



## EPIDEMIOLOGY, RISK FACTORS AND CLINICAL OUTCOME IN CORNEAL ULCER – A SINGLE INSTITUTION STUDY OF CENTRAL INDIA

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### ABSTRACT

**Background:** Corneal ulcer is one of the major causes of blindness in developing countries thus this study was conducted to evaluate demographic pattern, risk factors, diagnosis of causative organism by basic laboratory facilities and to access treatment response so that a systematic approach may be adopted in preventing and treating this sight threatening disorder.

**Materials and Methods:** A prospective study of corneal ulcer patients from November 2016 to October 2019 was done. Data related to socio-demography, predisposing factor and prior treatment were recorded. Ulcer was evaluated by slit lamp examination. Corneal scrapings were subjected to Gram's stain and 10% KOH wet mount. Treatment was given according to clinical features and laboratory results

**Results:** 234 eyes were evaluated. 75.6% were between 26-55 yrs. 78.6% eyes presented with vision <3/60. Trauma was commonest factor found in 73.50% patients. On staining 22.6% were having fungal and 67.10% mixed bacterial and fungal infection. Overall 45.29% completely recovered.

**Conclusion:** Corneal ulceration predominantly presented in rural area in males of agricultural occupation following neglected ocular trauma which can be treated successfully with proper medical management. A community based awareness can prevent corneal ulceration related visual morbidity.

**KEYWORDS :** Fungal keratitis, Corneal ulcer, ocular trauma, corneal scrapping.

### INTRODUCTION

Globally, it is estimated that ocular trauma and corneal ulceration result in 1.5-2 million cases of corneal blindness annually.<sup>1</sup> 90% of such patients belongs to developing countries, where the lesion has now been recognised as a silent epidemic.<sup>2</sup> A national survey by the Government of India (1991-2001) estimated that corneal lesions were responsible for 9% of blindness in the country.<sup>3</sup> A wide spectrum of microbial organisms can produce corneal infections and, consequently, the therapeutic strategies adopted for its treatment may be varied.<sup>4</sup> Considering the importance of corneal ulceration as a major cause of visual loss, many studies have reported the prevalence of microbial pathogens and identified the risk factors predisposing to corneal infections.<sup>5,6,7</sup> In India, previous studies have highlighted that microbial keratitis occurs more frequently in men, those in an agricultural occupation, and is more likely following trauma to the eye.<sup>8,9</sup>

Availability of investigations like microbiological evaluation and culture sensitivity are necessary for proper management of corneal ulcer and to reduce the dreaded complications. In developing countries like India most patients belong to rural areas as trauma is a leading cause of corneal ulcer which leads to high incidence because of irrational use of steroids and late presentation to an ophthalmologist.

This study aims to evaluate the demographic pattern including age and sex predilections, occupation, various predisposing risk factors, the type of microbes causing the ulcers on the basis of basic laboratory investigation and clinical findings and the result of treatment provided so that a systematic approach may be adopted in preventing and treating this sight threatening disorder.

### METHOD

This study was conducted in ophthalmology department of

Bundelkhand Medical College Sagar from November 2016 to October 2019. During these three years about 75,000 patients were seen in our department out of which 547 were recorded ulcer patients. We included 234 eyes of 234 patients in our study. Patients with presumed microbial keratitis were included in this study with exclusion criteria of

1. Those with viral keratitis
2. Ulcer with impending or actual perforation or near total corneal melting
3. Ulcer in healing stage with prior treatment
4. Small children in whom proper examination and scraping was not possible without GA.
5. Patients not certain of regular follow up

After including in study demographic data, history to find out predisposing factors, previous treatment and duration of symptoms were recorded. Visual acuity was recorded at the time first examination. Patients were evaluated on slit lamp biomicroscope to examine corneal ulcer including location, size, depth of ulcer along with margins, floor, infiltrations and presence or absence of hypopyon.

After detailed ocular examination, corneal scrapings were obtained from the margins of the ulcer using a sterile Baird - Parker blade. For suspected bacterial ulcer, therapy given was Moxifloxacin 0.5% eye drop alone or Combination of fortified cefazoline (50 mg/ml) and fortified tobramycin (14mg/ml) in non-responding cases. Oral ciprofoxacin was added in patients with ulcer near limbus. In the fungal corneal ulcers initial therapy was Natamycin 5% eye drop alone, in ulcers not more than 50% of corneal thickness. Oral fluconazole tablets 200-400 mg daily were added if deeper infection was present. Combination therapy including both antibacterial and antifungal were given in ulcers with suspected mixed infection, either clinically or on scrapings. Atropine 1% eye drop three-time daily was given in all patients as supportive therapy.

Patients were first evaluated for treatment response after 48 hours on the basis of signs of inflammation & symptomatic relief to the patient. Patients showing improvements were re-evaluated after seven days & those who were not showing improvement were admitted to see compliance, re-scraping was done & therapy modified accordingly. Those who came with perforation or impending perforation were treated either by cyanoacrylate glue application or tarsorrhaphy or conjunctival grafting as per indication.

