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LONG-TERM VISUAL OUTCOMES IN INFECTIOUS AND NON-INFECTIOUS UVEITIS: A SYSTEMATIC REVIEW

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ABSTRACT

Uveitis is a heterogeneous group of intraocular inflammatory diseases and remains a significant cause of long-term visual impairment in both pediatric and adult populations. Visual outcomes vary widely depending on disease etiology and the development of vision-threatening ocular complications. This systematic review aimed to compare long-term visual outcomes and ocular complications in patients with infectious and non-infectious uveitis. A systematic literature search was conducted in PubMed, the Cochrane Library, Scopus, Google Scholar, and PROSPERO for studies published between January 2015 and 2025, in accordance with PRISMA 2020 guidelines. A total of 847 records were identified55 duplicates were removed, 792 records were screened, 49 full-text articles were assessed for eligibility and 14 studies were included in the qualitative synthesis. Eligible studies included pediatric and adult patients with anterior, intermediate, posterior, or panuveitis reporting at least one long-term visual outcome, including best-corrected visual acuity (BCVA), severe visual impairment or blindness, or vision-threatening ocular complications. Study selection and data extraction were performed independently by two reviewers. Due to substantial heterogeneity, findings were synthesized using a qualitative narrative approach. Fourteen studies met the inclusion criteria. Non-infectious uveitis was more frequently reported than infectious uveitis across included studies. Long-term visual outcomes were commonly reported using BCVA measures, and cataract, glaucoma or ocular hypertension, and macular complications were the most frequently described long-term sequelae in both etiologic groups. Direct quantitative comparisons were limited by heterogeneity in study design, outcome definitions, and follow-up duration. Long-term visual outcomes in uveitis vary by etiology and are frequently influenced by vision-threatening complications. These findings highlight the importance of accurate etiologic classification and long-term follow-up in both pediatric and adult patients to reduce visual morbidity.

Keywords: infectiuous uveitis; long-term coutcomes; non-infectious uveitis; uveitis; visual acuity; visual outcomes

INTRODUCTION

Uveitis encompasses a heterogeneous group of intraocular inflammatory disorders and remains a significant cause of visual impairment in both pediatric and adult populations worldwide. The condition may involve any segment of the uveal tract and is classified anatomically as anterior, intermediate, posterior, or panuveitis. Despite advances in diagnostic approaches and therapeutic strategies, uveitis continues to be associated with substantial long-term visual morbidity due to recurrent inflammation and irreversible ocular damage (Sittivarakul W, et al., 2024). Etiologically, uveitis is broadly divided into infectious and non-infectious forms. Infectious uveitis arises from viral, bacterial, parasitic, or fungal pathogens, whereas non-infectious uveitis is commonly linked to autoimmune, idiopathic, or systemic inflammatory disorders, including juvenile idiopathic arthritis and HLA-B27–associated

diseases. Accurate etiologic classification is essential, as treatment strategies and prognostic outcomes differ considerably between these two categories (Siiskonen M, et al., 2023).

Long-term visual outcomes in uveitis are determined by multiple factors, including disease etiology, anatomical involvement, disease chronicity, and the development of vision-threatening complications such as cataract, glaucoma or ocular hypertension, cystoid macular edema, epiretinal membrane, and retinal detachment. While numerous studies have reported visual outcomes within specific uveitis subtypes, the available evidence is heterogeneous, limiting direct comparisons between infectious and non-infectious uveitis (Sharon Y, et al., 2024). Therefore, the objective of this systematic review was to compare long-term visual outcomes and vision-threatening ocular complications in pediatric and adult patients with infectious and non-infectious uveitis, providing a comprehensive synthesis of current evidence to support clinical decision-making and guide future research.

