

# Treatment Outcomes of Post Cataract Surgery Endophthalmitis in Kingdom of Bahrain

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## ABSTRACT

**Purpose:** Endophthalmitis after cataract surgery is an uncommon but extremely feared and devastating complication, which requires prompt recognition and appropriate treatment in order to prevent a poor visual outcome. This study was conducted to evaluate the incidence, clinical features, causative organisms, and the final visual outcomes associated with endophthalmitis post cataract surgery.

**Methods:** This is a retrospective study of all eyes with endophthalmitis within 6 weeks of cataract surgery between January 1, 2014 till December 31, 2018, and with at least 3 months follow-up.

**Results:** The 5-year incidence of acute-onset endophthalmitis after cataract surgery was 293.9 per 100,000 (0.29%); 263.5 per 100,000 (0.26%) for phacoemulsification and 545 (0.54%) for ECCE ( $P= 0.294$ ). The main presenting features were pain (100%), corneal edema (90%) and vitritis (90%). The culture reports showed 2 cases of *Staphylococcus epidermidis*, 2 cases of *Streptococcus* species, 1 case of *Candida*, 1 case of *Enterococcus*, and 1 case of gram-negative bacilli. Of the 10 patients, 2 (20%) had a final best corrected visual acuity (BCVA) of 20/200 or better, 3 (30%) had visual acuity of counting fingers, 3 (30%) had a final BCVA of light perception and 2 (20%) had a final BCVA of NPL.

**Conclusion:** The final visual outcomes of post cataract surgery endophthalmitis are generally poor and only 20% of the eyes achieved a BCVA  $\geq 20/200$ . Prevention and care of post cataract endophthalmitis play a key role in the prevention and treatment of blindness.

**Keywords:** Endophthalmitis, Extracapsular Cataract Extraction, Phacoemulsification, Microbiology, Visual Outcome, kingdom of Bahrain

## INTRODUCTION

Cataract surgery is one of the most commonly performed procedure worldwide. Endophthalmitis after cataract surgery is an uncommon but extremely feared and devastating complication, which requires prompt recognition and appropriate treatment in order to prevent a poor visual outcome<sup>1</sup>. The incidence of endophthalmitis following cataract surgery varies in different studies (0.02-0.68)<sup>2-4</sup>. In Saudi Arabia, the 10-year incidence of acute-onset endophthalmitis after cataract surgery was 0.068%<sup>5</sup>. Although the technical refinement in the past two decades were justified from a safety standpoint and have led to simplified postoperative care and faster visual recovery, recent reports in the literature indicate that the incidence of post cataract endophthalmitis might be increasing with the use of clear corneal incision cataract extraction<sup>4,6,7</sup>. The visual outcome of post cataract surgery endophthalmitis is generally poor. Studies by Lalitha et al.<sup>8</sup> and the Wu et al.<sup>9</sup> found that final visual acuities  $\geq 20/40$  achieved in 29.4% and 21%, respectively. On the other hand, studies by the Ding et al.<sup>10</sup> and the Al-Mezaine et al.<sup>5</sup> found that final visual acuities  $\geq 20/40$  achieved in 6.5% and 10% of eyes with post cataract surgery endophthalmitis, respectively. Factors influencing treatment outcome are visual acuity at presentation, bacterial culture results, and the type of treatment<sup>11</sup>.

There is no consensus on whether a primary vitrectomy should be done as initial treatment for endophthalmitis after cataract surgery<sup>12</sup>. The Endophthalmitis Vitrectomy Study (EVS) advocates primary vitrectomy only in patients with visual acuity as bad as light perception, while Kuhn and associates advocate early vitrectomy in more

patients<sup>11-13</sup>. Causative organism is considered a major determinant in treatment results, however there are only few data about the outcome of endophthalmitis after cataract surgery in relation to the microbial culture<sup>14,15</sup>. World literature on endophthalmitis revealed that coagulase negative *Staphylococci* is the most common causative organism for post-cataract endophthalmitis<sup>11</sup>.

