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## Microbiological aetiology of acute dacryocystitis in hospital Universiti Sains Malaysia, Kelantan Malaysia

Madhusudhan<sup>1</sup>, Yanti Muslikan<sup>1</sup>, Nabilah Ismail<sup>2</sup>, Adil Hussein<sup>1\*</sup>

<sup>1</sup>Department of Ophthalmology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

<sup>2</sup>Department of Medical Microbiology and Parasitology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

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### ABSTRACT

**Objective:** To determine the microbiological aetiology of acute dacryocystitis presented to the Hospital University Sains Malaysia, Kubang Kerian, Kelantan in 5 years duration from 2005 until 2010. **Methods:** This is a retrospective analysis of patients who were clinically diagnosed as acute dacryocystitis from 2005 until 2010 to determine the regional microbiological pattern. The age, gender, predisposing factors, intravenous antibiotics and their microbiological results of discharge from punctal expression were collected. The laboratory procedures were in accordance with the Clinical and Laboratory Standards Institute guidelines. **Results:** There were 23 patients admitted to the eye ward during study period. Females ( $n=17$ ) outnumbered males ( $n=6$ ). Majority of isolates were Gram-positive bacteria ( $n=10$ , 43.4%) followed by Gram-negative isolates ( $n=2$ , 12.9%). The most predominant isolates were *Streptococcus pneumoniae* (*S. pneumoniae*) (21.7%) followed by *Staphylococcus epidermidis* (*S. epidermidis*) (13.0%). **Conclusions:** *S. pneumoniae* was the commonest gram positive organism identified in our study. 47.8% patients showed resistant to initial empirical treatment.

## 1. Introduction

Acute dacryocystitis is heralded by the sudden onset of pain and redness in the medial canthal region which is caused by lacrimal sac distension and inflammation of less than 2 weeks duration. Obstruction of the nasolacrimal duct leading to stagnation of tears in a pathologically closed lacrimal drainage system can result in dacryocystitis[4]. Dacryocystitis is a common problem, yet there are relatively few studies describing the microbiologic characteristics of lacrimal sac infections[1]. Many studies have shown predominance of Gram positive organism[1] as the main culprit, however

there's reason to believe that a changing trend in microbiological spectrum is emerging[2–5]. This could be better understood in regards of aetiological variation of other ocular diseases such as infective keratitis and microbial conjunctivitis[5] based on distinct patterns of geographical variation in accordance to the local climate. Hence, an understanding of the region-wise aetiological agents is utmost importance in the management of these diseases[6]. The purpose of this study was to determine the current bacteriology of acute dacryocystitis in our adult patients and to evaluate regional differences by comparing with other previously reported studies.

## 2. Materials and methods

This is a retrospective, noncomparative and consecutive analysis of patients diagnosed to have acute dacryocystitis at Hospital Universiti Sains Malaysia

\*Corresponding author: Adil Hussien, Department of Ophthalmology, School of Medical Sciences, Universiti Sains Malaysia, Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia.

Tel: 609-7676365

Fax: 609-7653370

E-mail: dradilhus@gmail.com

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(HUSM) Kelantan Malaysia who underwent microbiological evaluation presenting between January 2005 and December 2010. Clinical and microbiological records of patients were reviewed and data were collected. Patients were deemed as having acute dacryocystitis on the basis of a combination of history, physical examination and culture readings. The records were reviewed for age, sex, lacrimal sac side involved, duration of stay, predisposing factors, associated complication and culture results.

### 2.1. Specimen collection and processing

All microbiological specimens were collected either by conjunctival swab or applying pressure over the lacrimal sac and by allowing the purulent material to reflux through the lacrimal punctum. In certain cases specimens were collected from pus discharge following spontaneous bursting of abscess.

All specimens were inoculated onto blood agar, MacConkey agar, chocolate agar and Thayer Martin agar. After incubation, the isolated bacteria were identified using a standard set of biochemical tests and an Analytical Profile Index (API) system if indicated; API 20E, API 20 NE and API STREP (bioMérieux, France). API is a standardized identification system for non-fastidious, Gram-negative and Gram-positive bacteria, which incorporating 21 miniaturized biochemical tests and a database. The reactions are screened according to the Reading Table and the identification is obtained by referring to the API database or using the identification software.

### 2.2. Antimicrobial susceptibility testing

All isolates were subjected to antimicrobial susceptibility testing using disc diffusion method and interpreted according to the Clinical and Laboratory Standards Institute (CLSI) guidelines[7].