METHOD

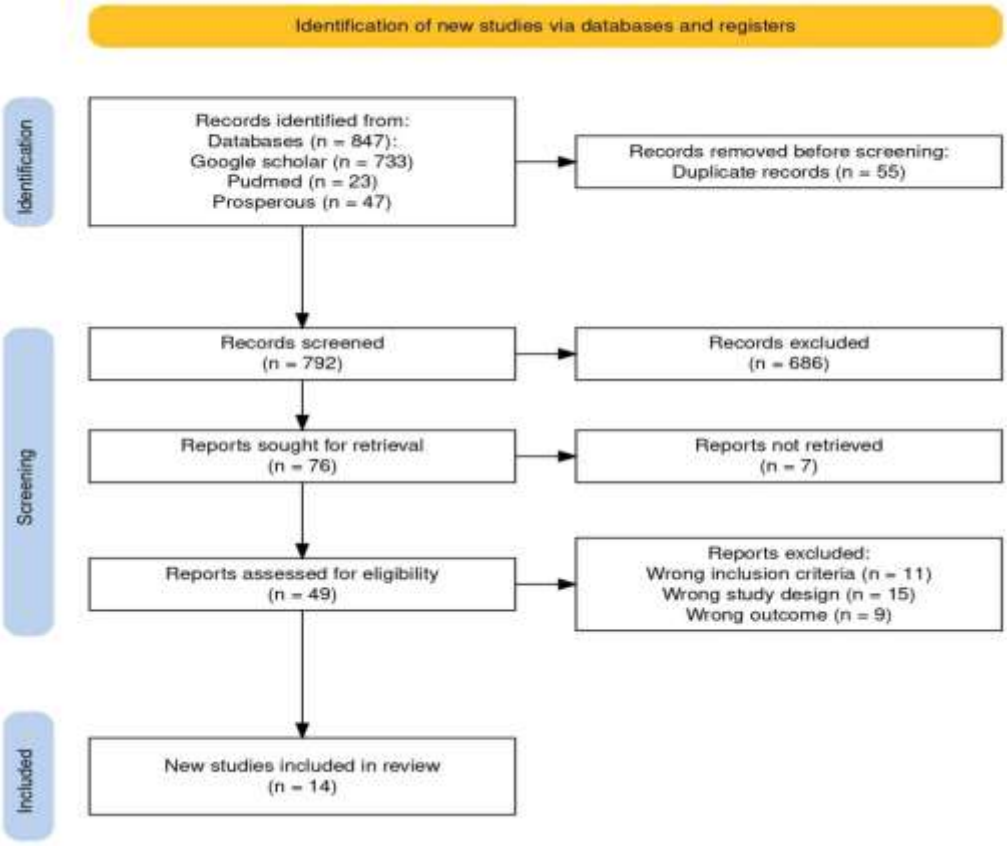

Figure 1. PRISMA flow diagram illustrating the study selection process for the systematic review on systematic drug effects in uveitis

This systematic review compared long-term visual outcomes in patients with infectious and non-infectious uveitis and was conducted in accordance with the PRISMA 2020 guidelines. A comprehensive literature search was performed in PubMed, the Cochrane Library, Scopus, Google Scholar, ResearchGate, and PROSPERO for studies published between January 2015 and 2025. The search strategy used MeSH terms and free-text keywords related to uveitis, infectious and non-infectious etiologies, and visual outcomes, with no language restrictions applied. Eligibility criteria were defined using the PICO framework. The study population included pediatric and adult patients with anterior, intermediate, posterior, or panuveitis. Eligible studies evaluated infectious uveitis caused

by viral, bacterial, parasitic, or fungal pathogens and/or non-infectious uveitis associated with autoimmune, idiopathic, or systemic inflammatory conditions. Studies were required to report at least one long-term visual outcome, including best-corrected visual acuity (BCVA), severe visual impairment or blindness, or long-term ocular complications. Cohort studies, case–control studies, randomized controlled trials, and case series involving ten or more patients were included, while case reports and studies lacking relevant outcome data or clear etiologic classification were excluded.

Study selection and data extraction were independently performed by two reviewers, with disagreements resolved by consensus. All identified records were first screened based on titles and abstracts to exclude clearly irrelevant studies. Potentially eligible articles then underwent full-text assessment against predefined inclusion and exclusion criteria, with reasons for exclusion documented in accordance with PRISMA 2020 guidelines. Extracted data included study characteristics, uveitis etiology, sample size, follow-up duration, long-term visual outcomes, and ocular complications. Due to substantial heterogeneity in study designs, outcome measures, and follow-up periods, a quantitative meta-analysis was not conducted. Findings were therefore synthesized using a qualitative narrative approach. The literature search identified 847 records; after screening and eligibility assessment, 14 studies were included in the final review.

