

Original Research Article**A Cross-Sectional Study on Viral Keratitis in a Tertiary Care Hospital****Dr. Sona Babu¹, Dr. P.R. Siva Sankar²**

¹Postgraduate, Department of Ophthalmology, Government Medical College, Anantapuram, Andhra Pradesh, India.

Assistant Professor, Department of Ophthalmology, Government Medical College, Anantapuram, Andhra Pradesh, India.

Corresponding Author

Dr. P.R. Siva Sankar, Assistant Professor, Department of Ophthalmology, Government Medical College, Anantapuram, Andhra Pradesh, India.

Received: 16-12-2023 / Revised: 21-12-2023 / Accepted: 19-01-2024

ABSTRACT**Background**

Viral keratitis is one of the leading cause of corneal blindness leading to corneal scarring and subsequent visual impairment. Improved understanding of presentation, early diagnosis and treatment, precipitating factors of viral keratitis can help in the prevention of permanent loss of visual acuity.

Methods

A cross-sectional study was carried out on 50 patients who are clinically diagnosed with viral keratitis in department of ophthalmology at Government General Hospital, Ananthapuramu for a period of 6 months from January 2023 to June 2023. These patients were examined for visual acuity, slit-lamp examination to know the size, shape of ulcer. Fluorescein staining done to know the activity of the lesion, corneal sensations were checked, and anterior chamber reaction to rule out uveitis. Then these patients were kept on antiviral treatment for 2 weeks and followed up for determining visual improvement

Results

Out of 50 patients, 25 (50%) patients were diagnosed with HSV keratitis, followed by 15 (30%) cases of HZO keratitis, 10 cases (20%) were of adenoviral keratitis. Most common clinical presentation was epithelial keratitis (70%), followed by subepithelial keratitis (20%), stromal keratitis with ulceration (6%) and neurotrophic keratitis (4%). Fever (50%) was the most common precipitating factor followed by URTI (20%), Steroid instillation (16%), trauma (10%), spontaneous (4%). Out of 50 patients most of them had visual acuity in the range of 6/6 to 6/36 which was improved to the range of 6/6 to 6/12 after 2 weeks of antiviral treatment.

Conclusion

Herpes simplex keratitis is the most common viral keratitis encountered in our study and epithelial keratitis in the form of dendritic ulcer is the most common clinical presentation seen. Fever was the major precipitating factor. All these patients had significant improvement in the visual outcome following treatment for 2 weeks.

Keywords: HSV – Herpes Simplex Virus, HZO – Herpes Zoster Virus, URTI-Upper Respiratory Tract Infection

INTRODUCTION

viral keratitis is the most leading cause of corneal blindness in the developing countries like India¹. This is the most common cause of corneal opacity and second most common cause of blindness after cataract. Incidence of viral keratitis kept on increasing in India due to poor socioeconomic status, widespread use of antibiotics and steroids². It is most commonly seen in immunocompromised population and children. Immunocompromised states such as malignancy, HIV infections and prolonged steroid usage causes greater risk for developing viral keratitis. Herpetic eye disease remains a significant cause of blindness worldwide affecting over one million people annually³.

Both DNA and RNA viruses causes viral keratitis. viruses belonging to herpes group are responsible for most of the viral keratitis like Herpes type 1,2,3 (VZV), 4 (CMV), 5 (EBV), Human herpes virus 6 (HHV-6), Human herpes virus 7 (HHV-7), Human herpes virus 8 (HHV-8) and adeno viruses. Of these, HSV-1 is the most common agent. In clinical practice, herpes simplex keratitis is the most common type of viral keratitis seen. HSV can affect any part of the eye but keratitis is the most common presentation. HSV is a double stranded DNA virus with icosahedral capsid. HSV is subdivided into HSV1 & HSV 2. Herpes simplex type 1 causes orofacial infections whereas herpes type 2 causes genital Herpes infections¹. HZO occurs due to reactivation of HSV3 virus in the trigeminal ganglion. Hutchinson sign is more predictive (50-80%) of ocular involvement and is strongly prognostic for ocular inflammation and corneal sensory denervation.⁴

Improved understanding of clinical pattern and precipitating factors of viral keratitis can help in the early treatment and prevention of viral keratitis.

