STUDY THE CURRENT PATTERN OF BACTERIAL ISOLATES WITH NASOLACRIMAL PASSAGE OBSTRUCTION AND THEIR ANTIBIOTIC SENSITIVITY PATTERNS IN A TEACHING HOSPITAL.

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ABSTRACT

Introduction: An acquired nasolacrimal duct obstruction can occur at any age and is classified as either primary or secondary. The nasolacrimal obstruction, also known as PANDO (Primary acquired nasolacrimal duct obstruction), is observed mainly in conditions due to inflammation or fibrosis. Material and methods: This was a prospective observational study with a sample size of 100 patients. All the patients coming to Ophthalmology OPD have epiphora complaints, discharge or both, along with regurgitation on pressure over lacrimal sac and mucoid or mucopurulent or clear regurgitant material on sac syringing were taken. Before the beginning of the investigative procedure, informed consent was taken. The Clinical and Laboratory Standards Institute’s standardised Kirby-Bauer disc diffusion test was used to determine antibiotic susceptibility. Results: In our study, the distribution of patients according to bacterial isolates was as follows, a maximum of 62% of patients were found with no growth while 18% MSSA, 10% CONS, 6% S.pneumoniae, 4% Pseudomonas were observed, respectively. In our study, CONS was observed as the predominant bacterial isolate in the diabetics with a Female preponderance, followed by MSSA (39%), Pseudomonas (75%) and S.pneumoniae (34%). We found Ciprofloxacin as a broad-spectrum antibiotic that works against most bacterial isolates. Conclusion: A higher female preponderance was observed in our study, with the left side being affected in most of the patients. We also observed that most patients hailed from rural areas and belonged to lower socio-economic classes. This is attributed to a lack of hygiene and awareness among low socioeconomic groups. In all the patients showing positive culture growth, Gram-positive organisms were the dominant species. We conclude that Ciprofloxacin, as a broad-spectrum antibiotic, works against most bacterial isolates. Keywords: Nasolacrimal passage, bacterial isolates

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Introduction

An acquired nasolacrimal duct obstruction can occur at any age and is classified as either primary or secondary. The nasolacrimal obstruction, also known as PANDO (Primary acquired nasolacrimal duct obstruction), is observed mainly in conditions due to inflammation or fibrosis. It is estimated that symptomatically acquired nasolacrimal duct obstruction occurs at an annual average incidence rate of 30.47 per 100,0001. Generally,
the preponderance is more in women in the 40 to 60-year age range, as the nasolacrimal passage lumen is narrow in the female anatomy.

Staphylococcus epidermidis is the most commonly isolated component of the lacrimal excretory system. Staphylococcus spp., Streptococcus spp., Pneumococcus spp., and Pseudomonas spp. are the commonly prevalent bacteria isolated from the lacrimal sac, which is suggestive of the presence of both gram-positive and gram-negative.

Every year 16-19 Lakh cataract surgeries are performed in India. At most of these centres, preoperative sac syringing is done to rule out any possibility of infections in the lacrimal sac, leading to vision-threatening post-operative conditions like endophthalmitis or panophthalmitis.

With a better understanding of the Bacteriological isolates seen in the lacrimal duct obstruction, we would be able to select a more efficacious antimicrobials agent, decreasing unnecessary exposure to antimicrobials. Bacteriological study of nasolacrimal passage obstruction is becoming more important to avoid vision-threatening consequences such as endophthalmitis and hypopyon corneal ulcers following intraocular procedures such as cataract surgery and glaucoma filtration surgery.

Material and methods

This was a prospective observational study with a sample size of 100 patients. All the patients coming to Ophthalmology OPD have epiphora complaints, discharge or both, along with regurgitation on pressure over lacrimal sac and mucoid or mucopurulent or clear regurgitant material on sac syringing were taken. Before the beginning of the investigative procedure, informed consent was taken.

Demographic factors like age, sex, occupation, social status, and area of residence (Urban or Rural) were recorded as per the attached format. The lacrimal sac focus did a complete ocular examination of the selected patients. Snellen’s visual acuity chart measured UCVA at 6 meters distance, and BCVA with refraction adjusted according to the subjects at the same distance was also measured. Detailed slit lamp evaluation was done to rule out any other ocular pathologies.