RESULT AND DISCUSSION

Study Selection

The systematic search identified 847 records across all databases. After removal of duplicates, 792 records were screened by title and abstract, of which 686 were excluded. Seventy-six full-text articles were assessed for eligibility, and 27 studies were excluded due to inappropriate study design, insufficient outcome reporting, or unclear etiologic classification. A total of 14 studies were ultimately included in the final systematic review.

Study Characteristics

The included studies were published between 2015 and 2025 and predominantly employed retrospective observational or cohort designs, with one systematic review and meta-analysis and one narrative review. Study populations ranged from 18 to 491 patients, with follow-up durations varying from approximately 10 months to over 9 years, reflecting long-term visual outcomes. Etiologies of uveitis included infectious causes such as ocular toxoplasmosis and mixed infectious etiologies, as well as non-infectious causes, including idiopathic uveitis, juvenile idiopathic arthritis (JIA)-associated uveitis, HLA-B27–associated uveitis, and other autoimmune conditions. Several studies focused on pediatric populations, particularly JIA-associated and idiopathic uveitis.

Table 1.
Characteristics of Included Studies

No	Author	Year	Study Design	Study Type	Etiology	Sample Size
1	Bajwa A et al.	2015	Retrospective observational study	Primary	Mixed uveitis etiologies	491 patients (644 eyes)
2	Lee CS et al.	2017	Retrospective observational study	Primary	Various uveitis etiologies	290 patients (404 eyes)
3	Sharon Y et al.	2024	Retrospective multicenter study	Primary	Non-infectious anterior uveitis	76 patients (125 eyes)
4	Al-Haddad C et al.	2019	Retrospective observational study	Primary	Pediatric ueveitis	49 patients (80 eyes)
5	Cann M et al.	2018	Retrospective cohort study	Primary	Non-infectious pediatric uveitis	166 children (293 eyes)
6	Siiskonen M et al.	2023	Population-based cohort	Primary	Pediatric idiopathic & JIA uveitis	119 patients

No	Author	Year	Study Design	Study Type	Etiology	Sample Size
7	Marelli et al.	2021	Retrospective cohort study	Primary	JIA-associated uveitis	125 patients
8	Nguyen AH et al.	2021	Retrospective study	Primary	Pediatric non-infectious uveitis + ME	21 children (26 eyes)
9	Groen F et al.	2016	Retrospective cohort study	Primary	Mixed uveitis etiologies	133 patients (219 eyes)
10	Rojas-Carabali et al.	2021	Retrospective descriptive study	Primary	Intermediate uveitis	18 patients
11	Rattanathamsakul et al.	2024	Retrospective cohort study	Primary	Ocular toxoplasmosis	95 eyes
12	Sittivarakul W et al.	2024	Retrospective study	Primary	Ocular toxoplasmosis	92 patients (95 eyes)
13	Scagnellato L et al.	2025	Systematic revies & meta-analysis	Review	JIA-associated uveitis	22 studies (2208 cases)
14	Pathanapitoon K et al.	2017	Narrative review	Review	HLA-B27-associated uveitis	Not reported

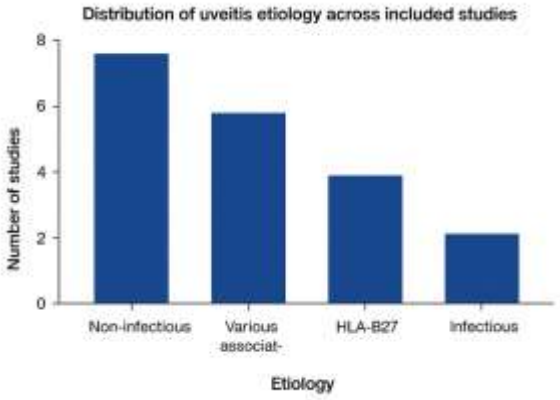

Chart 1. Distribution of Uveitis Etiology

Across the included studies, non-infectious uveitis was the most frequently reported etiology, identified in 7 studies, followed by uveitis with various systemic or mixed associations in 6 studies. HLA-B27–associated uveitis was reported in 4 studies, whereas infectious uveitis represented the smallest proportion, documented in 2 studies. This distribution indicates that the majority of studies focused on non-infectious or immune-mediated uveitis populations with long-term follow-up.

