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A Retrospective Study of Bacterial Keratitis in Bundelkhand Region.

Dr. Jitendra Kumar[1], Dr. Shruti Vaish[2]
[1,2] *(Department of Ophthalmology, M.L.B. Medical College, Jhansi, Uttar Pradesh, India)*

Abstract
Background and Purpose*: Bacterial keratitis is an important cause of corneal blindness world over including India. To determine the incidence and microbiological profile of bacterial keratitis.*
Materials and methods: *A retrospective review of microbiology records of patients presenting with suspected bacterial keratitis seen between July 2015 and March 2016 was performed. Patients with positive bacterial cultures were further analyzed for the type of fungus isolated and associated bacterial pathogens.*
Results: *200 cases (191 patients) of presumed bacterial keratitis were included. P. aeruginosa (41.7%) was the most common pathogen followed by S. aureus.*
Conclusion: *Knowledge of the ''local'' etiology within a region may be valuable in the management of bacterial keratitis is instituting an empirical therapy, especially when facilities for microscopy, cultures and antibacterial susceptibility are not readily available. The baseline information presented will also be helpful in the planning of a corneal ulcer management strategy and for future studies on bacterial keratitis.*

I. Introduction

Bacterial keratitis is a major cause of preventable monocular morbidity and blindness globally particularly in Asia[1-6]. The severity usually depends on the underlying condition of the cornea and the pathogenicity of the infecting bacteria. Hence, bacterial keratitis is an ophthalmic emergency that needs immediate treatment [7,8]. However, antibiotic resistance among ocular pathogens is increasing worldwide [5]. Resistance increases the risk of treatment failure with potentially serious consequences [5].

Bacterial keratitis is rare in the absence of predisposing factors [2,10-12]. Factors, which influence the etiology and pathogenesis of bacterial keratitis are contact lens wear, especially soft lenses worn overnight , ocular surface disease, including: corneal exposure, corneal anaesthesia , corneal decompensation, chronic epithelial defect, neurotrophic keratopathy, e.g. secondary to HSK or diabetes, - tear deficiency (ocular trauma or surgery, including loose or broken sutures immune compromise topical steroid use) and lid margin infection (usually *Staphyloccocal*) [13]. Until recently, most cases of bacterial keratitis were associated with ocular trauma or ocular surface diseases. However, the widespread use of contact lenses has dramatically increased the incidence of contact lens related keratitis [10,11,13,14]. Besides, the pattern of risk factors predisposing to bacterial keratitis varies with geographical
regions [12,13].

A wide range of bacteria can cause bacterial keratitis like Pseudomonas sp. (Gram -ve), Staphylococcus sp. (Gram +ve) ,Streptococcus sp. (Gram +ve) and other Gram -ve organisms (severe contact lens-related infections tend to be Gram -ve)
However, Pseudomonas aeruginosa is the most frequent and the most pathogenic ocular pathogen, which can cause corneal perforation in less than 24 hours after onset [1,13,15]. Besides, the bacteriological profile and their susceptibility as well as resistant patterns vary from place to place and in the same place from time to time [8-10].

II. Material And Methods

A retrospective analysis was performed for all patients seen between July 2015- March 2016 with laboratory proven bacterial keratitis. Documentation of all patients included socio-demographic features, duration of symptoms, predisposing factors, slit lamp biomicroscopy findings, associated ocular conditions,

other systemic diseases, therapy received prior to presentation, visual acuity at the time of presentation, treatment given, response to treatment during follow up and the clinical outcome.

All suspected infectious corneal infiltrates and ulcers were scraped for microbial culture and sensitivity studies before treatment was initiated or changed. Two corneal scrapings were obtained from each case with separate needle by scraping the leading edge and base of the ulcer using short, firm strokes.

One scraping was subjected to Gram stain. The second scraping was inserted into a 2ml brain heart infusion broth. After appropriate incubation, subcultures was made onto sheep blood agar (5%), chocolate agar, manitol salt agar and MacConkey agar (Oxoid, Hampshire, UK) using the standard methods **[16].** The inoculated media plates were incubated at their respective optimal temperatures; such as blood agar and chocolate agar plates were incubated at 37°C with 5-10% CO2. All other media were incubated at 37°C in aerobic conditions. The plates were examined after 24 and 48 hours. Growth, if any, was identified by standard methods [18]. A culture was considered positive when there is growth of the same organism on two or more media.