MATERIALS AND METHODS

Our study was a cross sectional observational study conducted for a period of 6 months in our ophthalmology OPD, at GGH Anantapur on 50 patients of clinically diagnosed keratitis. Informed consent was taken from all these patients before the study

50 clinically diagnosed viral keratitis patient were included in our study. Detailed history was taken from these patients regarding the onset, duration, progression of symptoms and also emphasized on associated fever and upper respiratory tract infection. Most common precipitating factors for viral keratitis are fever, URTI, Trauma, steroids drops instillation, foreign body and also it can be spontaneous. All these patients were subjected to detailed ocular examination under slit lamp, distant visual acuity testing was performed with Snellen's chart, Fluorescein staining was done to know the pattern and activity of corneal lesion, corneal sensation were checked.

Diagnosis of viral keratitis was strictly based on the clinical presentation, Fluorescein staining, slit lamp examination and decreased /absent corneal sensation. Slit lamp examination findings are diagnostic of viral keratitis, but previous medication and duration can change the appearance of lesions on slit lamp.

Viral keratitis can affect different layers of cornea, based on which it can be classified as epithelial, subepithelial, stromal keratitis (without ulceration, with ulceration), endothelial keratitis (disciform, diffuse, linear) and another entity as sequelae of epithelial keratitis as neurotrophic keratitis.

Epithelial keratitis is of different types like dendritic ulcer, geographic ulcer, pseudo dendritic ulcer. On Flourescein staining dendritic ulcer have a branching, linear pattern with terminal bulbs, which can be appreciated under cobalt blue filter of slit lamp biomicroscopy. Whereas subepithelial keratitis seen as nummular lesion below the epithelium which won't take up Flourescein stain. Stromal keratitis without ulceration appears as focal, multifocal, diffuse infiltration during acute inflammatory stage and the epithelium will be intact. In stromal keratitis with ulceration there will be necrosis, melting, ulceration, dense infiltration of stroma with an overlying epithelial defect which will be Flourescein stain positive. Endothelitis can be of disciform, diffuse and linear pattern. In disciform endothelitis there will be stromal edema in disc pattern with underlying keratic precipitates. In diffuse endothelitis there will be scattered keratic precipitates spread over the entire endothelium. Linear pattern will have line of keratic precipitates progressing from limbus.

Adenoviral keratitis has bilateral presentation and are associated with fever, upper respiratory tract infection and preauricular lymph nodes. They present initially as conjunctivitis later on develops as keratitis. In acute stage patient have symptoms like pain, redness, watering, photophobia and has punctate epithelial erosions on cornea. These lesions progress to subepithelial opacities followed by anterior stromal infiltrates and later on nummular opacities in the chronic stage. HZO presents with pustular vesicular lesion along the ophthalmic division of trigeminal nerve on the half side of face. If there are pustules at the tip of the nose (due to involvement of nasociliary nerve) there will be corneal involvement as pseudodendrites. This sign is known as Hutchinson's sign³. These pseudo dendrites takes up Flourescein stain and having superficial dendriform like pattern differs from dendritic lesion by its shorter stockier appearance with blunt ends with no terminal bulbs and having peripheral location in the cornea. In herpes simplex keratitis patient will be having history of fever and recurrence. Herpes simplex keratitis is having dendritic pattern in Flourescein staining which appears as linear, thin branched lesion with terminal bulbs. Geographical pattern also can be seen HSV keratitis. Other entity is neurotrophic keratitis which are seen as sequelae of epithelial keratitis arises from impaired corneal sensation and with decreased tear production. These lesions are horizontally oval in shape with rolled up edges.

These patients were treated with topical and oral antivirals, for 2 weeks along with cycloplegics. According to HEDS study, Oral antivirals were given if there is stromal and endothelial keratitis. All these patients were followed up to 2 weeks for determining the visual improvement. Patients were followed up on 7th day and 14th day. Pre treatment visual acuity and post treatment visual acuity was recorded at each follow up.

50 patients of clinically diagnosed viral keratitis were included in our study. Patient who are not consenting for study and who had recurrent episodes of viral keratitis and those who have superadded bacterial, fungal and other infections and associated uveitis were excluded. Old cases of viral keratitis with no signs of viral keratitis also excluded from our study

RESULTS

Out of 50 patients of clinically diagnosed viral keratitis 25 patients were of HSV keratitis, which was about 50%. 15 patients were of HZ keratitis (30%) and 10 patients were of adenoviral keratitis (20%)

Sl. no	Type of keratitis	No. of patients affected	Percentage (%)
1	HSV keratitis	25	50