Frequency of Ocular Complications

Table 2.
Ocular Complications

No	Author	Year	Specific complication
1	Bajwa A et al.	2015	Cataract, glaucoma, ocular HTN, ocular surgery
2	Lee CS et al.	2017	Catarct , glaucoma, CME, ERM, RD
3	Sharon Y et al.	2024	Cataract, glaucoma, PS, CME
4	Al-Haddad C et al.	2019	Cataract, glaucoma, amblyopia, CME
5	Cann M et al.	2018	Catarct, glaucoma, CME, band keratophaty
6	Siiskonen M et al.	2023	Catarct. glaucoma, CME, ERM
7	Marelli et al.	2021	PS, cataract, band keratopathy, glaucoma
8	Nguyen AH et al.	2021	Cataract, band keratopathy, glaucoma
9	Groen F et al.	2016	Cataract, CME, ERM, glaucoma
10	Rojas-Carabali et al.	2021	ME. catarct, ERM, RD
11	Rattanathamsakul et al.	2024	Macular scar, OHT,ERM,RD
12	Sittivarakul W et al.	2024	Macular scar, OHT, ERM, RD
13	Scagnellato L et al.	2025	Catarct, glaucoma, band keratopathy
14	Pathanapitoon K et al.	2017	PS, cataract, galukoma, CME

Ocular complications were commonly reported across the included studies. Cataract was the most frequently observed complication, reported in 11 studies, followed closely by glaucoma or ocular hypertension (OHT) in 11 studies. Cystoid macular edema (CME) was reported in 9 studies, while epiretinal membrane (ERM) was identified in 8 studies. Retinal detachment was less frequently reported, occurring in 6 studies. Overall, anterior and posterior segment complications were prevalent among patients with uveitis in the long term, with lens- and pressure-related complications being the most commonly documented across studies.

Visual Acuity Outcomes

Baseline BCVA varied substantially across studies, reflecting heterogeneity in disease severity at presentation. Baseline visual acuity ranged from relatively preserved vision (>0.8 Snellen) to moderate or severe visual impairment (>0.8 logMAR). Across the included studies, long-term visual outcomes were generally stable or improved, particularly in cohorts receiving contemporary immunosuppressive or biologic therapy. Several studies reported overall improvement or stabilization of BCVA, while others demonstrated reduced rates of severe visual impairment at final follow-up. However, a subset of studies particularly those involving infectious etiologies or complicated disease courses reported persistent visual impairment or final BCVA ≤20/200 in a proportion of patients.

Table 3.
Visual Outcomes

No	Author	Year	BCVA baseline	Follow-up duration	Outcomes
1	Bajwa A et al.	2015	Median 018 logMAR (IQR 0.10-0.60)	Median 2.0 yrs (IQR 0.2-6.8)	BCVA stable overall; prognosis related to severity
2	Lee CS et al.	2017	Mean 0.62 ± 0.70 logMAR	Mean 4.5 ± 3.1 yrs	Pverall BCVA improvement
3	Sharon Y et al.	2024	Mean 0.39 ± 0.45 logMAR	Mean 6.8 ± 5.1 yrs	BCVA improved or stable
4	Al-Haddad C et al.	2019	42.1% ≤ 20/50 : 18.4% ≤ 20/200	Mean 13.2 ± 15.1 mo	Age- related visual outcomes
5	Cann M et al.	2018	18.4% > 0.3 logMAR	Median 5 yrs	Improved vs historical cohorts
6	Siiskonen M et al.	2023	Majority > 0.8 Snellen	Mean 97 ± 57 mo	Low visual impaiment rate
7	Marelli et al.	2021	Tidak disebutkan	Mean 9.2 ± 1.7 yrs	Visual impairment at final FU
8	Nguyen AH et al.	2021	Median 0.54 logMAR	Mean 35.3 ± 25.7 mo	69.2% ME resolution
9	Groen F et al.	2016	35% BCVA ≤ 0.3	1 year	Reduced visual impairment
10	Rojas-Carabali et al.	2021	Mean 0.19 ± 0.19 logMAR	Mean 24.4 ± 33.9 mo	Final BCVA improved
11	Rattanathamsakul et al.	2024	Mean 0.82 / 1.13 logMAR	Up to 24.4 ± 33.9 mo	BCVA improved post-treatment
12	Sittivarakul W et al.	2024	Mean 0.82 / 1.13 logMAR	Median 10.9 mo	21% VA ≤20/200 final
13	Scagnellato L et al.	2025	Nor reported	≥ 5 yrs	Pooled visual impairment
14	Pathanapitoon K et al.	2017	Nor reported	Not reported	Generally favorable prognosis

