Infect Chemother. 2021 Jun;53(2):381-383
https://doi.org/10.3947/ic.2021.0023
pISSN 2093-2340·eISSN 2092-6448

ic Infection & Chemotherapy

Correspondence



# Risk of *Klebsiella pneumoniae* Endogenous Endophthalmitis during Bacteremia: Implications for Screening

**Riyaz Bhikoo [1], Paul Robert Ingram [2,3,4], William Cunningham [1], Pavindran Gounder [1], Benjamin Host [1], and Fred K. Chen [1,5,6]**

[1]Department of Ophthalmology, Royal Perth Hospital, Perth, Western Australia, Australia
[2]School of Pathology and Laboratory Medicine, University of Western Australia, Perth, Australia
[3]Department of Microbiology, PathWest Laboratory Medicine, Fiona Stanley Hospital, Perth, Western Australia, Australia
[4]Department of Infectious Diseases and Microbiology, Royal Perth Hospital, Perth, Western Australia, Australia
[5]Centre for Ophthalmology and Visual Science (incorporating Lions Eye Institute), The University of Western Australia, Perth, Western Australia, Australia
[6]Department of Ophthalmology, Perth Children's Hospital, Perth, Western Australia, Australia



**Received:** Mar 3, 2021
**Accepted:** Mar 25, 2021

**Corresponding Author:**
**Paul Robert Ingram, MD**
Microbiology Department, PathWest Laboratory Medicine, Fiona Stanley Hospital,11 Murdoch Drive, 6150 Perth, Western Australia, Australia.
Tel: +61 8 92242244
Fax: +61 8 92241989
E-mail: paul.ingram@health.wa.gov.au



**ORCID iDs**
Riyaz Bhikoo
https://orcid.org/0000-0002-0463-2123
Paul Robert Ingram
https://orcid.org/0000-0001-7733-7072
William Cunningham
https://orcid.org/0000-0002-0936-5642
Pavindran Gounder
https://orcid.org/0000-0002-2184-9535
Benjamin Host
https://orcid.org/0000-0001-5733-873X
Fred K. Chen
https://orcid.org/0000-0003-2809-9930

**Conflict of Interest**
No conflicts of interest.

Dear Editor,

Endogenous endophthalmitis is caused by bacteremic spread of pathogens to the posterior segment of the eye. *Klebsiella pneumoniae* is the most frequent bacterial cause of endogenous endophthalmitis [1]. In keeping with animal models in which rapid destruction of retinal photoreceptors occurs as early as 24 - 48 hours after inoculation, *K. pneumoniae* endogenous endophthalmitis (KLEE) ocular outcomes are poor, particularly if diagnosis and treatment are delayed [2, 3]. In this regard, the role of ocular screening of asymptomatic patients with *K. pneumoniae* bacteremia is debated [4].

After obtaining the relevant ethics committee approvals (identifier numbers 14299/7985), we retrospectively identified state-wide public hospital KLEE cases via discharge summary International Classification of Diseases codes. KLEE was defined as culture of *K. pneumoniae* from an intraocular specimen, or intraocular inflammation in conjunction with *K. pneumoniae* bacteremia. By cross referencing cases against a state-wide public pathology database, we calculated the risk of KLEE during *K. pneumoniae* bacteremia, with or without concurrent liver abscess. *K. pneumoniae* bacteremia and liver abscess were defined as culture of *K. pneumoniae* from a blood or hepatic specimen respectively.

Between 2006 and 2020, we identified 11 cases of KLEE amongst 2,689 episodes of *K. pneumoniae* bacteremia (**Table 1**), giving a risk of 0.4%, which increased to 9.0% (4/44) if the patient had a concurrent liver abscess. Four patients (36%) did not report ocular symptoms at the time of presentation and for these patients (including two obtunded patients), recognition of endophthalmitis was delayed by at least 48 hours. For patients whose presentation did include ocular symptoms, intravitreal antimicrobials were administered within 24 hours.

Published rates of KLEE amongst patients with *Klebsiella* bacteremia range from 1.0% in New Caledonian [5] to 3.8% in Singapore [2]. Whilst KLEE is an emerging syndrome within Australia [3], the low frequency of hypervirulent clones (K1/K2 subtypes) amongst Australian

**Author contributions**

Conceptualization: RB, PG, FC. Data curation: RB, PG, PI. Formal analysis: RB, PI. Investigation: RB, BH. Methodology: RB, WC, FC. Software: RB, PI. Validation: RB, PI. Writing - original draft: RB, PI, FC. Writing - review & editing: WC, PG, BH.