Cataract surgery is one of the most commonly performed surgical procedures in the kingdom of Bahrain. Data from Middle Eastern countries including Bahrain on cataract surgery related complications are inadequate. Although several large series on the epidemiology and incidence of endophthalmitis have been conducted worldwide, it is unclear whether the results of studies from Northern America and Europe are applicable to the other populations and settings in other region. Therefore, we have conducted this study to evaluate the incidence, clinical features, causative organisms, and final visual outcomes associated with endophthalmitis after cataract surgery in the kingdom of Bahrain.

## MATERIALS AND METHODS

This is a retrospective study of all eyes that were diagnosed as having endophthalmitis within 6 weeks of cataract surgery between January 1, 2014, till December 31, 2018, and with at least 3 months follow-up in Salmaniya Medical Complex (SMC) Kingdom of Bahrain. Approval was obtained from SMC health research committee, Ministry of Health –Bahrain and the study followed the principles of the Declaration of Helsinki.

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Only patients who had standard Extracapsular Cataract Extraction (ECCE) or clear corneal phacoemulsification with or without intraocular lens (IOL) implantation were included. Data included patients operated in SMC, as well as referred patients who were operated elsewhere within Bahrain. Also included were patients who had surgery that began as clear corneal phacoemulsification but was converted to ECCE. Exclusion criteria were delayed onset endophthalmitis infection (diagnosed more than 6 weeks after surgery) and cataract surgery in combination with other procedures including penetrating keratoplasty, pars plana vitrectomy (PPV), and trabeculectomy.

Data were collected by reviewing medical and electronic records of 10 patients diagnosed and admitted with presumed endophthalmitis in SMC. The data were analyzed for demographic details including age, sex, general health (e.g. diabetes mellitus, systemic hypertension), presence of ocular disease, preoperative visual acuity, type of cataract surgery, type of IOL, surgical complications, time to diagnosis, microbiology results, type of treatment instituted, length of follow-up, and final visual acuity.

Diagnosis of endophthalmitis was performed clinically based on symptoms of pain and/or worsening visual acuity and with signs of prominent inflammatory anterior chamber reaction or hypopyon, vitreous cellular reaction or marked vitreous opacification in B-scan ultrasonography. Initial treatment was administered to these patients in accordance with the EVS Group Guidelines.<sup>11</sup> Briefly, PPV and vitreous sampling for smear and culture with a conjunction of intravitreal antibiotics injection were considered for patients with visual acuity of light perception. All patients presenting with a visual acuity of hand motions (HM) or better had initial vitreous aspiration and intravitreal antibiotics. Patients who presented with a visual acuity of light perception only and with corneal involvement that precluded PPV also had vitreous aspiration and intraocular antibiotics. After the vitreous sample was withdrawn, 0.1ml aliquots of intravitreal vancomycin (1.00mg in 0.1ml), ceftazidime (2.25mg in 0.1ml), and dexamethasone (400.00µg) were administered. Topical fortified vancomycin (5%), ceftazidime (5%), prednisolone eye drops (1%), and tropicamide eye drops (1%) were started and tapered gradually at 3-day intervals depending on the response to treatment.

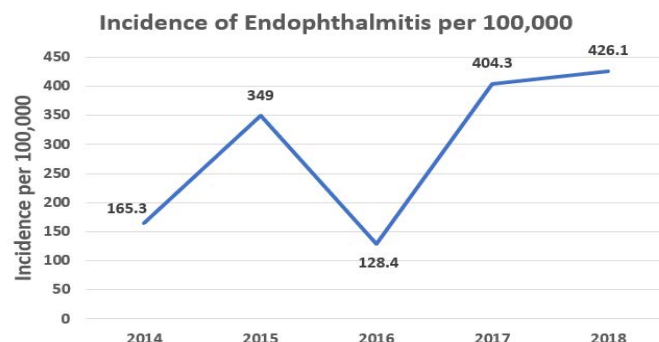
Specimens were stained using Gram and Giemsa stains. Samples were inoculated in blood agar (aerobic and anaerobic), chocolate agar, and thioglycolate broth, all incubated at 37°C. In addition, room-temperature cultures on Sabouraud agar without cycloheximide were used to grow fungi. A positive culture was defined as growth if the same organism grew on two or more media or had confluent growth on at least one solid medium. Any growths suspected to be contaminants by microbiology staff were excluded from the study.