Clinical examination was done, which included the evaluation of the nature of discharge, lacrimal sac patency, presence of fullness in the lacrimal sac, and the nature of the regurgitant material on pressure over the lacrimal sac and during sac syringing was also examined.

Following the collection of the samples, they were immediately transferred to a microbiology laboratory for pathogen isolation and identification. The first swab was used for Gram staining, while the second was used immediately for inoculation into culture media such as Blood agar, Chocolate agar, and MacConkey’s agar. The swab was incubated at 37°C for 24-48 hours in Blood agar, Chocolate agar, and MacConkey’s agar plates. After 24 and 48 hours of incubation, the Blood agar and Chocolate agar plates were examined. The Clinical and Laboratory Standards Institute’s standardised Kirby-Bauer disc diffusion test was used to determine antibiotic susceptibility.

The patients’ data in the study was collected, compiled in excel sheets, coded and further tabulated. Data analysis for the study was done using SPSS software (Version 22).

Results

In our study, most patients were over the age of 50(61%) while just 2% were under the age of 30, 12% were between the ages of 31 and 40, and 25% were between the ages of 41 and 50. 52% were female in our study, while 48% were male patients. In our study, maximum patients were farmers (34%) followed by housewives (27%), labourer around (13%), service holder (9%), factory worker (6%), driver (5%), watchmen (4%) and students (2%) respectively. In our study, the area-wise distribution of patients was as follows, 64% of patients were from rural areas, while 36% were from urban areas.

In our study, Socio-economic status wise, 77% of patients were from the Lower income group, while 23% were from the middle-income group according to the Modified Kuppuswamy scale. Moreover, out of the total cases in our study, diabetes mellitus was noted in 40% of our patients.

In our study, 89% of patients were with Gram staining positive, while 11% were Gram-negative.

In our study, the distribution of patients according to bacterial isolates was as follows, a maximum of 62% of patients was found with no growth. In comparison, 18% MSSA, 10% CONS, 6% S.pneumoniae, 4% Pseudomonas were observed, respectively.

In our study, CONS was observed as the predominant bacterial isolate in the diabetics with a Female preponderance, followed by MSSA (39%), Pseudomonas (75%) and S.pneumoniae (34%).

In our study, the distribution of the bacterial isolates according to the gender of patients was as follows maximum male isolate was found to be MSSA (17%), CONS (8%) with S.pneumoniae (2%), and Pseudomonas (2%) respectively.

In our study, the distribution of the bacterial isolates according to the gender of patients was as follows in females, the maximum number of the isolate was found to be MSSA (19%), CONS (11%), with S. Pneumoniae (10%), Pseudomonas (6%) respectively.

Discussion

The most common lacrimal system disorder is an obstruction in the nasal lacrimal ducts (NLDO) or dacryostenosis. Dacryocystitis is a condition in which the lacrimal sac becomes inflamed due to a blockage in the nasolacrimal duct. It is a major source of ocular morbidity in both children and adults. Every year 16-19 Lakh cataract surgeries are performed all over India. At most of these centres, preoperative sac syringing is done to rule out any possibility of infections in the lacrimal sac, leading to vision-threatening post-operative conditions like endophthalmitis or panophthalmitis. Epiphora is a common condition that causes much discomfort and hampers a person’s quality of life. Since both the mucus membrane-lined tract’s conjunctival and nasal mucosal surfaces are normally colonized with bacteria, each can be contagious. So knowledge about the bacterial isolates and their antibiotic sensitivity will help us give a more targeted approach and help to reduce the resistance of the bacteria to the antibiotics.

This prospective observational study included 100 clinically diagnosed cases of Nasolacrimal passage obstruction. This study was conducted between September 2019 and August 2021. All the patients coming to ophthalmology OPD with regurgitation from the lacrimal sac on pressure (ROPLAS positive) and any regurgitant material on sac syringing, either clear, mucoid or mucopurulent, were taken.

