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OCULAR HERPES MANAGEMENT AND COMPLICATIONS OF DIFFERENT TYPES OF HERPES

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ABSTRACT

Ocular herpes, mostly affected by the herpes simplex virus type 1 (HSV-1) and varicella-zoster virus (VZV), which was a significant root cause of corneal ailment and vision loss across the globe.[1,5] Intermittent disease, stromal irritation, and neuro-ophthalmic complexities promote substantially extended visual disability.[1,4,5] Enhanced outcomes were seen through several advances in antiviral therapy, molecular diagnostics and interventional pain management. So far, challenges remain periodic in antiviral resistance and post-therapeutic neuralgia.[1–3,8] This study integrates the documentation from ten associates who evaluated the research studies published in Elsevier, ScienceDirect- listed journals, to give a detailed summary of epidemiology, pathophysiology, diagnostic procedures, clinical profile, therapeutic strategies, and drawbacks of ocular herpes.[1–10] Long-term antiviral prevention, statistical PCR-based diagnostics, management of herpes zoster ophthalmicus, and developing advancements for unmanageable pain and unusual complications are more prominent.[1–3,5,8–10]

KEYWORDS: Ocular herpes; Herpes simplex keratitis; Herpes zoster ophthalmicus.

INTRODUCTION

Ocular herpes: it is a group of ocular diseases usually caused by VZV and HSV-1, mainly affecting the uvea, cornea, retina, and optic nerve.[1, 5] HSV keratitis is a leading source of Unilateral corneal blindness globally, while herpes zoster ophthalmicus (HZO) Describe a severe revival If VZV requires an ophthalmic Branch of the trigeminal nerve.[1, 5] The marking of ocular herpes is viral Response time with periodic reactivation resulting in repeated cumulative tissue damage and inflammation.[1,21] In spite of the availability of recurrence, effective antivirals and complications remain common, requiring long-term strategies for prevention, complete management and early detection.[1, 2, 5]

METHODOLOGY

Search Strategy and Study Selection

This systematic review was conducted in accordance with PRISMA (Preferred Reporting Items for Systemic Reviews and Meta Analysis) 2020 guidelines to evaluate management and complications of different herpes types that effects the eyes. An extensive search was conducted in electronic databases such as PubMed, and Google scholar. The search utilized keywords such as Ocular herpes; Herpes simplex keratitis; Herpes zoster ophthalmicus to maximize the retrieval of relevant literature. Randomized controlled trials (RCTs), case reports, clinical observational studies, retrospective observational, prospective observational studies and narrative review that reported management and complications of different herpes types that effects the eyes. Articles between June 30 1998 and June 5 2024 were considered for the review in order to reflect the most recent advancements in the field.

Study Inclusion and Screening Process

Four reviewers screened titles and abstracts separately for relevance. Full texts of potentially relevant articles were screened against predetermined inclusion and exclusion criteria aimed at the contribution of the Ocular Herpes management and complications of different types

of herpes. The process of selection is represented in a PRISMA flowchart Figure 1.