Analysis was undertaken using SPSS. Fisher's exact test was used to determine the statistical significance of the 5-year incidence of acute onset endophthalmitis after cataract surgery between phacoemulsification and ECCE. P values of < 0.05 were considered statistically significant.

## RESULTS

From January 1, 2014, through December 31, 2018, 3403 cataract surgeries were performed at SMC. These included 3036 cases (89.2%) of phacoemulsification and 367 cases (10.8%) of ECCE. Over this 5-year period, the proportion of phacoemulsification to ECCE procedures increased from 84.8% in 2014 to 92.9% in 2018, whereas the proportion of ECCE to phacoemulsification procedures decreased from 15.2% in 2014 to 7.1% in 2018.

The 5-year incidence of acute-onset endophthalmitis after cataract surgery was 293.9 per 100,000 (0.29%): 263.5 per 100,000 (0.26%) for phacoemulsification and 545 per 100,000 (0.54%) for ECCE (P= 0.294, Fisher exact test). Figure 1 shows the incidence of endophthalmitis by year.



**Figure 1:** Annual incidence rate of acute-onset endophthalmitis after cataract surgery

The mean age of the 10 patients (7 males, 3 females) with acute-onset endophthalmitis after cataract surgery was 68.5 (ranges from 38 to 89 years). The mean time between cataract surgery and diagnosis of endophthalmitis was 20 days (ranges from 1 to 41 days). Endophthalmitis occurred in 5 right eyes (50%) of 10 cases. Of the 10 patients with endophthalmitis, 5 (50%) had diabetes mellitus, 1 (10%) had pseudoexfoliation, and 2 (20%) had glaucoma. Table 1 shows the clinical characteristics and outcomes of the patients.

**Table 1:** Clinical characteristics of cases with acute-onset endophthalmitis after cataract surgery (n=10)

Characteristics	No.	%
<b>Demographics</b>		
Age (years) (mean)	68.5	
<b>Gender</b>		
Female	3	30
Male	7	70
<b>Time from surgery to presentation</b>		
< 3 days	3	30
4-7 days	0	0
> 7 days	7	70
<b>Surgical procedures</b>		
<b>Operated eye</b>		
Right	5	50
Left	5	50
<b>Procedure type</b>		
Phacoemulsification	8	80
ECCE	2	20
<b>Type of IOL</b>		
PC Acrysoft	6	60
PC PMMA	4	40
<b>Intraocular lens inserted</b>		
Yes	10	100
No	0	0
<b>Posterior capsule rupture</b>		
Yes	4	40
No	6	60

ECCE: Extracapsular Cataract Extraction, PC Acrysoft IOL: Posterior chamber Acrylic foldable intraocular lens, PC PMMA: posterior chamber poly (methyl methacrylate) (PMMA) intraocular lens.

Of the 10 patients who developed acute-onset endophthalmitis after cataract surgery, 8 (80%) had clear corneal phacoemulsification (1 case converted to ECCE) and 2 (20%) had ECCE. Posterior capsule rupture and vitreous loss occurred in 4 patients (40%), all of them had anterior vitrectomy intraoperatively and 1 had a dropped lens nucleus. The number and type of IOLs implanted were as follows: 6 acrylic foldable posterior chamber and 4 poly (methyl methacrylate) (PMMA) posterior chamber.

Of the 10 patients, 4 (40%) presented within 2 weeks of cataract surgery. In general, the presenting visual acuity was poor; 1 patient presented with a visual acuity better than 20/200 and 9 (90%) presented with visual acuity of < 20/200 (Table 2). The main presenting clinical features were ocular pain (100%), corneal edema (90%) and vitritis (90%) (Table 3).

Intravitreal medications administered at the time of endophthalmitis diagnosis included ceftazidime 2.25 mg/0.1 mL, vancomycin 1.00 mg/0.1 mL in 6 patients (60%). Primary PPV was performed in 4 patients, and evisceration was performed in 1 patient who presented with NPL vision.

