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PREDICTORS OF POOR VISUAL OUTCOMES IN PATIENTS WITH ENDOPHTHALMITIS AT THE PROVINCIAL REFERRAL HOSPITAL IN BANDA ACEH: A RETROSPECTIVE STUDY

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ABSTRACT

Introduction: Endophthalmitis is a severe intraocular infection that can cause irreversible visual loss. Data from Indonesia remain limited. This study described the clinical characteristics of infectious endophthalmitis and assessed factors associated with visual outcomes at a tertiary hospital in Aceh, Indonesia.

Methods: This retrospective study included 94 patients diagnosed with infectious endophthalmitis at Dr. Zainoel Abidin General Hospital, Banda Aceh, between December 2021 and November 2024. Demographic, clinical, microbiological, management, complication, follow-up, and visual acuity data were obtained from medical records. Visual outcomes were classified as poor (<1/60) or good (≥1/60). Patients lost to follow-up were reported separately. Multivariable logistic regression was performed among patients with available final visual acuity.

Result: The mean age was 52.8 years, and 63.8% were male. Exogenous endophthalmitis accounted for 93.6% of cases, most commonly following cataract surgery (47.9%). At presentation, 88.3% had VA <1/60. Vitreous culture was not performed in 42.6%, while 31.9% showed no bacterial growth; Pseudomonas spp. were the most frequently identified organisms. Pars plana vitrectomy (PPV) was performed in 55 patients (58.5%). Thirteen patients (13.8%) were lost to follow-up. Among 81 patients with available final visual acuity, 49 (60.5%) had poor and 32 (39.5%) had good visual outcomes. Initial VA <1/60 was significantly associated with higher odds of poor visual outcome (adjusted OR = 15.542, 95% CI: 1.607–150.360; p = 0.018). Other variables were not significantly associated with visual outcome.

Conclusion: Poor presenting visual acuity was associated with poorer visual outcomes. Most patients presented with severe visual impairment, and post-cataract surgery was the most common etiology.

Keywords: Endophthalmitis, Visual Acuity, Pars Plana Vitrectomy, Visual Outcome, Indonesia

Introduction

Endophthalmitis is a vision-threatening intraocular infection characterized by intense inflammation of the vitreous and aqueous humours. Although relatively uncommon, the condition is considered an ophthalmic emergency because it may progress rapidly to irreversible blindness if not diagnosed and treated promptly. The most frequent cause of exogenous endophthalmitis worldwide is cataract surgery, with a recent meta-analysis reporting a pooled incidence of 0.092%. The incidence has shown a decreasing trend over time, from 0.097% before 2000 to 0.089% between 2000 and 2010, and 0.063% after 2010.[1] In parallel, the number of intravitreal injections for retinal vascular diseases has increased markedly in recent years. Although the reported incidence of post-injection endophthalmitis is low (approximately 0.039% or 1 in 2,500 injections), this route now represents a significant and growing cause of infectious endophthalmitis.[2] In addition, traumatic endophthalmitis accounts for a substantial proportion of cases, with reported incidences ranging from 3% to 17% among patients with penetrating ocular injuries, and is strongly associated with poor prognostic features such as intraocular foreign bodies, traumatic cataract, and retinal detachment.[3]

Across different etiologies of endophthalmitis, several prognostic factors have been consistently identified. Poor presenting visual acuity remains the strongest predictor of unfavorable outcome, regardless of the underlying cause. In traumatic cases, larger wound size, high-velocity injuries, delayed presentation beyond 24 hours, and the presence of intraocular foreign bodies are strongly associated with poor prognosis, particularly when complicated by retinal detachment or traumatic cataract. Advanced age also correlates with worse final vision in both traumatic and non-traumatic endophthalmitis.