Eleven antibiotics commonly used and available at HUSM to treat eye infections were tested which include penicillin (10 units), ampicillin (10  $\mu$ g), amoxicillin-clavulanic acid (20/10  $\mu$ g), cefuroxime (30  $\mu$ g), ceftazidime (30  $\mu$ g), cefotaxime (30  $\mu$ g), gentamicin (10  $\mu$ g), ciprofloxacin (5  $\mu$ g), trimethoprim-sulfamethoxazole (1.25/23.75  $\mu$ g), chloramphenicol (30  $\mu$ g) and erythromycin (15  $\mu$ g). Isolates showing an intermediate level of susceptibility were classified as resistant.

## 3. Result

Between 2005–2010, cultures from 23 adult patients with the diagnosis of acute dacryocystitis were submitted for microbiological studies. The average age of patients studied was 46.5 years (range, 17 to 78 years). There was a predominance of female subjects (17 of 23; 73.9%) compared with male subjects (6 of 23; 26.0%) among our patients. Duration of stay ranged from 3 to 8 d with mean of 5.4 d.

The right lacrimal sac was infected in 13 patients (56.2%) compared to the left which was in 10 patients (43.4%). There was no bilateral involvement. The most common causative factor was nasolacrimal duct obstruction ( $n=14$ ; 60.8%), followed by trauma ( $n=1$ ; 4.34%). Meanwhile no specific causes were identified in 34.7% of patients ( $n=8$ ).

Of the 23 samples, 16 (69.5%) yielded a positive microbial culture. Of these patients with positive culture results, 2 (8.60%) patients had mixed cultures with more than 1 microorganism, and another 1 (4.34%) patient had a culture of normal flora. The remaining 12 (75.0%) patients had pure cultures with a single pathogen. 5 (21.7%) cultures recorded no growth and 2 patients had missing microbiological data. The results of the microbiological data are presented in Table 1.

**Table 1**

Summary of the demographic data on acute dacryocystitis in HUSM from 2005 until 2010.

Demographic data		<i>n</i>
Laterality	Left eye <i>n</i> (%)	10
	Right eye <i>n</i> (%)	13
Mean days of admission		5.4
Predisposing factors		–
Nasolacrimal duct obstruction	Complete	11
	Partial	3
	Trauma-related	1
	No causes identified	8
Associated complication on presentation	Preseptal cellulitis	5
	Orbital cellulitis	1
	Nil	17

The most predominant organism in our study was Gram positive bacteria representing 43.4% (10/23) of the cultures. *Streptococcus pneumoniae* (*S. pneumoniae*) was the most commonly isolated organism ( $n=5$ ; 21.7%), followed by coagulase-negative staphylococci ( $n=3$ ; 13.0%) and *Staphylococcus aureus* (*S. aureus*) ( $n=2$ ; 8.6%). There was only 13.0% (3/23) of the isolates yielded Gram negative bacteria. 8.6% (2/23) of these isolates were reported as *Enterobacter* species, meanwhile the other

was *Pseudomonas* species ( $n=1$ ; 4.34%).

The highest percentage of bacterial isolates were susceptible to cloxacillin ( $n=12$ ; 52.1%), ciprofloxacin ( $n=6$ ; 26.0%) and amoxicillin/clavulanic acid ( $n=5$ ; 21.7%) (Augmentin, GlaxoSmithKline, Research Triangle Park, NC, U.S.A.). Cloxacillin was used prior to culture as an empirical therapy in all patients in this study. Clinical improvement of infection was seen in 12/23 cases (52.1%) with initial empirical antibiotic therapy. Based on culture and sensitivity report, 11/23 (47.8%) cases were resistant to initial empirical therapy and required a change in antibiotics. Of note, 4/23 cases did not show improvement and required a combination of systemic antibacterial agents ( $n=4$ ; 17.3%). Table 2 shows the summary of the use of antibiotics in acute dacryocystitis.

Most predominant organisms in our study was Gram positive bacteria representing 10/23 (43.4%) cultures. *S. pneumoniae* was the most commonly isolated organism ( $n=5$ ; 21.7%), followed by *S. aureus* ( $n=3$ ; 13.0%) and *Staphylococcus epidermidis* (*S. epidermidis*) ( $n=2$ ; 8.6%). There was only 3/23 (13.0%) of the overall isolates yielded Gram negative bacteria. 2 (8.6%) of these isolates were reported as *Enterobacter* species, meanwhile the other was *Pseudomonas* species ( $n=1$ ; 4.34%).

**Table 2**

Microbiological data on acute dacryocystitis presenting to HUSM from 2005 until 2010.

Positive culture	16 (69.5)
<i>S. pneumoniae</i>	5 (21.7)
<i>S. aureus</i>	2 (8.6)
<i>S. epidermidis</i>	3 (13.0)
<i>Enterobacter</i> species	2 (8.6)
<i>Pseudomonas</i> species	1 (4.3)
Mixed growth	2 (8.6)
Normal skin flora	1 (4.3)
No growth	5 (21.7)
Microbiological data not available	2 (8.6)

**Table 3**

Summary on the use of antibiotics on acute dacryocystitis presented to HUSM from 2005 until 2010.

