Original Article

Ophthalmology and Allied Sciences
Volume 4 Number 1, January - April 2018
DOI: http://dx.doi.org/10.21088/oas.2454.7816.4118.4

Clinical Profile and Management Outcomes of Infectious Keratitis in a Tertiary Eye Care Hospital

M. Meera Alias Devasena*, Sujatha Mohan, Mohan Rajan**, Bina John****

*Assistant Professor, Department of Ophthalmology, Sri Ramachandra Medical College & Research Institute, Porur, Chennai, Tamil Nadu 600116, India. **Rajan Eye Care Hospital, No: 5, Vidyodaya East II street, T. Nagar, Chennai, Tamil Nadu 600017, India.

Abstract

Context: Corneal infection is a leading cause of ocular morbidity and blindness worldwide. Infective corneal ulcers form a major threat to vision and are an important cause of treatable corneal blindness.

Settings and Design: Prospective Follow up Study.

Aims: To study the Risk factors, etiology, clinical features and to analyse the treatment modalities, response and outcomes in 150 patients of infectious keratitis.

Methods and Material: A Prospective study was done among 150 patients of infectious keratitis in a tertiary eye care hospital. History of predisposing factors and symptoms of infectious keratitis were documented. Morphology and characteristics of the ulcer were noted. Fluorescein staining was done in all cases. Patients were started on appropriate antimicrobial therapy based on clinical diagnosis, smear and culture reports. Statistical analysis used: Data entry and analysis were done by SPSS-10.0 for windows software. Chi square test was done for risk factors of infectious keratitis.

Results: Among the 150 patients, 54% were males and the mean age was 41.3 years. About 54% (81) gave history of trauma. About 44% were diagnosed as fungal keratitis, 40% bacterial keratitis, 12% viral and 4% had acanthamoeba keratitis. Overall 114 corneal ulcers healed well to medical management. Ulcers with trauma and smaller ulcers (< 3 mm) and reported within 7 days of onset of symptoms had better healing rate which was statistically significant ($p < 0.013$).

Conclusions: Bacterial and fungal corneal ulcers are equally prevalent in our population. History of trauma is a significant risk factor. Patients who presented late and fungal etiology had poor prognosis.

Keywords: Infectious Keratitis; Prospective Study; Follow up Study; Hypopyon; Keratoplasty; Corneal Ulcer.

Introduction

Corneal infection is a leading cause of ocular morbidity and blindness worldwide [1]. Corneal opacity due to central corneal ulcer is a major cause of monocular blindness in developing countries [2]. The incidence of microbial keratitis is still high in developing countries, due to lack of medical awareness and inaccessibility to medical treatment [3].

According to a study, the annual incidence of corneal ulcers in south India is 10 times higher than in developed countries like USA [4]. The causative organisms differ from region to region and according to the source of economic income. For example, a country with agricultural based economy encounters more fungal-related keratitis. Traumatic corneal ulcers are more frequent in our country [5]. Early diagnosis and proper treatment is important in preventing vision threatening complications. Due to their high incidence and potential complications, infective corneal ulcers form a major threat to vision and are an important cause of treatable corneal blindness [6].

Corresponding Author: M. Meera Alias Devasena, Assitant Professor, Department of Ophthalmology, Sri Ramachandra Medical College & Research Institute, Porur, Chennai, Tamil Nadu 600116, India.
E-mail: meeradevasena@yahoo.in

Received on 19.01.2018, **Accepted on** 09.02.2018

Objectives

The Aims of our Study are:

To study the Risk factors, etiology, clinical features and to analyse the treatment modalities, response and outcomes in 150 patients of infectious keratitis.

Materials and Methods

A Prospective Follow up study was done among 150 patients of infectious keratitis in a tertiary eye care hospital, Chennai. Ulcers of noninfective etiology and neurotropic ulcers were excluded from the study.

Selection of Cases

All cases of infective corneal ulcers identified clinically and with positive cultures were studied and analysed. Corneal ulcer was defined as a loss of corneal epithelium with underlying stromal infiltration with or without suppuration associated with signs of inflammation with or without hypopyon.

History Taking

A detailed history was taken in all patients. History of predisposing factors like trauma, traumatizing agents like stick, sand, vegetable matter, contact lens wear, etc were obtained. Symptoms of pain, redness, watering, photophobia, visual disturbances and their duration and onset and treatment history were documented. History of associated systemic illness like diabetes was noted.

Examination

Detailed slit lamp examination was done. Morphology and characteristics of the ulcer like the size, shape, margin, surface, depth, stromal infiltration, vascularisation, and hypopyon were noted. Fluorescein staining was done in all cases.