Positive microbiological cultures further indicate more severe infection and poorer outcomes. In emergency settings, corneal ulcers combined with impaired initial vision significantly increase the risk of evisceration, with endogenous cases generally faring worse than exogenous ones. Conversely, timely pars plana vitrectomy, prompt removal of intraocular foreign bodies, and early diagnosis remain critical in improving visual outcomes and reducing the likelihood of irreversible vision loss.[3-7]

In resource-limited settings such as Indonesia, these challenges are compounded by geographical barriers, delayed referral pathways, and limited availability of vitreoretinal subspecialists. The province of Aceh, located at the northern tip of Sumatra, is a region where access to advanced ophthalmic services is often limited. Despite the clinical importance of endophthalmitis, there is a paucity of published data from Indonesia describing the demographic profile, microbiological spectrum, management patterns, and predictors of outcomes. This study was therefore conducted to describe the clinical and demographic characteristics of patients with endophthalmitis treated at a tertiary referral hospital in Aceh, Indonesia, and to identify predictors of poor visual outcomes. The findings are expected to provide context-specific evidence that may inform early triage, optimize management strategies, and strengthen follow-up protocols in resource-constrained environments.

Methods

Study Design and Setting

This was a retrospective, hospital-based case series conducted at the Ophthalmology Department of Dr. Zainoel Abidin General Hospital, a tertiary referral hospital in Banda Aceh, Indonesia, which serves as the main referral center for the province and surrounding islands. Medical records of patients diagnosed with infectious endophthalmitis between December 2021 and November 2024 were reviewed.

Patients

All patients diagnosed clinically with endophthalmitis during the study period were included. The diagnosis was established based on clinical findings, including ocular pain, decreased vision, an anterior chamber reaction (hypopyon, flare), vitritis, and vitreous opacities, confirmed by B-scan ultrasonography.

Patients with uncertain diagnoses or insufficient medical records for the variables required for the descriptive analysis were excluded. For analyses of final visual outcome, only patients with documented final visual acuity were included. Patients who were lost to follow-up without a documented final visual acuity were excluded from the visual outcome and logistic regression analyses.

Data Collection

Demographic and clinical information was extracted from medical records, including age, sex, residence, etiology and onset of endophthalmitis, comorbidities, presenting visual acuity, final visual acuity, microbiological culture results, treatment modalities, complications, and follow-up duration.

Visual acuity was documented using Snellen visual acuity or counting-finger equivalents as recorded in the medical records.

For categorical analyses, presenting and final visual acuity were dichotomized as <1/60 and ≥1/60. Poor visual outcome was defined as a documented final visual acuity <1/60, whereas good visual outcome was defined as a documented final visual acuity ≥1/60. Follow-up duration was recorded descriptively and classified as <1 month or ≥1 month. Patients without documented follow-up after the initial visit were classified as lost to follow-up.

Management strategies were categorized into two groups for regression analysis: (1) pars plana vitrectomy (PPV) with intravitreal antibiotic administration; and (2) non-PPV management, including intravitreal antibiotic injection without PPV, medical treatment, and other surgical procedures.

Microbiological data were obtained from vitreous or aqueous samples when culture was performed as part of routine clinical care. Results were retrieved retrospectively from microbiology laboratory records. Not all patients underwent microbiological culture, and antibiotic susceptibility testing was not consistently available; therefore, only organism identification data were analyzed.

Complications were recorded from the medical records. Patients could have more than one complication; therefore, complication categories were not mutually exclusive. For the binary complications variable used in the analysis, patients were classified as having complications when one or more documented ocular complications were present. Individual patients could have more than one type of complication.

Ethical Approval

The study adhered to the tenets of the Declaration of Helsinki and received approval from the Ethics Review Committee of Universitas Syiah Kuala Faculty of Medicine (Ref:181/ETIK-RSUDZA/2025). The requirement for written informed consent was waived due to the retrospective nature of the study.

Statistical Analysis

All clinical data were reviewed and validated by a multidisciplinary team consisting of a retina specialist (LMZ), two ophthalmologists specializing in infection and immunology (CPS and EN), and two general practitioners (PNM and DI). Continuous variables were summarized as means ± standard deviations (SD), whereas categorical variables were presented as frequencies and percentages. Multivariable logistic regression analysis was performed to assess factors associated with poor visual outcome, defined as a documented final visual acuity <1/60. Only patients with documented final visual acuity were included in this analysis. Odds ratios (ORs) with 95% confidence intervals (CIs) were reported. A p-value <0.05 was considered statistically significant. Statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA).