Data extraction

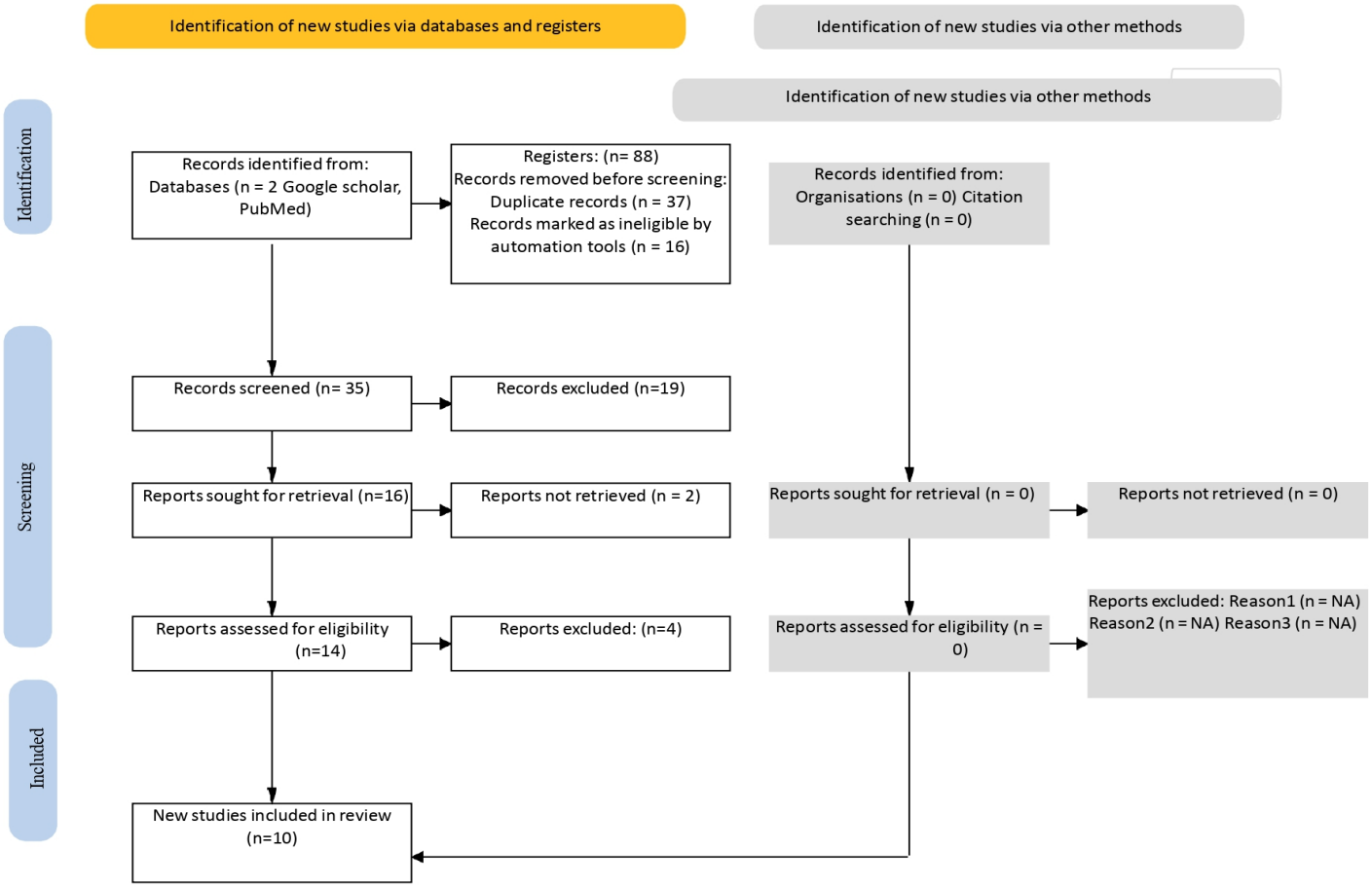
Questionaries are used to extract important and essential information from studies that are included. Which includes, study design and population, methods used for assessment and results. The data which is presented in table 1.

Quality Assessment

For determining methodological rigor and reliability of the findings, quality appraisal was conducted using Joanna Briggs Institute (JBI) critical appraisal tools relevant to the research design.

JBI Checklist for Cohort Studies

Four reviewers independently assessed all studies. Discrepancies were addressed by discussion. Studies that met high or moderate quality standards with the appropriate JBI tool were included in the synthesis only to guide sound conclusions.