Laboratory Investigations

Slit lamp guided scraping from the edge of corneal ulcer was done in almost all cases for confirmation of clinical diagnosis except those of peripheral ulcers of less than 2mm responding to topical antibiotics and those of viral keratitis. It was done under topical anaesthesia using proparcaine drops with a sterile 15 no. blade. Gram's staining, 10% Potassium Hydroxide (KOH) wet mount was done with material from scrapings. The scrapping materials were also inoculated onto blood agar, chocolate agar, non-nutrient agar, Sabouraud's dextrose agar in rows of C-shaped streaks. Routine laboratory investigation should always include both bacterial and fungal media by the standard C-streak method [7]. Random blood sugar levels were done for all patients. Liver function tests were done in cases where systemic antifungal drugs were indicated.

Treatment

After getting informed consent from the patients who were included in our study they were started on appropriate antimicrobial therapy either as monotherapy or combination therapies based on clinical diagnosis and smear and culture reports. The selection of antibiotics can be in the form of specific agents or a combination therapy [8]. Voriconazole is a new, promising therapy for fungal keratitis that is refractory to standard antifungal agents [9]. Also, cycloplegics (1% atropine eye drops) twice a day was given to all patients. If there is increased intraocular pressure, Tab. Acetazolamide 250 mg was added. Oral Anti-inflammatory drugs were given for severe, painful ulcers.

Follow- up

Daily slit lamp examination was done for all patients to assess the size, depth and extent of ulcer. Presence and size of hypopyon if any was noted. Depending on signs of improvement, patients were followed up at appropriate intervals. In all progressing ulcers, daily wound debridement was done using sterile No.15 blade. Timely surgical intervention was done whenever needed. Surgery when performed with 8 mm or smaller diameter donor grafts had better results than larger grafts [10].

Data Compilation and Analysis

Data entry and analysis were done by SPSS-10.0 for windows software. Percentages and p values were estimated. Chi square test was done for risk factors of infectious keratitis.

Results

The present study was done in a tertiary eye care hospital which included 150 patients of infective corneal ulcer. The maximum number of patients were

in the age group 11-50 years who accounted for around 62% of cases, as they are more involved in outdoor and physical activities. The mean age of presentation was 41.26 years. In our study, 54% of patients were males and 46% were females .

Outdoor workers were mainly labourers and farmers who constituted 36% of cases. Housewives (24%) sustained injury due to domestic trauma like finger nail injury etc. About 54% patients had history of corneal trauma. Out of these 8% had injury with vegetable matter. The remaining 46% had injury with dust/stick and others. 12% were contact lens users. Details are given in Figure 1. Only 14% of the patients sought proper treatment within 2 days to a specialist centre. About 42% reported within a week. 28% reported between 8 and 14 days and 16% reported after 15 days. Details are given in Figure 2. About 81 patients had history of trauma to the eye involved. At the first visit, 74 patients presented with visual acuity better than 6/12. About 66 had visual acuity between 6/18 and 6/60. 3cases presented with visual acuity less than 6/60. 3 patients came as late referral and had only perception of light (PL+). Almost 66% of cases presented with ulcer of size between 2-5mm. Likewise, around 72% patients showed infiltration limited to anterior 1/3rd of stroma. In 28% posterior 2/3rd of stroma was involved. Ulcers more than 5 mm with posterior 2/3rd stromal infiltration are aggressively treated with anticipating complications. About 36% patients had hypopyon ulcers. Details are given in Table 1.

Among the corneal scrapings, Gram's staining showed positivity in 60 cases, out of which 48 showed Gram positive organisms and 12 gram negative. KOH wet mount was positive in 45 cases of fungal ulcer and 21 patients were KOH negative, this may be because of prior treatment taken elsewhere and application of antifungal drugs.

Table 1: Risk factors, Clinical presentation and Corneal Ulcer Morphology

	N	Percentage
H/O trauma		
Present	81	54
Absent	69	46
Visual acuity at presentation		
>6/12	72	48
<6/12 to 6/60	66	44
<6/60 to CFCF	9	6
PL+	32	
Size of the ulcer		
< 2mm	24	16
2 to 5 mm	99	66
>5 mm	27	18
Stromal infiltration		
< 1/3 rd stroma	108	72
>1/3 rd stroma	42	28
Hypopyon		
Present	54	36
Absent	96	64