**Table 2:** Presenting Visual acuities of patients with acute-onset endophthalmitis after cataract surgery

Presenting visual acuities	No	%
≥20/200	1	10
CF	4	40
HM	3	30
PL	1	10
NPL	1	10

**Table 3:** Presenting clinical features of patients with acute-onset endophthalmitis after cataract surgery

Presenting clinical features	No.	%
Ocular Pain	10	100
Corneal edema	9	90
Vitritis	9	90
Hypopyon	6	60
Lid edema	3	30
Chemosis	1	10

Microorganisms were isolated in 7 (70%) of the 10 patients by culturing. The culture reports showed 2 cases of Staphylococcus epidermidis, 2 cases of Streptococcus species (1 S. viridans and 1 S. oralis), 1 case of Candida, 1 case of Enterococcus, and 1 case of gram negative bacilli (Table 4).

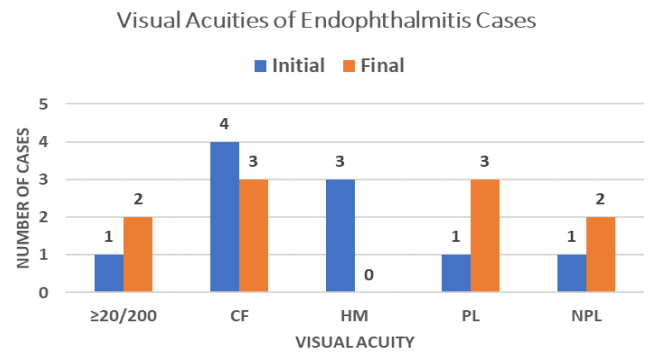
**Table 4:** Microbiological spectrum of patients with acute-onset endophthalmitis after cataract surgery

Culture results	No.	%
Negative Culture	3	30
Staphylococcus epidermidis	2	20
Streptococcus viridans	1	10
Streptococcus oralis	1	10
Candida	1	10
Enterococcus	1	10
Gram negative bacilli	1	10

The final visual outcome was generally poor. Of the 10 patients, 2 (20%) had a final best corrected visual acuity (BCVA) of 20/200 or better, 3 (30%) had visual acuity of counting fingers, 3 (30%) had a final BCVA of light perception and 2 (20%) had a final BCVA of NPL, 1 case resulted in evisceration (Table 5). The endophthalmitis case in eye that was eviscerated was caused by a virulent organism. Endophthalmitis after ECCE occurred in 2 eyes, of these, both had a final BCVA of counting fingers. Of the endophthalmitis cases that had a final BCVA of HM or worse, all these cases had phacoemulsification. The effect of standard treatment on visual acuity of patients with acute-onset endophthalmitis after cataract surgery is shown in Figure 2.

**Table 5:** Final visual acuities of patients with acute-onset endophthalmitis after cataract surgery

Final visual acuities	No	%
≥20/200	2	20
CF	3	30
HM	0	0
PL	3	30
NPL	2	20



**Figure 2:** Effect of standard treatment on visual acuity of patients with acute-onset endophthalmitis after cataract surgery

**DISCUSSION**

Endophthalmitis has been studied in great details in the past with various publications from western countries<sup>1,3,6</sup> and China<sup>10</sup> as well as the Indian subcontinent<sup>4,8</sup>. The studies aimed at evaluating the profile of all cases of post-cataract surgery endophthalmitis patients with emphasis on the clinical presentation, microbiological profile, treatment outcomes, and predictors of good visual outcome.

This study, to the best of our knowledge, represents an attempt to fill the void in the literature on endophthalmitis following cataract surgery in the Kingdom of Bahrain. The reported incidence of post cataract surgery endophthalmitis has varied, ranging from <0.05 to >0.3%<sup>3,4,6</sup>. The incidence of endophthalmitis after cataract surgery in this study of 293.9 per 100,000 (0.29%) is comparable to these earlier reported figures. Similarly, posterior capsule rupture shows the high association with endophthalmitis reported in other studies<sup>3,6</sup>. In our study, the male predilection and the age range from 38-89 years (mean, 68 years) are similar to that reported in previous studies<sup>11,14</sup>. Moreover, the occurrence of ocular pain as a presenting feature in 100% and corneal involvement in 90% of our cases are comparable to previously reported elsewhere<sup>5,11,16</sup>. Gupta et al.<sup>16</sup> and kamalarajah et al.<sup>1</sup> have reported a presenting VA < 20/200 in the majority ( 92.75% and 85%, respectively) of the patients which is similar to our study.