Result

Patient Demographics and Clinical Characteristics

A total of 94 patients with infectious endophthalmitis were included in the study. Their demographic and clinical characteristics are summarized in Table 1. Most patients were male (60, 63.8%), and the majority were aged ≥40 years (75, 79.8%). Right and left eye involvement was equally distributed.

Among the 17 patients with documented comorbidities, type 2 diabetes mellitus was the most common comorbidity (11, 64.7%). Post-cataract surgery endophthalmitis was the most common type of endophthalmitis, accounting for 45 cases (47.9%), followed by traumatic endophthalmitis (27, 28.7%) and keratitis-associated endophthalmitis (14, 14.9%). At presentation, most patients had severe visual impairment, with an initial BCVA of <1/60 in 83 patients (88.3%).

The geographical distribution of patients across Aceh Province is presented in Figure 1. Most cases were referred from Pidie, Aceh Besar, and Aceh Barat districts, reflecting the referral pattern to Dr. Zainoel Abidin General Hospital as a tertiary referral center.

Management, Clinical Outcomes, and Complications

Clinical management and outcomes are summarized in Table 2. Pars plana vitrectomy (PPV) with intravitreal antibiotics was the most frequently performed management approach, accounting for 55 patients (58.5%). Other surgical procedures were performed in 23 patients (24.5%), including evisceration in 12 patients (12.8%), periosteal graft in 9 patients (9.6%), and amniotic membrane transplantation in 2 patients (2.1%). Medical or non-surgical treatment was administered to nine patients (9.6%), while six patients (6.4%) received intravitreal antibiotic treatment.

Complications were documented in 63 patients. As individual patients could have more than one complication, complication categories were not mutually exclusive, and the total number of recorded complications exceeded the number of affected patients. Lens-related complications were the most frequently recorded category (21, 33.3%), followed by corneal complications (15, 23.8%) and anophthalmia (12, 19.0%). Retinal detachment and glaucoma were documented in five (7.9%) and six patients (9.5%), respectively.

At the last documented follow-up, 49 patients (52.1%) had a visual acuity of <1/60, 22 (23.4%) had visual acuity between 1/60 and 5/60, four (4.3%) had visual acuity between 6/60 and 6/45, and six (6.4%) achieved visual acuity >6/45. Thirteen patients (13.8%) were lost to follow-up. Among the 81 patients with an available final visual acuity assessment, 49 were classified as having a poor visual outcome (VA <1/60) and 32 as having a good visual outcome (VA ≥1/60).

Microbiological Findings

Microbiological findings are summarized in Table 3. Vitreous culture was not performed in 40 patients (42.6%). Among the remaining cases, no bacterial growth was identified in 30 patients (31.9%). Pseudomonas spp. were the most frequently identified organisms (9, 9.6%), followed by Gram-positive rods (4, 4.3%) and Klebsiella pneumoniae (2, 2.1%). Other organisms were identified less frequently.

Predictors of Poor Visual Outcome

Among the 94 patients, 13 (13.8%) were lost to follow-up and were excluded from the regression analysis. Multivariable logistic regression was performed among the remaining 81 patients with available final visual acuity data, including 49 patients with poor visual outcomes (VA <1/60) and 32 with good visual outcomes (VA ≥1/60).

The overall regression model was statistically significant (χ^2 = 13.516, df = 5, p = 0.019), with a Cox and Snell R^2 of 0.154 and a Nagelkerke R^2 of 0.208.