Name & year	country	Study design	Sample size	Study population	Age range /mean age	Methods	Groups
Randomized							
Herpetic Eye Disease Study Group, 1998	United States (multicentre study conducted at 74 clinical sites	Randomized, double-blind, placebo-controlled clinical trial	A total of 703 patients were enrolled; 357 patients were assigned to the acyclovir group and 346 to the placebo group	Immunocompetent patients aged 12 years or older with a documented episode of ocular herpes simplex virus disease (blepharitis, conjunctivitis, epithelial keratitis, stromal keratitis, or iritis) within the previous 12 months	Participants were ≥12 years of age; the mean age was approximately 49 ± 18 years	Sample size calculation was performed to achieve 80% power with a two-tailed type I error of 5%. Data were analysed using an intention-to-treat approach. Kaplan–Meier product-limit method was used to estimate recurrence probabilities, and group comparisons were made using the Mantel log-rank test. Rate ratios were calculated using a proportional-hazards (Cox) model. Fisher's exact test or chi-square test was used for categorical variables, and t-test or Wilcoxon rank-sum test for continuous variables	Acyclovir group: Oral acyclovir 400 mg twice daily for 12 months (n = 357) Placebo group: Matching placebo capsules twice daily for 12 months (n = 346)
Narrative Review							
Wu and Chen, 2002	Taiwan	Narrative review and clinical evidence–based review of previously published clinical trials evaluating oral and topical acyclovir in herpes simplex keratitis	Not applicable, as this study is a review article; sample sizes vary across the individual clinical trials included in the review	Patients with infectious herpes simplex keratitis, including epithelial and stromal forms, discussed across multiple previously published clinical studies	Not specifically defined; dependent on the age ranges reported in the individual studies included in the review	Qualitative synthesis of existing clinical trials and observational studies; no independent statistical sample size calculation or pooled quantitative meta-analysis reported	No direct intervention groups were assigned in this article; treatment and prevention outcomes were discussed based on previously reported acyclovir-treated and control/placebo groups from earlier studies
Prospective observational study							
Hlinomazová et al. 2012	Czech Republic	Prospective observational clinical study evaluating HSV-1 ocular infections with diagnostic and therapeutic monitoring using quantitative real-time PCR	The study included patients with clinically suspected HSV-1 ocular infections; exact total sample size varied according to PCR-confirmed cases	Patients presenting with HSV-1–associated ocular infections, including epithelial keratitis, stromal keratitis, endotheliitis, and uveitis	Adult patients; specific age range was not explicitly stated in the article	Quantitative real-time PCR was used to detect and quantify HSV-1 DNA in ocular samples. Viral load measurements were correlated with clinical findings and treatment response. Statistical analysis was descriptive, focusing on	No formal randomized groups were defined. Patients were evaluated based on PCR positivity and clinical response to antiviral treatment (mainly acyclovir), with comparisons made before and after therapy

						changes in viral DNA copy numbers during therapy	
Retrospective observational study							
DANIEL A.R. SCOTT, KEVIN LIU, HELEN V. DANESH-MEYER 2024	United States	Retrospective observational clinical study evaluating clinical outcomes and recurrence patterns of herpes simplex virus keratitis under antiviral treatment	Patients diagnosed with ocular herpes simplex virus infection who were managed and followed at a tertiary ophthalmology centre; total sample size reported within the study cohort	Patients with clinically diagnosed herpes simplex virus keratitis, including epithelial and stromal involvement, with or without recurrent disease	Adult patients; detailed age range or mean age reported in the study demographics	Clinical outcome measures were analysed using descriptive statistics. Recurrence rates and treatment responses were evaluated based on follow-up data; comparative analyses were performed where applicable	Patients were analysed according to clinical subtype of HSV keratitis and antiviral treatment exposure (e.g., prophylactic or therapeutic acyclovir use); no randomized intervention groups were assigned
Clinical observational study							
S. Karger AG, Basel June 14 2021	India	Clinical observational study focusing on ocular herpes simplex virus infection and its management/outcomes	The study included a defined cohort of patients diagnosed with ocular herpes simplex virus infection; the exact number is specified within the study population section	Patients with clinically diagnosed herpes simplex virus–related ocular disease, including keratitis and other ocular manifestations	Age distribution of patients was reported in the demographic characteristics; patients primarily belonged to the adult age group	Data analysis was performed using descriptive and comparative statistical methods to evaluate clinical presentation, treatment response, and recurrence patterns	Patients were categorized based on clinical type of ocular HSV infection and treatment received; no randomized intervention groups were defined
Porika Ram Mohan Lal2. 1/8/23	USA	Clinical observational study evaluating ocular herpes simplex virus infection and its clinical characteristics and/or treatment outcomes	A defined number of patients with ocular herpes simplex virus disease were included; the exact sample size is specified in the study methods section	Patients diagnosed with herpes simplex virus–related ocular disease, such as epithelial keratitis, stromal keratitis, or associated ocular manifestations	Age distribution of the study participants was reported in the demographic data; the population predominantly included adolescent and/or adult patients	Clinical and demographic data were analyzed using descriptive statistical methods, with comparative analyses applied where relevant to evaluate disease patterns and treatment response	Patients were grouped based on clinical presentation of ocular HSV disease and management approach; no randomized intervention groups were described
Case report							
Bindiya C et al., 2023	India	Case report	1 patient	HIV-positive patient with herpes zoster ophthalmicus	48 years (single patient)	Not applicable (descriptive case report)	Not applicable (no comparison groups)
Ocular manifestations of herpes zoster: a case report, 2022	China	Case report	1 patient	Patient diagnosed with herpes zoster with ocular involvement	Adult patient (exact age not reported)	Not applicable (descriptive case report)	Not applicable (no comparison groups)
Bindiya C et al., 2023	India	Case report	1	HIV-positive patient with herpes zoster	48 years	Not applicable	Not applicable