Table 2: Types of Corneal Ulcer and Management Outcomes

Types	N	Percent
Bacterial	60	40
Fungal	66	44
Viral	18	12
Acanthamoeba	64	
Outcomes:		
Healed ulcers with medical management	114	76
Ulcers not responded to medical therapy	30	20
Rapidly worsened ulcers	6 4	

Based on clinical findings, smear reports and culture sensitivity, 40% were bacterial ulcers, 44% were fungal ulcers, 12% viral and 4% were acanthamoeba keratitis. Out of 150 patients, 114 healed well with medical management and 36 cases were taken up for therapeutic penetrating keratoplasty either due to impending perforation or not responding to medical therapy. Details are given in Table 2 The mean treatment duration was 26 days. 40% healed well within 14 days and 36% within 28 days and the rest 24% had prolonged treatment. After therapeutic penetrating keratoplasty, 30 patients were doing well with no recurrence in the graft. 6 fungal ulcer cases who presented to us late, in spite of therapeutic penetrating keratoplasty had rapid worsening of disease with suppurative keratitis to endophthalmitis. On Statistical analysis of the data by using Chi-Square tests, healing of ulcers was better in younger patients less than 40 years, and was statistically significant (p value 0.003), this may be

Table 3: Association between age, history of trauma, duration of complaints, ulcer size and corneal ulcer healing.

S. No.	Parameters	Ulcer Healed	Ulcer not Healed	pvalue
1	Age			
	<40 years	75	6	0.003
	> 40 years	39	30	
2	History of trauma			
	YES	48	30	0.013
	NO	66	6	
3	Duration of complaints			
	< 7 DAYS	75	9	0.013
	> 7 DAYS	39	27	
4	Ulcer size			
	<3mm	93	18	0.030
	> 3mm	21	18	

Fig. 1:

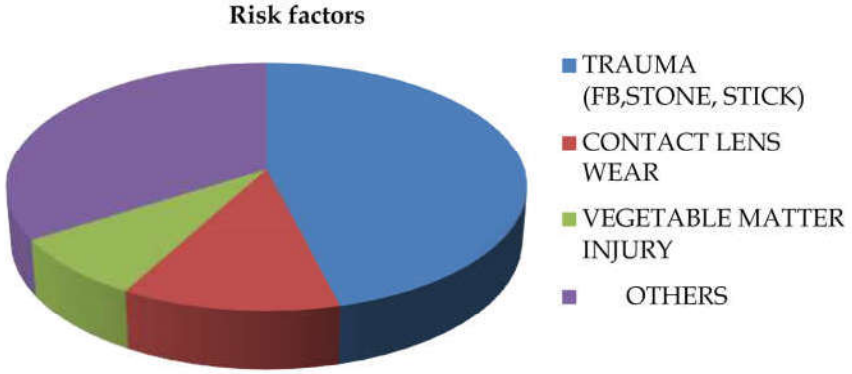
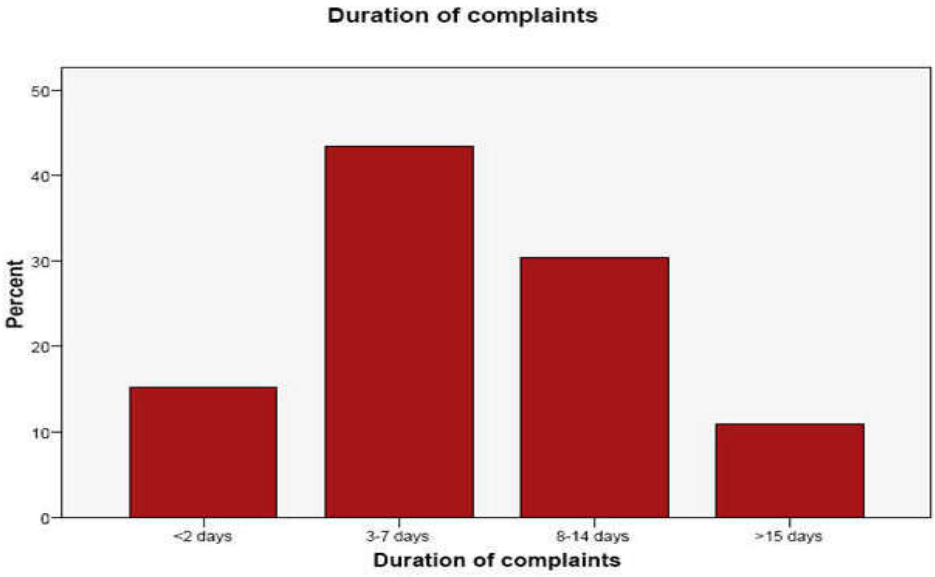


Fig. 2:



because of absence of risk factors like Diabetes which may impair the healing process. Traumatic corneal ulcers were found to have less healing rate than non traumatic ulcer group which was statistically significant (p value 0.013), Smaller ulcers of less than 3 mm and those who presented early in the course of disease within 7 days of onset of symptoms had better healing rate which were also statistically significant (pvalue 0.013 & 0.030). Details are given in Table 3.