At a tertiary hospital in Western India, we sought to determine bacterial isolates’ current pattern and antibiotic sensitivity patterns among patients with nasolacrimal passage obstruction. Various factors were included in this study, such as age, sex,
### Table 1 Bacterial isolate wise distributions of diabetic patients

| Bacterial Isolates (n=total no of isolates) | No of patients | Male | Female |
|--------------------------------------------|----------------|------|--------|
| MSSA(18)                                   | 7 (39%)        | 4    | 3      |
| CONS(10)                                   | 8 (80 %)       | 2    | 6      |
| S.pneumoniae(6)                            | 2 (34%)        | 1    | 1      |
| Pseudomonas(4)                              | 3 (75%)        | 2    | 1      |
| **Total**                                  | **20**         | **9**| **11** |

### Table 2 Bacterial isolates- distribution (Percentage-wise) among male

| Bacterial isolates | Male | Percentage (%) |
|--------------------|------|----------------|
| MSSA               | 8    | 17             |
| CONS               | 4    | 8              |
| S.pneumoniae       | 1    | 2              |
| Pseudomonas        | 1    | 2              |
| No growth          | 34   | 71             |
| **Total**          | 48   | 100            |

### Table 3 Bacterial isolates- Percentage-wise distribution among females

| Bacterial isolates | Female | Percentage |
|--------------------|--------|------------|
| MSSA               | 10     | 19         |
| CONS               | 6      | 11         |
| S.pneumoniae       | 5      | 10         |
| Pseudomonas        | 3      | 6          |
| No growth          | 28     | 54         |
| **Total**          | 52     | 100        |

### Table 4 Sensitivity pattern of antibiotics in gram-positive bacterial isolates

| Antibiotic | CONS (10) | S.pneumoniae (6) | MSSA (18) |
|------------|-----------|------------------|-----------|
|            | No. of sensitive isolates / Total isolates | SR (%) | No. of sensitive isolates / Total isolates | SR (%) | No. of sensitive isolates / Total isolates | SR(%) |

### Table 5 Sensitivity pattern of antibiotics in gram-negative bacterial isolates

| Antibiotic            | Pseudomonas (4) |
|-----------------------|------------------|
|                       | Number of sensitive cases / Total cases | SR (%) |
| Ciprofloxacin (5 mcg/disc) | 3/4 | 75 |
| Gentamycin (10 mcg/disc)     | 2/4 | 50 |
| Amikacin (30 mcg/disc)        | 2/4 | 50 |
| CAT (30/10 mcg/disc)         | 3/4 | 75 |
| CAC (30/10/ mcg/disc)        | 1/4 | 25 |
| Imipenem (10mcg/disc)        | 2/4 | 50 |
occupation, and socioeconomic status, to identify the causative organisms and their antibiotic sensitivity pattern. Ocular examination of the selected patients was done with a focus being the lacrimal sac. The pattern of relative incidence varies in different studies. Our study was at par with the other studies.

In our study, maximum patients were above 50 years (61%), while only 2% of patients were in less than 30 years, 12% were in the range 31 to 40 years, and 25% were in the range 41 to 50 years. In addition, in our study, 52% were female, while 48% were male patients.

In a study done by Vijay Kinikar et al., in 117 patients, 81 were females, and 36 were males contributing to 69.2% and 30.7%, respectively. The highest incidence in females was in the age group of 40 – 49, and in males, it was above 70 years and above age group. The mean age at presentation in females was 45.2 years and 51.1 years in males. MJ Bharathi et al. have reported a female to male ratio of 3.9:1. Kanograt Pornpanich et al. and Ahuja et al. noted that women are more frequently affected than men, with a 3:1 female preponderance. Ahuja et al., in their study conducted at a tertiary hospital, found that 41.9% were males and 58.1% were females. In several other studies, around 83% has been observed in females having dacryocystitis. In our study, maximum patients were farmers (34%) followed by housewives (27%), laborers around (13%), service holder (9%), factory worker (6%), driver (5%), watchmen (4%) and students (2%) respectively. Duke Elder in 1974 also got similar results.

According to the area of residence, 64% of patients were from rural areas, while 36% were from urban areas. According to the socioeconomic status, 77% of patients who formed the majority of the cases were from the lower-income group, while 23% were from the middle-income group classified based on the Modified Kuppuswamy scale. This is attributed to a lack of hygiene and awareness among low socioeconomic groups. Chayakul V et al. and Mandal R et al. reported similar findings in their studies.

Vijay Kinikar et al. reported that most of the patients were females, and most of them were homemakers (41%) who are commonly affected. Farmers 21.3% and laborers 20.5% were next most commonly affected, followed by students (6.8%). Finally, the least affected were professionals (1.7%).

