

## Study of causative bacterial agents and risk factors predisposing to bacterial keratitis in Iraq

Munira Ch. Ismael\*                      BSc, MSc, PhD  
 Aida H. Ibrahim\*\*                      BSc, MSc, PhD  
 Raghad L. Kadim\*\*\*                      BSc,  
 Estabrak A. Mubarak\*\*\*\*                      BSc

### Abstract:

**Background:** Infective keratitis is the most common cause of blindness and preventable ocular morbidity worldwide. There are many published series of infective keratitis from both temperate and tropical parts of the world, and management strategies are well established.

**Objective:** The current study was aimed to detect the specific bacteria and predisposing factors that predisposed for the bacterial keratitis.

**Material and methods:** Retrospective study of the hospital records of 40 patients who were diagnosed as bacterial keratitis and treated at the Ophthalmology in-patient department of at Ibn Al- haithum Teaching Hospital from May 2015 to December 2015. Patients who don't have corneal scraping, or culture and sensitivity findings discarded from this study. Predisposing factors, clinical and microbiological data were reviewed. Corneal scrapings were obtained by physicians then were subjected for bacterial culture and biochemical tests.

**Results:** *Pseudomonas aeruginosa* was the most common bacteria isolated at higher percentage 19(47.5%) cases whereas *Klebsiella pneumoniae* isolated at lower percentage 2(5%). The most common risk factors was foreign body in 10 (25%) followed by contact lenses in 8 (20%) patients.

**Conclusion:** Gram negative bacteria were the most frequent bacterial organisms especially *Pseudomonas aeruginosa* isolated from corneal scraping and corneal ulcer was found to be occurring principally by foreign body followed by contact lens wearing.

**Keywords:** Bacterial keratitis, bacterial pathogens of keratitis, risk factors and keratitis.

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### Introduction:

Corneal ulcer (bacterial keratitis) is defined as inflammation of the corneal layers caused by pathogenic organisms. Corneal ulcer in order to occur, a predisposing factors which injured the corneal epithelium must occur prior invasion of the cornea by pathogenic organisms (2). Infective keratitis may be caused by fungi, bacteria, protozoa and virus. The ratio of microbial pathogens causing keratitis differs according to the geographical locations and climate (3-6). Since of its high incidence and a wide complications, bacterial keratitis, is one of the most clearly visible threatening ocular infectious pathologies. The avascular stroma of cornea is potentially susceptible to bacterial infections, and many patients have a poor clinical outcome if aggressive and appropriate therapy is not promptly initiated (7). Bacterial keratitis is rare in the absence of predisposing factors (8,9). Factors which influence the etiology and pathogenesis of bacterial keratitis, vary (10). Until now, most cases of bacterial keratitis were accompanied with ocular trauma or ocular surface diseases. However, the widespread or un controlled use of contact lenses has

dramatically elevated the incidence of contact lens related keratitis (8,10,11). Several factors may compromise the mechanisms of defense of the ocular surface leading to corneal infection. Deficiency in tears, local corneal trauma, obstruction of the nasolacrimal duct, the utilizing of contact lenses, and immunodeficiency may lead to bacterial keratitis(12). The most frequent risk factor for bacterial keratitis followed by blepharitis was corneal trauma. Bacteriological detection of corneal scraping showed that the *P. aeruginosa* was the most frequent isolate followed by *S. aureus* and the antibiotic with the greatest coverage was ciprofloxacin(13).

### **Materials and methods:**

Retrospective analyzed the records of 40 inpatients of all ages with bacterial keratitis who taking treatment in the inpatient departments of Ibn Al- Haithum Teaching Hospitals in the period May 2015 to December 2015 was done. We discarded patients with nonbacterial causes of keratitis, and those didn't exhibited corneal scraping findings. Charts history and examination were focused on the following risk factors: corneal trauma, contact lens wear, ocular surface diseases, surgical complications as well as history of systemic diseases particularly diabetes mellitus. Antibiotic treatment, culture and sensitivity results, steroid drop therapy, and surgical

\* Tropical biological researches unit.

\*\* College of Veterinary Medicine/ Dept. of Microbiology .  
 aomahmed\_2006@yahoo.com

\*\*\*Ibn Al- haithum Teaching Hospital

\*\*\*\* Tropical biological researches unit.

interventions. Corneal scrape was done under magnification of a slit – lamp following dropping of 0.5% proparacain hydrochloride by using sterilized needle syringe cage #23. The obtained material was immediately streak onto the surface of solid media agar such as Blood agar, Chocolate, MacConkey agar and Sabouraud’s dextrose agar of C – shaped streaks and also inoculated onto brain heart agar and broth, all agar plates incubated at 37C° for 24 hour except Sabouraud’s dextrose agar plates incubated at two temperature degrees includes 37C° for 48 hour and room temperature.