Discussion

The present study of 150 patients of infective corneal ulcer have been analysed and the results compared with other studies as follows.

In the present study, 38% were in the age group of 10-30 years and 24% between 31-50 years and 36% were over 50 years. Similar results were seen by M. R. Shoja et al [11] in a cross sectional prospective study of 80 cases of microbial keratitis studied that the highest frequency belongs to the 40 to 50 age group. In this study, out of 150 cases, 46% had trauma with foreign body, stone etc., 8% had injury with vegetable matter and 12% were contact lens users. Trauma to eyes is very common in patients doing field work and factory workers because no personal protective measures are taken by our population. Similar findings were also observed in the studyby Norina T J et al [12] in an analytical study of 42 patients of infective keratitis found that history of recent eye injury was obtained from 26 (62%) patients,injury involving vegetative materials, such as paddy stalk, wood and grass, contributed 30% of cases and nine (21%) of the patients were contact lenses. Sudesh K Arya et al [13] in his study with 28 cases of bacterial keratitis, predisposing factors were present in 12 patients. Injury with vegetative matter and dust were the commonest predisposing factors followed by mechanical trauma and injury with iron nail .

In our study, only 21 patients out of 150 (14%) reported to us within 2 days, 63 patients (42%) presented within 3-7 days and 66 cases either reported first time or came as referred patient after 7 days of onset of complaints. Patients who presented within 7 days had a statistically significant improved healing rate than those who presented after 7 days. The present study coincides with the results of Rafael LacerddaFurlanetto RL et al [14], in their study reported that symptoms at presentation ranged from 1-3 days in 16 patients out of 65 (24.61%), 4-7 days in 19 cases (19/65; 29.23%), and more than 7 days in 27 patients (27/65; 41.53%).

In our study, bacterial and fungal infections occurred almost with equal frequency, the predominant bacterial and fungal species isolated being *Staphylococcus aureus* and Aspergillus species respectively. Thestudy done at L V Prasad Eye Institute, Hyderabad, showed that 71.9% of all cases of ulcerative keratitis were culture positive. Of the culture positive cases 63.9% were bacterial, 33% were fungal, 2.1% were parasitic, and 6.2% were due to mixed infection [15]. Similar results were also seen in the studies of Keshav BR et al [16], Bharathi MJ et al [17] and JS Titiyal et al [18], This was also supported by studies of M.R. Shoja et al showing that there is a region wise variation in the predominance of corneal pathogens.

Our study also showed that there was a significant association between early treatment and healing. Out of 84 ulcers that presented within 7 days of onset of symptoms, 75 healed well and among 66 patients who presented after 7 days of onset of symptoms,39 healed better. Overall 36 patients did not respond to medical management and proceeded to therapeutic penetrating keratoplasty. J S Titiyal et al showed that delay in starting definite treatment is a risk factor for perforation in corneal ulcers. In our study of 150 patients, 114 healed well (54 out of 60 bacterial, 36 out of 66 fungal, 6 acanthamoeba and 18 viral) responding to medical management. Follow up of the patients who had improvement with medical therapy showed a healed maculo leucomatous scar. About 30 patients had non healing ulcers, out of which 9 patients had impending perforation and 21 patients did not improve in spite of maximum medical management, this can be attributed to the virulence of organism or due to poor host immunity as in diabetics over 40 years of age and showed clinical improvement by therapeutic penetrating keratoplasty. Remaining 6 patients of fungal ulcer that came to us late as referral patients had fulminant aggressive ulcer which was progressing even after therapeutic penetrating keratoplasty, with florid iris new vessels and suppurative scleritis and had rapid worsening of disease to endophthalmitis. Norina T J et alin their retrospective study of fungal keratitis in Singapore showed that almost half of their cases required therapeutic penetrating keratoplasty due to the involvement of central large persistent nonhealing ulcers.

Conclusion

Infectious keratitis remains a therapeutic challenge and a vision threatening ocular condition. Bacterial

and fungal ulcers are equally prevalent in our population. Trauma is a significant risk factor for development of corneal ulcer. Patients who presented late in the course of disease and those of fungal etiology had poor prognosis, not responding to medical treatment requiring therapeutic penetrating keratoplasty. Patient education regarding personal hygiene, early approach to ophthalmologist following eye trauma, frequent eye medications and regular follow up are important in preventing complications.