Risk of Bias

None of the included studies reported a formal risk of bias assessment; therefore, the risk of bias was categorized as not assessed for all studies. As most studies were retrospective in design, the findings should be interpreted with caution.

Table 4.
Risk of Bias

No	Author	Year	Risk of bias
1	Bajwa A et al.	2015	Not assessed
2	Lee CS et al.	2017	Not assessed
3	Sharon Y et al.	2024	Not assessed
4	Al-Haddad C et al.	2019	Not assessed
5	Cann M et al.	2018	Not assessed
6	Siiskonen M et al.	2023	Not assessed
7	Marelli et al.	2021	Not assessed
8	Nguyen AH et al.	2021	Not assessed
9	Groen F et al.	2016	Not assessed
10	Rojas-Carabali et al.	2021	Not assessed
11	Rattanathamsakul et al.	2024	Not assessed
12	Sittivarakul W et al.	2024	Not assessed
13	Scagnellato L et al.	2025	Not assessed
14	Pathanapitoon K et al.	2017	Not assessed

This systematic review synthesizes current evidence on long-term visual outcomes in infectious versus non-infectious uveitis, highlighting that visual prognosis is influenced not only by etiology but also by disease chronicity, complication burden, and advances in therapeutic strategies (Scagnellato L, et al., 2025). Overall, the majority of included studies demonstrated stabilization or improvement of BCVA over long-term follow-up, particularly in non-infectious uveitis cohorts managed with modern immunomodulatory and biologic therapies (Rojas-Carabali W, et al., 2021). These findings are consistent with contemporary ophthalmic literature suggesting improved visual outcomes with early diagnosis, close monitoring, and aggressive control of intraocular inflammation (Pathanapitoon K, et al., 2017).

Despite improvements in visual acuity, ocular complications remain common, with cataract and glaucoma representing the leading causes of long-term visual morbidity (Cann M, et al., 2018). The high frequency of these complications underscores the cumulative impact of chronic inflammation and corticosteroid exposure, which remains a major challenge in uveitis management. CME emerged as a frequent and persistent complication, reinforcing its role as a key determinant of visual outcomes in both infectious and non-infectious uveitis (Nguyen A.H, et al., 2021). Infectious uveitis, particularly ocular toxoplasmosis, was associated with a higher prevalence of macular scarring, retinal detachment, and irreversible visual loss, reflecting the destructive nature of infectious retinal involvement (Bajwa A, et al., 2015).

In contrast, non-infectious uveitis cohorts—especially those with JIA-associated uveitis—demonstrated more favorable long-term visual outcomes when treated with biologic agents, although complications such as cataract and glaucoma remained prevalent (Marelli L, et al., 2021). The heterogeneity of included studies, variations in outcome definitions, and predominance of retrospective designs limit direct comparisons between infectious and non-infectious uveitis (Al-Haddad C, et al., 2019). Additionally, differences in follow-up duration and treatment protocols may have influenced reported outcomes. Nevertheless, the consistency of findings across studies suggests that long-term visual prognosis in uveitis is increasingly favorable, albeit with a substantial burden of preventable complications (Groen F, et al., 2016).

CONCLUSION

This systematic review indicates that long-term visual outcomes in uveitis vary by etiology and are commonly affected by vision-threatening complications. Non-infectious uveitis was more frequently reported than infectious uveitis, with cataract, glaucoma or ocular hypertension, and macular complications emerging as the most common long-term sequelae. Despite substantial heterogeneity across studies, these findings underscore the need for accurate etiologic classification and long-term follow-up to reduce visual morbidity in both pediatric and adult uveitis patients.

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