Initial visual acuity was significantly associated with visual outcome. Patients presenting with an initial VA <1/60 had higher odds of poor visual outcome (adjusted OR = 15.542, 95% CI: 1.607–150.360; p = 0.018). Follow-up duration, management modality, presence of complications, and type of endophthalmitis were not significantly associated with visual outcome in the multivariable analysis. Follow-up duration <1 month was not significantly associated with poor visual outcome (adjusted OR = 3.289, 95% CI: 0.723–14.974; p = 0.124). Similarly, non-PPV management (adjusted OR = 2.428, 95% CI: 0.743–7.937; p = 0.142), absence of complications (adjusted OR = 0.647, 95% CI: 0.226–1.857; p = 0.419), and exogenous endophthalmitis (adjusted OR = 0.675, 95% CI: 0.071–6.382; p = 0.731) were not significantly associated with poor visual outcome.

Table 1. Demographic and clinical characteristics (n=94)

Variables	n	%
Sex		
Male	60	63.8
Female	34	36.2
Age (years)		
<40	19	20.2
40–60	37	39.4
>60	38	40.4
Eye laterality		
Right	47	50
Left	47	50
Comorbidities (n=17)		
Type 2 diabetes mellitus	11	64.7
Hypertension	2	11.8
Others*	4	23.5
Type of endophthalmitis		
Post-cataract surgery	45	47.9
Traumatic	27	28.7
Keratitis-associated	14	14.9
Endogenous	6	6.4
Others†	2	2.2
Initial BCVA		
<1/60	83	88.3
1/60–5/60	10	10.6
6/60–6/45	1	1.1

*Others: hyperthyroidism and thalassemia.
† Others: post-trabeculectomy and post-intravitreal injection.

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Table 2. Management, Complications, and Clinical Outcomes of Patients with Endophthalmitis

Variables	n	%
Management (n=94)		
Pars plana vitrectomy and intravitreal antibiotics	55	58.5
Intravitreal antibiotic-based treatment	6	6.4
Medical/non-surgical treatment	9	9.6
Other surgical procedures†	23	24.5
Patient refused treatment	1	1.1
Complications (n=63)		
Lens-related complications‡	21	33.3
Anophthalmia	12	19
Corneal complications§	15	23.8
Retinal detachment	5	7.9
Glaucoma	6	9.5
Others¶	4	6.3
Last follow-up visual acuity		
<1/60	49	52.1
1/60–5/60	22	23.4
6/60–6/45	4	4.3
>6/45	6	6.4
Lost to follow-up	13	13.8
Follow-up duration		
≥1 month	67	71.3
<1 month	14	14.9
Lost to follow-up	13	13.8

† Other surgical procedures included evisceration in 12 patients (12.8%), periosteal graft in 9 patients (9.6%), and amniotic membrane transplantation in 2 patients (2.1%).
Patients could have more than one complication; therefore, complication categories were not mutually exclusive.
‡ Lens-related complications included aphakia in 18 patients (28.6%), pseudophakia in 2 patients (3.2%), and cataract in 1 patient (1.6%).
§ Corneal complications included corneal cicatrix in 7 patients (11.1%), corneal perforation in 7 patients (11.1%), and corneal melting in 1 patient (1.6%).
¶ Others included papillary atrophy in 3 patients (4.8%) and seclusio pupillae in 1 patient (1.6%).

Table 3. Microbiological findings (n=94)

Vitreous culture	n	%
Not performed	40	42.6
No bacterial growth	30	31.9
Pseudomonas spp.	9	9.6
Gram-positive rods	4	4.3
Klebsiella pneumoniae	2	2.1
Other organisms*	9	9.6

Other organism* includes Staphylococcus pseudintermedius, Staphylococcus hominis, Staphylococcus epidermidis, Staphylococcus lugdunensis, Staphylococcus warneri, Gram-negative rods, Pseudomonas putida, Acinetobacter baumannii, and Achromobacter denitrificans each isolated in 1 patient (1.1%).