The EVS study<sup>11</sup> has reported a 69.3% culture positive rate from biopsies/taps in post-phacoemulsification endophthalmitis and gram-positive bacteria were the most common cause in the majority of these cases. Coagulase -negative Staphylococcal isolates were the most common. Other species involved include Staphylococcus aureus, Streptococci, Enterococci, and gram-positive rods such as Bacillus. Gram-negative bacteria were isolated from a relatively low number of post-operative endophthalmitis cases (6%).

The culture positive rate of 70% reported in our study is comparable to other reported figures<sup>10,11,16</sup>. The microbiological results from SMC revealed coagulase negative staphylococci as the most common causative organism and this also is in concordance with the world literature on endophthalmitis<sup>5,10,11,16</sup>.

The therapeutic success of treatment of post-operative endophthalmitis depends largely on accurate and prompt diagnosis. The EVS reported that 53% of patients achieved 20/40 or better VA in western countries<sup>11</sup>. However, similar study in a Middle Eastern country reported only 10% of patients having VA better than 20/40.<sup>5</sup> In the same study, clear corneal phacoemulsification had a 1.73-fold higher risk for acute endophthalmitis than ECCE, however post ECCE endophthalmitis was associated with worst visual outcome.

In our study, the visual outcome after endophthalmitis was generally poor, with only 20% of eyes achieving a final BCVA equal or better than 20/200. Of the endophthalmitis cases that had a final BCVA of HM or worse, all these cases had phacoemulsification. It is believed that the stability and integrity of the clear corneal incision play critical roles in the increased frequency of post cataract endophthalmitis<sup>5,17</sup>.

Similar to the results reported in Gower et al<sup>18</sup> and Lalwani et al<sup>14</sup> studies, the results from the present study shows that a better presenting visual acuity results in a better final visual outcome. Furthermore, similar to the EVS study<sup>11</sup>, predisposing factors for poor visual outcomes in our study are poor presenting visual acuity and type of organism on culture.

Delay in presentation and diagnosis shall lead to delay in the management which may also lead to permanent damage to ocular tissue and result in poor visual outcomes<sup>11</sup>. Proper patient education about the operative complications, symptoms of potential complications especially postoperative endophthalmitis, rapid and appropriate diagnosis and management by the surgeon, are all essential for the improvement of prognosis<sup>2</sup>.

Prophylactic antibiotics can modify the incidence and severity of postoperative endophthalmitis. Intracameral cefuroxime 1 mg at the end of cataract surgery has been demonstrated to decrease the incidence of endophthalmitis by five-fold and was advocated as a routine prevention according to the ESCRS<sup>4</sup>.

Although, the data were collected in this study meticulously, the retrospective non-comparative design of study is an obvious limitation. However, we believe that this report from a large tertiary referral unit, which includes data gathered over the course of 5 years, reflects the current scenario of endophthalmitis in Kingdom of Bahrain.

This study highlights the incidence, clinical features, causative organisms and visual outcomes of endophthalmitis after cataract surgery in kingdom of Bahrain. Prevention and care of post cataract endophthalmitis play a key role in the prevention and treatment of blindness and deserve greater investigations and investment in the future.

## CONCLUSION

**Our study confirmed results of previous studies that document the reduced visual potential after acute post cataract endophthalmitis. With the continued innovations in cataract surgery and treatment of endophthalmitis, and the increasing resistance of microbes, further evaluation of incidence, characteristics, and treatment outcomes of endophthalmitis is required with larger prospective studies.**

**This will allow the ministry of health to develop a comprehensive management strategy for the prevention and treatment of post-operative endophthalmitis, thus prevention and treatment of blindness in Bahrain.**

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**Competing Interest:** None.

**Sponsorship:** None.

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**Ethical Approval:** The ethical clearance of the Salmaniya Medical Complex health research committee, Ministry of Health –Bahrain was obtained.

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