followed by susceptibility to aminoglycosides like amikacin, gentamicin and to quinolones like ciprofloxacin, levofloxacin etc. (i.e. 55 %). Gram negative organisms, pseudomonas spp. have shown resistance to Cephalosporin group of antibiotics. However, pseudomonas spp. have shown maximum susceptibility to nitrofurantoin 80 % , Colistin 80 % fuelled by to tigecycline 73.3 %. klebsiella

isolates were susceptible to nitrofurantoin, Colistin (100 %), ticarcillin / clavulanic Acid, ceftazidime doripenem, levofloxacin (80 %) followed by ertapenem, imipenem, meropenem, amikacin, gentamicin, nalidixic Acid, ciprofloxacin (70 %). *E. coli* isolates were 85.5 % susceptible to cefepime, Ertapenem, piperacillin / tazobactam, imipenem, meropenem, amikacin and gentamicin.

Mohammad Javed et al. stated that the female patients were more than males. Gram-positive organisms were the most common bacteria isolated accounting for 56.3 % (63 / 112), and the commonest species isolated was *Staphylococcus aureus* in 25 % (28 / 112) of the patients. *Hemophilus influenzae* was the commonest gram-negative isolate accounting for 30.2 % of all the gram-negative isolates. Gram-positive organisms were commonly sensitive to penicillins and vancomycin whereas gram-negative organisms were sensitive to quinolones and aminoglycosides. Our study results are in concordance with the Mohammad Javed et al. with difference to gram negative isolate frequency. In our study pseudomonas spp. were predominant in gram negative organisms.[10] Thressia Thomas et al. documented common aerobic Gram-positive organisms as Coagulase Negative staphylococcus (29.7 %) and *Staphylococcus aureus* (20.3 %). However, our study has revealed that *Staphylococcus aureus* was seen in (29.8 %) of patients and Coagulase negative staphylococcus was seen in (23.3 %).[11] of patients

CONCLUSIONS

In acute dacryocystitis, common etiological aerobic bacteria were gram positive cocci belonging to genus staphylococcus and common gram-negative bacteria were pseudomonas spp., klebsiella and *E.coli.* The gram-positive isolates were susceptible (100 %) to linezolid, daptomycin, teicoplanin, vancomycin, tetracycline, tigecycline. Susceptibility of gram negative bacteria differs with Genus and species of bacteria belonging to this group. In gram negative bacteria Colistin susceptibility ranged from 80 to 100 %.

Recommendations

In the current situation of evidence based medicine and increasing advance evolution systems in clinical laboratories emphasis should be given for culture of dacryocystitis cases. It is necessary to know pattern and magnitude of resistances among the strain distributed in particular region. The knowledge of bacterial profile in different geographic region, different age groups will help to develop and implement treatment protocol. This will reduce the cost burden and emergence of drug resistant strains.

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