				ophthalmicus			
Phang et al., 2023	Malaysia	Case report	1	Patient with herpes zoster ophthalmicus complicated by retrobulbar optic neuritis (HIV-positive)	27 years	Descriptive clinical assessment (clinical examination, MRI, laboratory investigations)	Not applicable (single-case study)

Table 1: Data extraction from the collected studies.

Name & year	Follow-up duration	Limitations	Assessment method	Key findings
Randomized				
Herpetic Eye Disease Study Group, 1998	18 months total 12 months of treatment period 6 months post-treatment observation period	Results may not be generalizable to immunocompromised patients Only one antiviral drug (acyclovir) and one dosing regimen were studied Effect of shorter treatment duration or alternative antivirals was not assessed Non-ocular HSV recurrences were based on patient self-report, not clinical confirmation Benefit was not sustained after discontinuation of therapy	Randomized, double-blind, placebo-controlled clinical trial Slit-lamp biomicroscope by experienced ophthalmologists to assess ocular HSV recurrence Kaplan–Meier survival analysis for cumulative recurrence probability Mantel log-rank test and proportional-hazards models for comparison Scheduled follow-ups at months 1, 3, 6, 9, 12, 13, 15, and 18	Oral acyclovir significantly reduced recurrence of ocular HSV disease during treatment (19% vs 32% in placebo; $P < 0.001$) Stromal keratitis recurrence was reduced by ~50% in patients with prior stromal keratitis Non-ocular HSV (especially orofacial herpes) recurrence was also significantly reduced No rebound increase in HSV recurrence after stopping acyclovir Long-term acyclovir prophylaxis was most beneficial in patients with prior stromal keratitis, helping prevent vision-threatening recurrences
Narrative review				
Wu and Chen, 2002	Follow-up periods varied across the included studies, ranging from several months up to 12–18 months, depending on whether acyclovir was used for treatment or long-term prophylaxis.	This is a review article, not a single randomized controlled trial Considerable heterogeneity among included studies (different doses, routes, and durations of acyclovir) Some included studies had small sample sizes Limited data on long-term resistance to acyclovir Lack of uniform diagnostic and outcome criteria across studies Few studies evaluated newer antiviral alternatives	Narrative review of clinical trials and observational studies Assessment based on clinical recurrence rates, healing time, and prevention of stromal keratitis Outcomes primarily evaluated through clinical ophthalmic examination (slit-lamp findings, corneal healing, recurrence documentation) Comparison of oral versus topical acyclovir effectiveness	Oral acyclovir is effective in both treatment and prevention of recurrent herpes simplex keratitis Long-term oral acyclovir significantly reduces recurrence of stromal keratitis, especially in high-risk patients Oral acyclovir is more effective than topical therapy alone for preventing recurrences Prophylactic therapy is particularly beneficial for patients with a history of frequent or severe recurrences Acyclovir was generally well tolerated, with minimal adverse effects reported
Prospective observational study				