Discussion

This study evaluated the clinical characteristics and factors associated with visual outcomes among patients with endophthalmitis treated at a tertiary referral hospital in Aceh, Indonesia. Most patients were adults over 40 years of age, accounting for 79.8% of the study population, and males represented 63.8% of cases. This predominance of male patients is consistent with previous reports showing a higher proportion of endophthalmitis among males, potentially related to greater exposure to ocular trauma and other risk factors.[8] The geographical distribution of patients across Aceh Province also reflects the referral role of Dr. Zainoel Abidin General Hospital, with the highest numbers of patients originating from Pidie, Aceh Besar, and Aceh Barat.

Post-cataract surgery endophthalmitis was the most common etiology, accounting for 47.9% of cases, followed by traumatic endophthalmitis (28.7%) and keratitis-associated endophthalmitis (14.9%). Postoperative endophthalmitis following cataract surgery is a serious complication that may result in substantial visual morbidity.[9,10] These findings are also consistent with previous reports in which postoperative and trauma-related infections represented important causes of endophthalmitis.[8,11] Most patients had severe visual impairment at presentation, with 88.3% presenting with an initial VA <1/60.

Microbiological examination was not performed in 42.6% of patients, while no bacterial growth was identified in 31.9%. Among the culture-positive cases, Pseudomonas spp. were the most frequently identified organisms, followed by gram-positive rods, Klebsiella pneumoniae, and several Staphylococcus species. Previous studies have reported the importance of gram-negative organisms, including Pseudomonas species, in endophthalmitis and their association with unfavorable visual outcomes.[12] The predominance of Pseudomonas spp. among the isolates in this study is consistent with the role of gram-negative bacteria in severe ocular infections.

Management approaches varied according to the clinical presentation. Pars plana vitrectomy (PPV) with intravitreal antibiotics was the most common treatment, performed in 55 patients (58.5%). Other surgical procedures were performed in 23 patients (24.5%), including evisceration in 12 patients (12.8%), periosteal graft in nine patients (9.6%), and amniotic membrane transplantation in two patients (2.1%). Previous studies have reported a role for vitrectomy combined with intravitreal antimicrobial treatment in selected patients with severe endophthalmitis.[13,14] In the present study, management modality was not significantly associated with visual outcome.

Complications were documented in 63 patients. Importantly, the complication categories were not mutually exclusive, and individual patients could experience more than one complication during the course of their disease or treatment. Therefore, the frequencies of individual complication types should not be interpreted as representing mutually exclusive patient groups or summed to estimate the total number of patients with complications. Lens-related complications, corneal complications, and anophthalmia were among the most frequently documented categories.

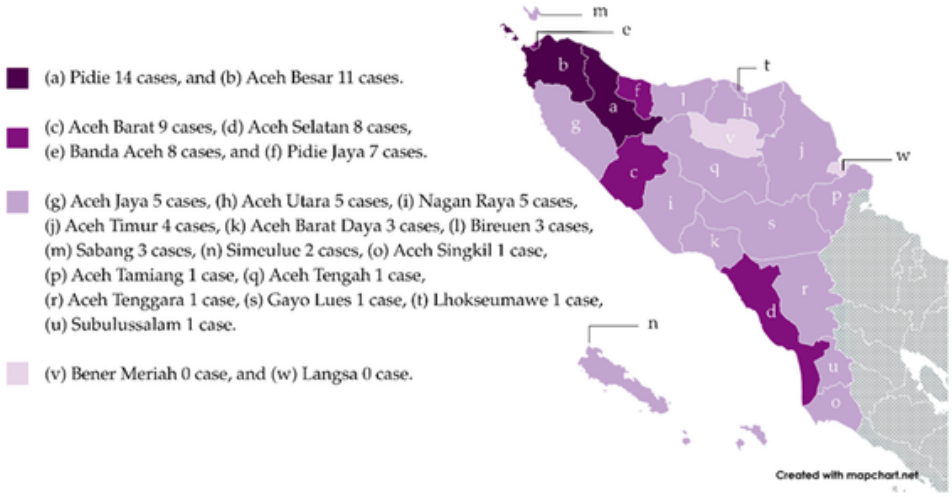

Figure 1. Geographical distribution of patients with endophthalmitis treated at Dr. Zainoel Abidin General Hospital, Aceh, Indonesia. Most cases were referred from Pidie, Aceh Besar, and Aceh Barat districts.