**Results:**

Patients were grouped according to their age into three groups: children (< 10 years) 3 (7.1%), adolescents (10-20 years) 5 (10%) and adults (> 20 years) 32(80%). Out of the 40 patients, 22 (55%) were males with male: female ratio 1.4:1. Causative organisms recovered from corneal scrapes were summarized in Table 1: in which *P. aeruginosa* bacterial isolates were isolated at higher percentage 19 (47.5%) followed by *Streptococcus pneumoniae* at 7 (17.5%), *Staphylococcus aureus* was 6 (15.5%) whereas *Staphylococcus epidermidis* had 6 (15%), Two isolates give *Klebsiella pneumoniae* at a percentage (5%).

**Table 1: Bacterial pathogens recovered from corneal scrapes of 40 eyes with bacterial keratitis treated at Ibn Al- Haithum Teaching Hospital**

Name of isolates	Total number of isolates	Percentage
<i>Pseudomonas aeruginosa</i>	19	47.5%
<i>Streptococcus pneumoniae</i>	7	17.5.5%
<i>Staphylococcus aureus</i>	6	15%
<i>Staphylococcus epidermidis</i>	6	15%
<i>Klebsiella pneumoniae</i>	2	5%
<b>Total</b>	<b>40</b>	<b>100%</b>

The relation between causative bacterial pathogens and risk factors that predisposed for bacterial keratitis was explained in details in the Table 2 in which corneal foreign body was the most important and frequent risk factor and this was reported in 12 (30%) patients, seven of them (58.3%) were occurred due to *P. aeruginosa*. Contact lenses were the second most frequent cause seen in 8 (20%) patients, 6 (75%) of them were also due to *P. aeruginosa*. Trauma was founded in 7 (17.5%). Ocular surface diseases were present in sixth (15%) patients and four patients (10 %) for unknown cause and three patients (7.5%) for surgical complications. Systemic risk factors were diabetes mellitus in ten (25%), immune-suppression in three (7.5%) cases. Keratitis involved the right eye in 23(57.5%) and the left eye in 16(42.5%) patients. The location of the infiltrates was central in 25(62%) cases. Hypopyon founded in nine (22.2%) cases. All 40 patients in the current study were initially managed empirically with first line broadspectrum antimicrobial treatment such as ceftazidime + gentamicin or cefalexin + gentamicin.

**Table 2: Bacterial culture results and Risk factors**

Bacterial pathogen / risk factor	trauma	Foreign body	Contact lens	Ocular Surface disease	Unknown cause	Surgical complication	No.
<i>Pseudomonas aeruginosa</i>	2	7	6	2	1	1	19
<i>Streptococcus pneumonia</i>	1	3	1	2	0	0	7
<i>Staphylococcus aureus</i>	2	0	0	1	2	1	6
<i>Staphylococcus epidermidis</i>	1	2	2	1	0	0	6
<i>Klebsiella pneumoniae</i>	1	0	0	0	1	0	2
<b>Total</b>	<b>7</b>	<b>12</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>3</b>	<b>40</b>

**Discussion:**

Infective keratitis rarely occur in normal eyes without any predisposing factors. The ocular surface is normally protected from microbial invasion through an intricate biochemical and anatomic relationship between the cornea, conjunctiva, lacrimal secretory apparatus and precorneal tear film, and the eye lids. Any disruption of the same may results in less effective defense against infection and such risk factors may vary with occupation. An association has been shown between the type of risk factor and microbial aetiology infection(12). The non traumatic risk factors and the use of the contact lenses predispose to bacterial keratitis, while the corneal injury due

vegetative matter predispose to fungal keratitis(13). Most of bacterial corneal ulcers were due to gram positive organisms as found in other countries(14). However, in this study 52.5% of bacterial corneal ulcers were due to gram negative organisms. *P. aeruginosa* is the most common gram negative bacteria isolated and is also the most common organisms responsible for contact lens induced corneal ulcer. In one of the study, *Pseudomonas* was responsible for nearly two thirds of the culture positive cases (15). Gram negative bacteria are known to be associated with soft contact lens wear (16). The harshness of the climate in Iraq and improper care in the handling of contact lenses may have contributed to the occurrence of bacterial keratitis among

our patients. Foreign body is the most frequent risk factor of corneal ulcerata percentage 25% cases. This is consistent with study made in Malaysia (2) but different from the results of studies done in the Western countries where it was found that contact lens wear was the main risk factor (15,17). Contact lens-induced corneal ulcers only constitute 20% of the all cases in the current study. However, this figure will be expected to elevate in the next years in Iraq as more people who are active and having modern life style are using it. The other risk factors identified in the current study were: trauma, ocular surface disease, unknown causes, and surgical complications.

**Conclusions:**

*Pseudomonas aeruginosa* and, to a lesser extent, *Streptococcus pneumonia* and *Staphylococci* spp. were the most causative organisms in our study, and the foreign body was the principle risk factor predisposing for bacterial keratitis. Adequate ocular prevention, knowledge of the microbial pattern in given clinical practice, and prompt choice of appropriate antibiotics constitute the management of bacterial keratitis that is caused by ocular injury or contact lens wear.

**Author contribution:**

Munira Ch. Ismael, Dr. Aida H. Ibrahim: study conception, study design acquisition of data analysis and critical revision.  
Raghad L. Kadim: collecting of samples.  
Estabrak A. Mubarak: lab investigations

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