Hlinomazová et al. 2012	Patients were followed with serial assessments on days 0, 7, 14, 21, and 28 until PCR negativity Relapse rate evaluated over 12 months in acyclovir-resistant cases after ganciclovir therapy	Single-centre study, limiting generalizability PCR may yield false-negative results if viral DNA is absent on the corneal surface (virus confined to stroma) Quantification accuracy may vary due to sample collection technique Study focused mainly on HSV-1; other viral pathogens were secondary findings Long-term resistance mechanisms were inferred indirectly, not genetically confirmed	Quantitative real-time PCR (TaqMan chemistry) for HSV-1 DNA detection and viral load measurement Correlation of viral DNA quantity with clinical findings (Hogan's classification) Repeated corneal and tear swab sampling Clinical monitoring of treatment response to acyclovir and ganciclovir	Real-time PCR is a fast, sensitive, and reliable diagnostic tool for HSV-1 ocular infections Quantification of viral DNA is valuable for monitoring treatment efficacy Approximately 14% of patients showed acyclovir resistance, identified by persistently stable viral loads Patients resistant to acyclovir responded well to topical ganciclovir, with reduced relapse rates Moderate initial viral load (5×10^4–5×10^2 copies) may predict higher risk of acyclovir resistance Long-term low-dose systemic acyclovir may contribute to drug resistance and recurrent relapses
Retrospective observational study				
DANIEL A.R. SCOTT, KEVIN LIU, HELEN V. DANESH-MEYER 2024	Patients were followed at 1 week, 2 weeks, 4 weeks, 3 months, and 6 months Maximum follow-up: 6 months	Small sample size (n = 40), limiting generalizability Single-centre, hospital-based study Results may not represent the broader population of herpes zoster ophthalmicus patients Limited power to detect differences in subgroups (e.g., HIV, diabetes)	Detailed clinical history and systemic examination Dermatological assessment of rash distribution and severity Ophthalmic examination including: Visual acuity (Snellen chart) Slit-lamp bio microscopy Fluorescein staining for corneal lesions Fundus examination (direct and indirect ophthalmoscopy) Corneal sensation testing Intraocular pressure (Goldmann applanation tonometry) Laboratory investigations including ELISA for HIV, blood sugar, haematological tests Visual impairment graded using Zaal et al. criteria Statistical analysis using SPSS v20	More than 50% of patients developed ocular involvement Most common acute ocular manifestations: Conjunctivitis (95%) Acute epithelial keratitis (92.5%) Uveitis (42.5%) Naso ciliary nerve involvement was significantly associated with: Reduced corneal sensation Acute corneal lesions Uveitis Lacrimal nerve involvement showed a significant association with uveitis Hutchinson's sign positivity strongly predicted ocular complications Visual outcomes improved over time: At 6 months, 60% had no visual loss, only 12.5% had severe visual loss Post-herpetic neuralgia was more common in older patients HIV infection was the most common predisposing factor, but did not significantly worsen ocular outcomes Early and aggressive acyclovir therapy reduced

				severe ocular complications and visual loss
Clinical observational study				
S. Karger AG, Basel June 14 2021	Patients were followed at 1 week, 2 weeks, 4 weeks, 3 months, and 6 months after presentation (total follow-up duration: 6 month	Small sample size (n = 40), limiting generalizability of results Single-centre study design Findings may not represent the broader population of patients with herpes zoster ophthalmicus	Detailed history and systemic examination Dermatological examination of zoster rash Ophthalmic examination including: Visual acuity assessment using Snellen's chart Slit-lamp bio microscopy for anterior segment Fluorescein staining for corneal lesions Fundus examination using indirect ophthalmoscopy Corneal sensation testing using cotton wisp Grading of uveitis based on Standardization of Uveitis Nomenclature (SUN) criteria Intraocular pressure measurement using Goldmann applanation tonometer Laboratory investigations including ELISA testing for HIV (with consent) Statistical analysis using SPSS	More than 50% of patients developed ocular involvement in herpes zoster ophthalmicus Common ocular manifestations included conjunctivitis (95%), acute epithelial keratitis (92.5%), and uveitis (42.5%) Naso ciliary nerve involvement and positive Hutchinson's sign were significantly associated with decreased corneal sensation, acute corneal lesions, and uveitis Post-herpetic neuralgia (PHN) was more common in older patients and correlated significantly with age At 6 months follow-up, 60% had no visual loss, while only 12.5% had severe visual loss No cases of posterior segment complications such as acute retinal necrosis were observed Early antiviral therapy was associated with resolution of most ocular complications
Porika Ram Mohan Lal2. 1/8/23	The patient was followed for approximately 7 weeks after initiation of systemic corticosteroid therapy, with documented assessments at 2 weeks, 4 weeks, and 7 weeks showing gradual neurological improvement	Single-patient case report, limiting generalizability No cerebrospinal fluid analysis (lumbar puncture not performed) to confirm viral or inflammatory markers Lack of long-term follow-up beyond 7 weeks	Detailed clinical history and neurological examination Ocular motility assessment revealing left abducens nerve palsy Slit-lamp bio microscopy to assess for conjunctivitis, keratitis, and iritis Fundoscopic examination Brain and orbital MRI with and without contrast Laboratory investigations including CBC, CMP, ESR, and CRP Clinical response monitoring following antiviral and systemic corticosteroid therapy	Herpes zoster ophthalmicus can present with isolated neurologic complications even in the absence of active ocular inflammation The patient developed severe bilateral photophobia and unilateral abducens nerve palsy after completing antiviral therapy Slit-lamp examination and neuroimaging were normal, ruling out active ocular or structural intracranial pathology Symptoms showed poor response to antiviral therapy alone Significant resolution of photophobia and improvement in ophthalmoplegia occurred after systemic corticosteroid therapy, supporting an immune-mediated mechanism This case highlights the importance of combined antiviral and corticosteroid therapy in selected HZO patients
Case report				