2	HZ keratitis	15	30
3	Adenoviral keratitis	10	20
Total		50	100

Out of 50 patients, 35 patients had epithelial keratitis, which was about 70%. 10 patients had subepithelial keratitis (20%). 3 patients had stromal keratitis with ulceration (6%). 2 patients had neurotrophic keratitis (4%)

Sl. no	Clinical pattern	No of patients affected	Percentage (%)
1	Epithelial keratitis	35	70
2	subepithelial	10	20
3	Stromal keratitis without ulceration	0	0
4	Stromal keratitis with ulceration	3	6
5	Endothelitis	0	0
6	Neurotrophic keratitis	2	4
Total		50	

out of 50 patients, 25 patients had fever as precipitating factor, which was about 50%, followed by Upper respiratory tract infection in 10 patients (20%), 8 patients had history of steroids drop instillation (16%), 5 patients had trauma as precipitating factor (10%), 2 patients had spontaneous occurrence (4%)

SL NO	Precipitating factor	No. of patients	Percentage (%)
1	fever	25	50
2	trauma	5	10
3	URTI	10	20
4	Steroid drops instillation	8	16
5	spontaneous	2	4

Out of 50 patients majority of the patients had visual acuity in the range of 6/6- 6/18 at the time of presentation. Only 6% patients had 6/36 visual acuity, which was improved to the range of 6/6 to 6/12, in that 80% patients had 6/6 vision after 2 weeks of treatment & follow up

Sl. no	Visual acuity	No. of patients at presentation & percentage	No. of patients & percentage after 2 weeks follow up
1	6/6	5 (10%)	40 (80%)
2	6/9	35 (70%)	8 (16%)
3	6/12	5 (10%)	2 (4%)
4	6/18	2 (4%)	0
5	6/24	0	0
6	6/36	3 (6%)	0
7	6/60	0	0
8	FC/HM	0	0
Total		50 (100%)	50 (100%)

DISCUSSION

Though slit lamp findings are diagnostic of viral keratitis, atypical lesions can make diagnosis difficult. Any previous medication or duration of disease can change the appearance of lesions. HSV keratitis (50%) has maximum prevalence in our study as compared to *Sodani et al*¹ study where they found it 53.4% from their study. *Liesang et al*⁵ found prevalence of ocular HSV as 149 per 100,000 population. In our study we found HZO keratitis as 30% of occurrence where as in *Miami*⁶ study occurrence of HZO keratitis was about 0.05%. *Kaiser*⁷ study found 30.9 per 100000 persons-years as overall incidence of HZO. In a study by *Lee et al*⁸ adenoviral keratitis was reported in 78% of patients in contrast to our study, where we had only 20% of patients presenting with adenoviral keratitis.

In our study majority of the patients had epithelial keratitis which accounts for 70% following that subepithelial was the second most common presentation subsequently 6% patients had stromal keratitis with ulceration and 4% patients had neurotrophic keratitis. A similar study conducted by *Sodani et al*¹ on clinical pattern of viral keratitis they also found similar picture to our study where 43.04 % patients had epithelial keratitis, 35.22 % had subepithelial keratitis, 16.52% had stromal keratitis without ulceration and 3.48% had endothelitis. A study by *Kabra et al*⁹ found stromal keratitis as maximum presentation in their study followed by dendritic ulcer (15.91%), endothelitis (8.64%) and geographical ulcer (4.09%). In *shah et al*¹⁰ study they found stromal keratitis without ulceration was the most common clinical pattern seen in their study, which was about 51.6% followed by endothelitis (21.8%), epithelial keratitis (17.5%) and neurotrophic keratitis (1.6%). A study by *Pramod et al*¹¹ also found epithelial keratitis as most common clinical pattern which was about 65% and stromal keratitis as 35% which was very similar to present study.

The major precipitating factor found in our study was fever which accounted for 50%, followed by URTI (20%), steroid drops instillation (16%), trauma (10%) and spontaneous occurrence (4%). Comparing with *Saini et al*¹² study they found only 15% patients had fever as precipitating factor, whereas minor trauma was seen in 20% of patients. In a study by *sodani*¹, fever was the most common precipitating factor which was about 39.13% similar to our study. They also found 60.49% patients with adenoviral keratitis had history of either some ayurvedic drops instillation or some steroid drops instillation by a common vial by the family members, where as in our study 16 % patients had history of steroid instillation. Similar study by *Whilhelmus*¹³ showed 26% of the patients had prior history of using steroid drops. Similarly a study by *Kabra et al*⁹, they reported 50% of patients had history of usage of some medication.