In our study, 40% of patients were with diabetes mellitus. Vijay Kinikar et al. reported Of the 117 patients studied, 17 patients had an associated systemic disease. Most of them had diabetes mellitus (14.5%), hypertension was seen in 11.9%, and other systemic disorders were found in 10 patients. (8.5%).

In our study, 89% of patients with a positive culture growth were with gram staining positive, while 11% were gram-negative. Vijay Kinikar et al. reported that of 126 samples cultured from 126 eyes, 74 (58.7%) samples yielded growth on culture, and 52 (41.2%) samples showed no growth. Patients with dacryocystitis had 65.4% and 69.7% of gram-positive cocci, respectively. According to Coden et al. and M J Bharathi et al., most of the clinical samples collected showed no growth 62% in our study. The most commonly isolated organism was MSSA (Methicillin sensitive S.aureus) which was 18%, followed by CONS (coagulase-negative staphylococci), which was 10%, S.pneumoniae amounting to 6% and 4% Pseudomonas aeruginosa respectively. This showed the predominantly present gram-positive organisms.

Few studies reported a very high number of culture-positive samples, who reported that inoculation of tissue samples on culture media instead of pus swabs might have been the cause for more culture-positive rates. Different sample collection strategies may have an impact on total culture-positive levels.

Khevna Patel et al. reported that 83% of 100 clinical samples were culture positive, with the remaining samples showing no growth (17%). Gram-positive and Gram-negative organisms were both isolated. The most prevalent organism found was Staphylococcus aureus (41%) amongst the Gram-positive bacterial isolates, followed by Streptococcus pneumoniae (9%). Among the Gram-negative organisms were Escherichia coli (17%), Pseudomonas aeruginosa (12%), Klebsiella pneumoniae (3%) and Haemophilus spp (1%).

Mandal et al. found similar results in their research of 56 patients in Kolkata, with Gram-positive Staphylococci being the most often implicated bacteria. While Shah and Santani reported in July 2011 from Jodhpur that the cultures included an equal amount of Gram-positive and Gram-negative organisms.

Our investigation discovered that the maximum sensitivity to Vancomycin was observed in gram-positive organisms among the coagulase-negative staphylococcus (100%) and Ciprofloxacin (90%), whereas erythromycin showed only 20% sensitivity. Among S.pneumoniae, the highest sensitivity was observed towards Ciprofloxacin, and Chloramphenicol (84% each), whereas Ampicillin (17%) showed the least sensitivity.

Among MSSA, the highest sensitivity was observed towards Vancomycin (94%), followed by Ciprofloxacin (89%) and Gentamycin (84%), whereas Ampicillin (34%) showed the least sensitivity.

Among Pseudomonas, the highest sensitivity was observed for TZP (Piperacillin-tazobactum), followed by Ciprofloxacin (75%) and CAT (Ceftazidime+Tazobactum) (75%) and the least sensitivity for CAC (Ceftazidime+cloxacillin acid) (25%).

Khevna Patel et al. reported that ciprofloxacin (82.9%) was sensitive in the maximum number of isolates of S.aureus (82.9%). Streptococcus pneumoniae cultures were sensitive to gentamycin (88.9%). The sensitivity among E. coli was for ceftazidime-tazobactam (CAT) (70.6%). Most of the isolates of Paeruginosa showed utmost sensitivity to CAT (83.3%). K. pneumoniae was sensitive to gentamycin (100%), and Haemophilus spp were sensitive to ciprofloxacin (100%). Streptococci were a prevalent cause of persistent dacryocystitis in the pre-antibiotic period. Streptococci, however, have been replaced by Staphylococci with the discovery of potent antibiotics such as penicillin and cephalosporins.

Conclusion

A higher female preponderance was observed in our study, with the left side being affected in most patients. We also observed that most patients hailed from rural areas and belonged to lower socio-economic classes. This is attributed to a lack of hygiene and awareness among low socioeconomic groups. In all the patients showing positive culture growth, Gram-positive organisms were the dominant species. Though the study was done over a longer time span due to the pandemic, the sample size was restricted. As a result, the bacterial isolates and antibiotic sensitivity patterns could not be ascertained. This was a single centre study other etiological factors like viral, fungal and parasitic origin were not studied. As a broad-spectrum antibiotic, we conclude that Ciprofloxacin works against most bacterial isolates.
Funding
This work did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest
There are no conflicts of interest to declare by any of the authors of this study.

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