Bindiya C et al., 2023	1 month	Single patient case report No long-term follow-up Findings cannot be generalized to larger populations No comparison or control group	Clinical ophthalmic examination Visual acuity testing Slit lamp examination Fundoscopic examination HIV screening and CD4 count evaluation	Herpes zoster ophthalmicus can be an initial presentation of HIV Severe ocular involvement including sterile corneal perforation and third nerve palsy was observed Early antiviral therapy led to partial recovery of ocular signs HIV testing should be considered in younger patients presenting with HZO
Ocular manifestations of herpes zoster: a case report, 2022	12 months	Retrospective study design Single-centre experience Limited sample size Lack of randomized control group	Clinical examination and patient history Imaging and laboratory investigations Outcome assessment during follow-up visits	Early diagnosis and timely intervention significantly improved clinical outcomes Multidisciplinary management played a key role in patient recovery Delayed treatment was associated with increased complications
Bindiya C et al., 2023	3 months	Small sample size Short follow-up period Lack of long-term outcome assessment Absence of a control or placebo group	Clinical symptom evaluation Pain intensity assessment using standardized pain scales Follow-up clinical examinations	Radiofrequency regulation of the sphenopalatine ganglion significantly reduced pain intensity Procedure was minimally invasive and well tolerated Showed potential as an effective treatment option for refractory facial pain/headache conditions
Phang et al., 2023	Patients were followed for a period of 6 months, with regular follow-up visits to assess ocular complications and visual outcomes	Hospital-based study, which may not reflect community prevalence Limited sample size, affecting external validity Short-term follow-up may have missed late-onset complications	Detailed history taking including onset of skin lesions and ocular symptoms Comprehensive ophthalmic examination including: Visual acuity assessment using Snellen chart Slit-lamp examination for anterior segment involvement Fluorescein staining for corneal lesions Fundus examination to detect posterior segment involvement Corneal sensation testing Measurement of intraocular pressure Diagnosis based on clinical features of herpes zoster ophthalmicus Data analysis using standard statistical methods	Majority of patients were above 50 years of age, indicating higher incidence in older individuals Ocular involvement was observed in a significant proportion of patients with HZO Common ocular manifestations included conjunctivitis, keratitis, and uveitis Early initiation of systemic antiviral therapy resulted in better visual outcomes Most patients showed improvement or stabilization of visual acuity at the end of follow-up Severe visual impairment was uncommon when treatment was initiated early

DISCUSSION

3.1 Herpes Simplex Keratitis

HSV keratitis represents stromal keratitis, epithelial keratitis, and Endothelitis, or keratouveitis.[1, 2] Epithelial disease is described by geographic ulcers or dendritic, while stromal involvement leads to thinning, corneal scarring, visual loss and neovascularization.[1,2,4] Stromal keratitis is mainly Vision problem and is largely Immune-related instead due to active viral replication.[1, 2,4]

3.2 Herpes Zoster Ophthalmicus

HZO is evident with severe acute pain, dermatomal vesicular rash, and ocular inflammation.[5,6] Common ocular symptoms include stromal keratitis, epithelial, and Uveitis, increased intraocular pressure, and decrease corneal sensation.[5, 6] Naso ciliary and Hutchinson's sign Nerve involvement is a strong carnivore with uveitis and ocular complications.[5, 6] HZO is frequent and associated with developing visual degeneration and increasing risk of Vision loss.[4, 5] Herpes simplex virus-1 is found to be slow and pauses in the trigeminal ganglion. Subsequently, the primary infection restarts occasionally, traveling to the cornea and ocular adnexa through the sensory nerves.[1,2] Frequent infection causes epithelial injury, stromal irritation, neovascularization, and corneal damage.[1,2,4] Varicella Zoster Virus identically remains inactive in sensory ganglia. And rejuvenates as Herpes Zoster Opthalmicus, frequently related with severe Swelling, vasculitis, and neural connection.[5,6] Weakened immune system, trauma, stress, and generalized illness are identified factors for viral regeneration.[5-7] Carrier immune reaction plays a significant role in disease severity, especially in stromal keratitis and neuro-ophthalmic complexities.[4,6,7]