In our study, most of the patients had visual acuity in the range of 6/6 to 6/18 at the time of presentation, only 6 % of patients had 6/36 visual acuity, which improved to the range of 6/6 to 6/12 within 2 weeks of antiviral treatment. Majority of the patients regained visual acuity 6/6 after 2 weeks of antiviral treatment which accounts for 80%. Similar study by *shah et al*¹⁰ showed 11.9% patients had visual acuity less than 3/60 after treatment and follow up. Another study like *Moor fields Eye hospital study*¹³ found that out of 152 patients with epithelial keratitis; only 3% had final visual acuity less than 20/200 after treatment, where as in Rochester study they found only 4 eyes had final visual acuity of less than 20/100¹⁴.

CONCLUSION

From our study we found herpes simplex keratitis is the most common type of viral keratitis and epithelial keratitis in the form of dendritic ulcer is the most common clinical manifestation. Fever was the major precipitating factor for viral keratitis found in our study. Most of the

patients had significant improvement in the visual outcome following the treatment. which could be due to early diagnosis, timely management and compliance of patients for treatment and follow up. In developing countries like India requires long term study to know the burden of viral keratitis. Since our study was a short-term study which was conducted for 6 months and the sample size being only 50, we could not observe any cases of stromal keratitis without ulceration and endothelitis. Improved understanding of burden of viral keratitis and its clinical pattern can lead up to early identification and treatment. Awareness should be given to people for discontinuing use of unprescribed drugs. Early diagnosis and timely intervention can reduce complications like corneal scarring and subsequent visual disability.

Financial support and sponsorship

Nil

Conflicts of interest

There are no conflicts of interest

REFERENCES

1. Sodani P, Sethi M, Kumar S, Bhagat V. Hospital based study of viral keratitis: A cross sectional , observational study JK Science 2022;24(2):99- 10
2. V. Satya Srinivas, A. P. R. Naidu. “A Clinical Study on Natural History of Viral Keratitis”. Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 47, November 12, 2015; Page: 8314-8316, DOI: 10.18410/jebmh/2015/1125.
3. Vadoothker S, Andrews L, Jeng BH, Levin MR. Management of Herpes Simplex Viral Keratitis in the Pediatric Population. Pediatric Infect Dis J 2018; 37: 949-51
4. Van Dyk, M., & Meyer, D. (2010). Hutchinson's sign as a marker of ocular involvement in HIV-positive patients with herpes zoster ophthalmicus. *South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde*, 100(3), 172–174. <https://doi.org/10.7196/samj.3191>
5. Liesegang TJ. Herpes Simplex Virus epidemiology and ocular importance. *Cornea* 2001; 20:1-13.
6. Tran KD, Falcon MM, Choi DS. Epidemiology of herpes zoster ophthalmicus: recurrence and chronicity. *Ophthalmology* 2016; 123:1469-75.
7. Borkar DS, Tham VM, Esterberg E. Incidence of herpes zoster ophthalmicus: Results from the Pacific Ocular Inflammation Study. *Ophthalmology* 2013; 120:451-56.
8. Lee J, Bilonick RA, Romanowski EG. Seasonal variation in human adenovirus conjunctivitis: A 30 year observational study. *Ophthalmic Epidemiol* 2018; 451-6
9. Kabra A, Lalitha P, Mahadevan K. Herpes Simplex Keratitis and visual impairment: A case series. *Indian J Ophthalmol* 2006; 54:23-27.
10. Shah A, Joshi P, Bhusal B. Clinical pattern and visual impairment associated with Herpes simplex keratitis. *Clin Ophthalmol* 2019; 13:2211-15.
11. Pramod NP, Rajendran P, Kannan KA, Thyagarajan SP. Herpes simplex keratitis in South India: clinic-virological correlation. *Jpn J Ophthalmol* 1999; 43:303-7.
12. Saini JS, Agrawala R. Clinical pattern of recurrent herpes simplex keratitis. *Indian J Ophthalmol* 1999; 47:11-4.

13. Wilhelmus KR. Antiviral treatment and other therapeutic interventions for herpes simplex virus epithelial keratitis. *Cochrane Database Syst Rev* 2015; 1:CD002898
 14. Young RR, Hodge DO, Liesegang TJ. Incidence, recurrence, and outcomes of herpes simplex virus eye disease in Olmsted County, Minnesota, 1976-2007: The effect of oral prophylaxis. *Arch Ophthalmol* 2010; 128:1178-83
-