Acknowledgement

I would like to sincerely thank Dr. A. Meriton Stanly and Dr. Ravi Shankar P. for their guidance and valuable suggestions .

Key Messages

Infectious keratitis remains a therapeutic challenge and vision threatening ocular condition. Patient education regarding personal hygiene, early approach to ophthalmologist following eye trauma, frequent eye medications and regular follow up are important in preventing complications

References

1. Kunimoto, Sharma S, Garg P, Gopinathan U, Miller D, Rao GN. Corneal ulceration in Hyderabad, South India. British Journal of Ophthalmology, 2000; 84:54-59.
2. Whitcher JP, Srinivasan M. Corneal ulceration in the developing world a silent epidemic. Br J Ophthalmol 1997;81:622-3.
3. Upadhyay M, P Karmacharya, S Koirala, D Shah, S Shakya, J Shrestha, H Bajracharya, C Gurung, and J Whitcher. The Bakthapur eye study ocular trauma and antibiotic prophylaxis for the prevention of corneal ulceration at Nepal. BJO 2001;85:388-392.
4. Srinivasan M, Gonzales CA, George C, Cevallos V, Mascrenhas JM, Asokan B, Wilkins J, Smolin G, Whitcher JP. Epidemiology and etiological diagnosis of corneal ulceration at Madurai, South India. BJO 1999;81:965-971.
5. Survey of Blindness in India – present status of national programme for control of blindness, New Delhi, Govt. of India, 1992.
6. Schaefer, Olivier Bruttin, Léonidas Zografos, Yan Guex-Crosier Y. Clinical and microbiological studyBacterial keratitis a prospective. BJO 2001;85: 842-8473.
7. Leck AK et al. Aetiology of suppurative corneal ulcers in Ghana and south India, and epidemiology of fungal keratitis. Br J Ophthalmol. 2002 Nov;86(11):1211-5.
8. Jones DB. Initial therapy of suspected microbial corneal ulcers. II. Specific antibiotic therapy based on corneal smears. Surv Ophthalmol 1979;24:97.
9. O'Day DM, Robinson RD, Head WS. Efficacy of anti-fungal agents in the cornea. I. A comparative study. Invest Ophthalmol Vis Sci 1083;24:1098.
10. Portnoy SL, Insler MS, Kaufman HE. Surgical manage-ment of corneal ulceration and perforation. Surv Oph-thalmol 1989;34(1)47-58:
11. M. R. Shoja and M. Manaviat. Epidemiology and outcome of corneal ulcer in yazd shahid sadoughi hospital, Acta Medica Iranica, 2004;42(2).
12. Norina T J, Raihan S, Bakiah S, Ezanee M, Liza-Sharmini A T, Wan Hazzabah W H Microbial keratitis: Aetiologicaldiagnosis and clinical features inpatients admitted to Hospital Universiti Sains Malaysia, Singapore Med J 2008 Jan;49(1):67-71.
13. Sudesh K Arya, Sunandan sood, Rajni Nahar, Charu Mithal, Rajeev Jain; Microbiological Profile and Management of Infectious Keratitis in An Urban Referral Centre. North Zone Ophthalmological Society, 2004 Jan;14(1).
14. RafaelLacerdda Furlanetto, Eduardo G V Andreo, Ioná G A Finotti, Enyr S Arcieri, Magno A Ferreira, Flavio JRocha; Epidemiology and etiologic diagnosis of infectious keratitis in Uberlandia, Brazil. Euro J Ophthalmology. 2010 May-Jun;20: 498-503.
15 Prashant Garg MS and Gullapalli N Rao. Corneal ulcer: diagnosis and management. LV Prasad Eye Institute, J Comm. Eye Health 1999;12(30):21-23.
16. Keshav BR Zacheria GIdeculla T Bhat V, and Joseph M. Epidemiological Characteristics of Corneal ulcers in south sharqiya Region Oman Medical Journal 2008 Jan;23(1).
17. Bharathi MJ, Ramakrishnan R, Meenakshi R, Mittal S, Shivakumar C, Srinivasan M. Microbiological diagnosis of infective keratitis: Comparative evaluation of direct microscopy and culture results. Br J Ophthalmol 2006;90:1271-6.
18. J S Titiyal, S Negi, A Anand, R Tandon, N Sharma, and R B Vajpayeeal; Risk factors for perforation in microbial corneal ulcers in north India. Br J Ophthalmol. 2006 June;90(6):686–689.