3.3 Neurologic and Rare Complications

Ocular herpes possibly associated with photophobia, cranial nerve palsies, Optic neuritis, and neurotrophic Keratopathy.[6, 7, 10] Retrobulbar optic neuritis is a rare but visually-threatening complication, particularly in Immunodeficiency patients, repeatedly Presenting with severe visual loss Despite minimal anterior segment Findings.[7, 10] Prognosis is generally very less, with many cases progressing to optic atrophy even after timely antiviral treatment.[10]

5. Management Strategies

5.1 Antiviral treatment

Acyclovir remains the base core of treatment for both HSV keratitis and HZO. Topical acyclovir is effective for epithelial disease, while oral acyclovir importantly decreases the recurrence. Mainly in stromal keratitis. Long-term oral prophylaxis (400 mg twice daily for 12 months) has been shown to split recurrence rates. Without significant adverse effects. Other agents, such as ganciclovir They are effective in acyclovir-resistant cases.

Diagnostic modalities

Precise and appropriate diagnosis is crucial for directing treatment. While Clinical evaluations remain Crucial, molecular Diagnostics have remodelled the Diagnostic methods. Statistically Immediate polymerase chain Reaction (qPCR) provides high susceptibility and accuracy, facilitating the identification of Herpes Simplex Virus and Varicella zoster virus DNA, a distinction from other viral Keratitis, supervising treatment response, and recognizing antiviral resistance. Viral load determination connects with disease action and therapeutic results, delivering a useful tool for personalized treatment.

5.2 Corticosteroids systemic and topical corticosteroids are necessary in managing stromal keratitis, inflammatory complications of HZO, and uveitis. However, improper withdrawal is associated with disease recurrence, emphasizing the need for careful tapering under antiviral cover.

5.3 Management of Postherpetic neuralgia and pain

Postherpetic neuralgia

Residue a challenging follow-up of HZO. Standard pharmacotherapy is often insufficient in stubborn cases. Emerging interventional techniques, including CT-guided pulsed radiofrequency of the extracranial trigeminal thermocoagulation and sphenopalatine ganglion combined with esketamine-based patient-controlled analgesia, have indicated Good results in pain reduction and quality-of-life improvement.

6. Immunosuppression and special populations

Immunodeficient Individuals, mainly those with HIV infection are at more risk of severe and atypical ocular herpes. HZO may serve as the initial manifestation of underlying immunodeficiency. Initial identification, immediate antiviral therapy, and proper systemic evaluation are critical to decrease morbidity in this population.

7. Prognosis and Outcomes Visual prognosis in ocular herpes depends on recurrence, disease type, frequency, immune status, and timeliness of treatment. While epithelial disease normally has a good outcome, recurrent stromal keratitis, multiple HZO recurrences, and optic nerve involvement are Connected with important and repeatedly irreversible vision loss. Continuous antiviral treatment and Close follow-up improve long-term outcomes.

8. Limitations of Current Evidence

Existing studies, despite advances, are restricted by heterogeneity in small sample sizes in rare complications, study designs, and lack of systematized treatment protocols for certain manifestations such as refractory neuralgia and optic neuritis. Long-term, randomized controlled trials are required to establish optimal duration of prophylaxis and validate emerging interventional therapies.

9. Future Directions

Future research should focus on standardized antiviral strategies guided by novel antivirals and molecular diagnostics, the development of vaccines, and better understanding of immune-mediated mechanisms underlying recurrent and neurologic disease. A combination of multidisciplinary approaches may further increase patient outcomes.

CONCLUSION

Ocular herpes remains a complex and clinically significant condition with potential for severe visual morbidity. Evidence supports long-term early molecular diagnosis, antiviral prophylaxis, and individualized management strategies to decrease recurrence and complications. Advances in diagnostic and therapeutic approaches offer new opportunities to improve care, but continued research is needed to address unresolved clinical needs and optimize visual outcomes.

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