In the multivariable analysis, the presence of complications was not significantly associated with visual outcome. Visual outcome analysis was based on patients with an available final visual acuity assessment. Of the 94 patients included in the study, 13 (13.8%) were lost to follow-up and were reported separately rather than being classified as having a poor visual outcome. Among the remaining 81 patients, 49 had a poor visual outcome, defined as final VA <1/60, while 32 had a good visual outcome, defined as final VA ≥1/60.

In the multivariable logistic regression analysis, initial visual acuity was significantly associated with visual outcome.

Patients presenting with an initial VA <1/60 had lower odds of achieving agood visual outcome than those presenting with an initial VA ≥1/60 (adjusted OR= 15.542, 95% CI 1.607–150.360; p = 0.018). finding is consistent with previous studies suggesting that poorer presenting vision is associated with less favorable visual outcomes in patients with endophthalmitis.[8,12,13]

Follow-up duration was not significantly associated with visual outcome (adjusted OR = 3.289, 95% CI 0.723–14.974; p = 0.124). Management modality, presence of complications, and type of endophthalmitis were also not significantly associated with visual outcome in the multivariable analysis.

Table 4. Predictors of Poor Visual Outcomes

Variables	Poor (n=49)	Good (n=32)	Adjusted OR (95% CI)	P-value
Initial VA				
<1/60	48 (98.0%)	26 (81.3%)	15.542 (1.607–150.360)	**0.018***
≥1/60	1 (2.0%)	6 (18.8%)	Reference	
Follow-up time				
<1 month	11 (22.4%)	3 (9.4%)	3.289 (0.723–14.974)	0.124
≥1 month	38 (77.6%)	29 (90.6%)	Reference	
Management				
Non-PPV	19 (38.8%)	8 (25.0%)	2.428 (0.743–7.937)	0.142
PPV	30 (61.2%)	24 (75.0%)	Reference	
Complication				
Absent	15 (30.6%)	14 (43.8%)	0.647 (0.226–1.857)	0.419
Present	34 (69.4%)	18 (56.3%)	Reference	
Type of endophthalmitis				
Exogenous	47 (95.9%)	30 (93.8%)	0.675 (0.071–6.382)	0.731
Endogenous	2 (4.1%)	2 (6.3%)	Reference	

* Statistically significant at p < 0.05

Limitations

This study has several limitations. First, its retrospective design relied on the availability and completeness of medical records, which may have resulted in missing or incomplete data, particularly regarding microbiological cultures and follow-up information. Second, the single-center setting may limit the generalizability of the findings to other populations and healthcare settings. Third, the relatively small sample size and the small number of patients in some categories, particularly those with endogenous endophthalmitis and an initial VA ≥1/60, may have limited the precision of the regression estimates. This is reflected by the wide confidence intervals observed for some variables. Fourth, management approaches were heterogeneous and were determined according to the clinical condition and severity of individual patients, which may have influenced the observed relationship between treatment modality and visual outcome. Finally, 13 patients were lost to follow-up and therefore had no available final visual acuity assessment. These patients were excluded from the visual outcome regression analysis and reported separately; consequently, their final visual outcomes could not be determined. Larger prospective multicenter studies with standardized follow-up and visual acuity assessments are needed to further evaluate factors associated with visual outcomes in endophthalmitis.

Conclusion

In this retrospective study of patients with endophthalmitis treated at a tertiary referral hospital in Aceh, Indonesia, poor initial visual acuity was associated with a lower likelihood of achieving a good visual outcome. Follow-up duration, management modality, the presence of complications, and the type of endophthalmitis were not significantly associated with visual outcome in the multivariable analysis. Post-cataract surgery was the most common etiology, and most patients presented with severe visual impairment. These findings highlight the importance of presenting visual acuity in assessing visual prognosis among patients with endophthalmitis.

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