**Table 1.** Patient, treatment and clinical outcome data for patients with *Klebsiella pneumoniae* endogenous endophthalmitis (n = 11)

| | |
|---|---|
| Age (years) (median, IQR) | 61 (37 - 82) |
| Male gender (n, %) | 8 (73%) |
| South East Asian ethnicity (n, %) | 6 (55%) |
| Diabetic (n, %) | 5 (46%) |
| Examination findings at presentation | |
| Visual acuity: hand motion or worse (n, %) | 10 (91%) |
| Conjunctival infection (n, %) | 11 (100%) |
| Hypopyon (n, %) | 7 (64%) |
| Proptosis (n, %) | 5 (46%) |
| Elevated IOP (n, %) | 1 (9%) |
| Vitritis (n, %) | 11 (100%) |
| Concurrent organ systems involved | |
| Hepatic (abscess) (n, %) | 9 (82%) |
| Respiratory (pneumonia) (n, %) | 6 (55%) |
| Genitourinary (abscess) (n, %) | 3 (27%) |
| Central nervous system (meningitis/encephalitis) (n, %) | 2 (18%) |
| Treatment | |
| Systemic antimicrobials (n, %) | 11 (100%) |
| Intravitreal antimicrobials (n, %) | 10 (91%) |
| Vitrectomy | |
| Primary (n, %) | 1 (9%) |
| Secondary (n, %) | 1 (9%) |
| Outcomes | |
| Evisceration or Enucleation (n, %) | 6 (55%) |
| Visual acuity: hand movements or worse (n, %)[a] | 4 (36%) |
| Inpatient mortality (n, %) | 0 (0%) |

[a]At most recent outpatient follow up assessment.
IQR, interquartile range; IOP, intra ocular pressure.

*K. pneumoniae* bacteremia isolates may explain the lower risk of KLEE amongst our cohort [6]. In keeping with other studies, most of our patients had epidemiological links to Asia, were diabetic, and visual acuity outcomes were poor [7].

More than one third of our patients did not report ocular symptoms at the time of presentation. As early diagnosis and therapy improves visual outcomes [7], ophthalmologic screening of bacteremic patients without (or with unrecognised) ocular symptoms may off set delays in recognition of KLEE. However universal ophthalmologic review during *Klebsiella* bacteremia may detect asymptomatic retinal lesions of uncertain significance in 43% of patients [8]. Thus, contrary to published recommendations in favour of universal ocular screening for patients with *Klebsiella* sepsis [9] (akin to standard practice for candidemia in which the risk of endophthalmitis is 10 - 37% [10]), we conclude that routine ophthalmologic review for the purposes of early detection of endophthalmitis be limited to bacteremic patients with concurrent liver abscesses or other predisposing factors such as infective endocarditis [4]. Finally, as severity of illness is a risk factor for ocular spread [9], patients obtunded due to overwhelming *Klebsiella* sepsis should be considered for routine ophthalmological evaluation.

## REFERENCES

1. Jackson TL, Eykyn SJ, Graham EM, Stanford MR. Endogenous bacterial endophthalmitis: a 17-year prospective series and review of 267 reported cases. Surv Ophthalmol 2003;48:403-23.
PUBMED | CROSSREF

2. Sng CC, Jap A, Chan YH, Chee SP. Risk factors for endogenous Klebsiella endophthalmitis in patients with *Klebsiella* bacteraemia: a case-control study. Br J Ophthalmol 2008;92:673-7.
PUBMED | CROSSREF
3. Odouard C, Ong D, Shah PR, Gin T, Allen PJ, Downie J, Lim LL, McCluskey P. Rising trends of endogenous *Klebsiella pneumoniae* endophthalmitis in Australia. Clin Exp Ophthalmol 2017;45:135-42.
PUBMED | CROSSREF
4. Nagasako Y, Inagaki K, Serizawa S, Hamada M, Echizen N, Takahashi O, Deshpande GA, Ohkoshi K. Risk factors associated with retinal lesions resulting from widespread systemic infection. Ophthalmol Retina 2017;1:333-8.
PUBMED | CROSSREF
5. Melot B, Colot J, Guerrier G. Bacteremic community-acquired infections due to *Klebsiella pneumoniae*: clinical and microbiological presentation in New Caledonia, 2008-2013. Int J Infect Dis 2015;41:29-31.
PUBMED | CROSSREF
6. Chang L, Bastian I, Warner M. Survey of *Klebsiella pneumoniae* bacteraemia in two South Australian hospitals and detection of hypermucoviscous phenotype and magA/rmpA genotypes in *K. pneumoniae* isolates. Infection 2013;41:559-63.
PUBMED | CROSSREF
7. Lee S, Um T, Joe SG, Hwang JU, Kim JG, Yoon YH, Lee JY. Changes in the clinical features and prognostic factors of endogenous endophthalmitis: fifteen years of clinical experience in Korea. Retina 2012;32:977-84.
PUBMED | CROSSREF
8. Neudorfer M, Barnea Y, Geyer O, Siegman-Igra Y. Retinal lesions in septicemia. Am J Ophthalmol 1993;116:728-34.
PUBMED | CROSSREF
9. Bouza E, Cobo-Soriano R, Rodríguez-Créixems M, Muñoz P, Suárez-Leoz M, Cortés C. A prospective search for ocular lesions in hospitalized patients with significant bacteremia. Clin Infect Dis 2000;30:306-12.
PUBMED | CROSSREF
10. Brooks RG. Prospective study of *Candida* endophthalmitis in hospitalized patients with candidemia. Arch Intern Med 1989;149:2226-8.
PUBMED | CROSSREF