The bacterial isolates from the corneal scrapings were identified up to species level based on different criteria which include morpho-cultural and biochemical characteristics. *In vitro* antibiotic susceptibility testing of the bacterial isolates was performed by Kirby-Bauer disc diffusion method **[18].** The interpretation of the results was according to the Clinical Laboratory Standards Institute (CLSI) methodology as susceptible, intermediate and resistant.

III. Results

A total of 191 patients (200 eyes) were seen with a corneal infiltrate that was compatible with a diagnosis of bacterial keratitis during the study period. The age of the patients ranged from 6 months to 94 years (mean age 39 years). Sex distribution was close to 1:1 (102 men and 89 women). Predisposing factors of bacterial keratitis are summarised in **[Table 1]**

Table 1 Frequency of predisposing ocular conditions in bacterial keratitis

Factor	**Number of cases**	**Percentage**
Corneal trauma	95	50.3%
Ocular surface disease	41	21.3%
Contact lens wear	29	15%
Corneal surgery	8	4%
None	18	9.4%

Table 2 Organisms isolated in bacterial corneal ulcers.

Bacteria	**No isolated**
Gram positive cocci	
Staphylococcus *aureus*	16
CONS	29
Gram negative bacilli	
Pseudomonas *aeruginosa*	33
Serattia *marnesens*	11
Proteus	3
Klebsiella	1

IV. Discussion

Bacterial keratitis is an ophthalmic emergency that needs immediate institution of treatment. In the absence of laboratory diagnosis the initial therapy is usually broad spectrum intensive treatment. Specific therapy should be based on laboratory data which identify the causative agents and provide antibacterial susceptibility results[19].

We found that corneal trauma is the commonest predisposing factor in our patients. This is consistent with similar studies [19,22]. However, other studies reported contact lens wear [15]. In positive cultures, *P. aeruginosa* (41.7%) was the most common pathogen, which is similar to the results of several other studies, [19,21,23,25-26] followed by *S. aureus* (20.8%). As part of the normal flora of the cornea, *Pseudomonas* grow better in the cornea than in any known culture media [23] and causes infection when mechanical trauma of the

corneal epithelium occurs. It produces exotoxin A, which causes tissue necrosis leading to corneal ulceration [7,16]. However, other similar studies [23-24] reported S. pneumoniae as the most common isolate in bacterial keratitis. One study in India [18] reported P. aeruginosa and S. pneumoniae as a predominant isolates of bacterial keratitis with equal frequency.

Other studies [22,29] reported Staphylococcus spp. as a predominant isolates. This may be due to the variation with the patient population, health of the cornea, geographic location and climate, and also tends to vary somewhat over time [23,27].

In general, the ocular isolates identified in this study were similar to those of many other studies conducted in different areas either nationally or internationally except few differences. Even though the main bacteria known to cause severe keratitis are P. aeruginosa and S. aureus, the prevalence and degree of occurrence of corneal pathogens over others are dependent on the geographic location and on the local population [20].

Resistance and sensitivity based on in vitro testing may not reflect true clinical response to an antibiotic because of the host factors and penetration of the drug [20].

In conclusion, corneal trauma was the most common risk factor for bacterial keratitis. Bacteriological analysis of corneal scrapings showed that P. aeruginosa was the most common isolate followed by S. aureus; and the antibiotic with the greatest coverage was ciprofloxacin. As drug resistance among bacterial pathogens is an evolving process, routine surveillance and monitoring studies should be conducted to provide update and most effective empirical treatment for bacterial keratitis. This study also calls for large scale studies on the bacteriology and risk factors of bacterial keratitis for proper management of the cases.

Based on results from susceptibility testing in this study, most Gram-negatives (84.6%) were susceptible to amikacin, gentamicin, and ciprofloxacin; whereas most Gram-positives (85.7%) were susceptible to vancomycin, ciprofloxacin and doxycycline. The sensitivity of gentamicin against Gram-negative bacilli was 84.6% and the coverage of thisantibiotic for P. aeruginosa was 90.0%. However, study conducted in India [29]reported low sensitivity of gentamicin against P. aeruginosa. Amikacin had high coverage against S. aureus (80.0%; 4 of 5). This is consistent with similar studies conducted in India [20.29]

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