Antibiotic	<i>n</i> (%)
Cloxacillin	12 (52.1)
Ciprofloxacin	6 (26.0)
Augmentin	5 (21.7)
Combined therapy	4 (17.3)

The highest percentage of bacterial isolates were susceptible to cloxacillin ( $n=12$ ; 52.1%), ciprofloxacin

( $n=6$ ; 26.0%) and amoxicillin/clavulanic acid ( $n=5$ ; 21.7%) (Augmentin, GlaxoSmithKline, Research Triangle Park, NC, U.S.A.). Cloxacillin was used prior to culture as an empirical therapy in all patients in this study. Clinical improvement of infection was seen in 12/23 cases (52.1%) with initial empirical antibiotic therapy. Based on culture and sensitivity report 11/23 (47.8%) cases were resistant to initial empirical therapy and required a change in antibiotics. Of note, 4/23 cases did not show improvement and required a combination of systemic antibacterial agents ( $n=4$ ; 17.3%). Table 2 shows the summary of the use of antibiotics in acute dacryocystitis.

#### 4. Discussion

Acute dacryocystitis is a clinical diagnosis distinguished from isolated preseptal cellulitis and mucocoeles by the presence of inflammation and tenderness of the medial canthal region, mucopurulent material in the lacrimal sac, and epiphora from ductal obstruction; fever and leukocytosis are supportive of the diagnosis but not required to be present.

Dacryocystitis can become a life-threatening infection with the potential to progress to orbital cellulitis and/or orbital abscess, meningitis, or cavernous sinus thrombosis[9]. Its typical predisposing factor is nasolacrimal duct obstruction. Obstruction of the nasolacrimal duct from whatever source results in stasis with the accumulation of tears, desquamated cells, and mucoid secretions superior to the obstruction. This creates a fertile environment for secondary bacterial infection. In our study it was also proven that 60.8% cases was related to either complete (47.8%) or partial (13.0%) nasolacrimal duct obstruction.

Incidence of acute dacryocystitis is seen mainly in middle-aged or older people with a 3: 1 female preponderance due to obliteration of the lumen[2,4,6]. Similarly in this study, patients with age greater than 35 years were significantly more in number and the over all female-to-male ratio in this study was 2.9: 1 and female subjects (73.9%) were significantly more in number in acute dacryocystitis than male subjects (26.0%).

The spectrum and the proportion of bacterial pathogens as well as antibiotic susceptibility may differ from region to region[5,6]. Coden *et*

al[8] and Mj Bharati *et al*[6] reported 65.4% and 69.7% of Gram-positive cocci from patients with dacryocystitis respectively. In our study Gram positive-cocci was found in 43.4% of the isolates. Comparing the current study with previous ones reveals that the majority have historically reported a predominance of Gram-positive organisms.

A wide range of published articles revealed *S. aureus* as the main culprit over the years[1,2,6,11]. Surprisingly our data revealed *S. pneumoniae* (21.7%) was highest in the list followed by staphylococcus epidermidis (13.0%). Previously reported prevalence of *S. pneumoniae* was in the figure of 10%[1,6]. Mj Bharati *et al*[6] reported the prevalence of *S. pneumoniae* was found to be higher in chronic cases (67.3%) than in acute cases (32.7%) in South India.

The higher incidence of acute cases in our demographic data shows possibility of changing trends in microbiologic spectrum of dacryocystitis. Other studies meanwhile also suggested increase in frequency of Gram-negative and MRSA infection[10,11]. Gram-negative bacilli represented only 12.8% in our study with *Enterobacter* species seen in 8.6% patients, followed by *Pseudomonas* species (4.3%). Susceptibility to initial empirical treatment of cloxacillin only showed improvement in 52.1% of patients. Importantly however nearly half (11/23, 47.7%) were resistant to initial empirical therapy but susceptible to cephalosporins and amoxicillin/clavulanic acid whereby statistically, these antibiotics are reasonable choices for empirical therapy as its been suggested in other various published studies[1,6,10].

In conclusion, we found that the microbiologic spectrum of dacryocystitis overall is primarily Gram-positive organisms. *S. pneumoniae* was the commonest gram positive organism identified in our study.

This variation is of particular importance in understanding the underlying etiology of typical infectious organisms, and preferred its management. Thus, there are many organisms that may not be sensitive to empiric oral antibiotic therapy, and clinicians must be prepared to change antibiotics[1]. Furthermore, many of these patients will require lacrimal surgery particularly if the nasolacrimal duct obstruction is not addressed.

## Conflict of interest statement

The authors declare that there is no conflict of interest.

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