First follow up in our study was after one week of initiation of therapy & second follow up was after 3 weeks. Status of ulcer was evaluated on each follow up, on the basis of clinical features as whether healing or deteriorated. Visual acuity was recorded & change in visual acuity was noted. Patients were kept on follow up till complete resolution of ulcer. Antimicrobials were prescribed four times a day after complete healing for one week in bacterial and for two weeks in fungal corneal ulcer to prevent recurrences. Treatment was considered as successful if final outcome was an inactive corneal opacity and was recorded as complete recovery. Patients, in whom anatomical integrity couldn't be saved, like those who were eviscerated or perforated, were categorized as deteriorated.

**RESULTS**

In this study total 234 patients were included. In this study 169(72.2%) patients were male and 65(27.8%) patients were female. Maximum patients(75.6%) were from age group 26-55 years whereas patients of paediatric age group are minimum(3.0%). Farmers were most commonly presented with corneal ulcer(55.1%) followed by labourers(24.8%). Most common predisposing factor was ocular trauma(73.5%) followed by foreign body insertion(16.2%). 184(78.6%) eyes were blind (<3/60) at the time of presentation & 50 (21.4%) had visual acuity more than or equal to 3/60. (Table: 1)

**Table: 1 – Patients characteristics**

Characteristics		Number	%
<b>Age wise distribution (in years)</b>	<15	7	3.0%
	16-25	22	9.4%
	26-35	71	30.3%
	36-45	62	26.5%
	46-55	44	18.8%
	56-65	19	8.0%
	>65	9	3.8%
<b>Sex</b>	Male	169	72.2%
	Female	65	27.8%
<b>Occupation</b>	Farmer	129	55.1%
	Labourer	58	24.8%
	Tradesmen/professional	14	6.0%
	Domestic worker	15	6.4%
	Unemployed/unknown	8	3.4%
	Student/children	10	4.3%
<b>Predisposing factors</b>	Trauma	172	73.5%
	Foreign body	38	16.2%
	Cataract surgery	10	4.3%
	Diabetes mellitus	9	3.8%
	Unknown	5	2.2%
<b>Visual acuity at presentation</b>	NPL	15	6.4
	<3/60	169	72.2%
	>3/60	50	21.4%

On slit lamp biomicroscope, ulcers were found to be in central & Para central region of cornea in 185(77.1%) patients while in 5(2.1%) patients only peripheral part was involved. In 36 (15.4%) cases ulcer was large enough to involve central, Paracentral and peripheral part. 139 (59.4%) ulcers were of size 2-5 mm, 75(32.0%) were of size >5mm and only 20 (8.6%) patients were mild type involving <2mm of cornea. 61(26%) ulcers were involving more than 50% of corneal thickness,

173(74%) involving superficial stroma. On corneal scraping, 53 (22.6%) were pure fungal ulcers & 157 (67.10%) were fungal ulcers having co-infection with bacteria while only bacteria were identified in 20(8.5%) patients. (Table: 2)

**Table: 2 – Corneal Ulcer characteristics at presentation**

Characteristics	Number	%	
<b>Location of Ulcer</b>	Central	52	22.2%
	Paracentral	24	10.3%
	Peripheral	5	2.1%
	Central+ Paracentral	109	46.6%
	Central+ Paracentral+ Pericentral	36	15.4%
	Paracentral+Pericentral	8	3.4%
<b>Size of ulcer (in mm)</b>	<2	20	8.6%
	2-5	139	59.4%
	>5	75	32.0%
<b>Depth of ulcer (corneal thickness)</b>	<50%	173	74.0%
	>50%	61	26%
<b>Microbial isolates</b>	Bacteria	20	8.5%
	Fungus	53	22.6%
	Mixed	157	67.1%
	Unknown/ No isolate	04	1.8%

186(79.5%) patients came for 1st follow up. 118(63.4%) were in healing stage. 9(4.83%) were deteriorating out of which 1 case i.e. 0.53% were perforated. 55(29.56%) had shown improvement on snellen's acuity, while 10(5.37%) patient's visual acuity decreased compared to their acuity at the time of presentation. In rest of the 121(65.05%) patients there was no change in visual acuity. 160 (68.37%) came for subsequent follow-ups. In these patients 120(75.0 %) were healing and 15(9.3%) were deteriorating clinically in which 6(3.75%) were perforated. Overall 106(45.29%) patients recovered completely and 20(8.54%) patients deteriorate. Rest of the patients stopped follow ups before completion of treatment.

**Table: 3 – Treatment Response on Follow-up**

Characteristics		First follow-up	Second follow-up
<b>Local response (on corneal ulcer)</b>	Healing	118	120
	No Change	59	25
	Progression	8	9
	Perforation	1	6
	Lost follow-up	48	75
<b>Visual acuity</b>	Improved	55	106
	No change	121	33
	Deteriorate	10	20
	Lost follow-up	48	75

**DISCUSSION**

Highest number of patients presenting to our hospital were between 26 to 55 years of age. This is socio economically active age group. Most of them are agriculture worker as this is the commonest occupation of rural population in developing countries. This explains why agriculture trauma is the leading predisposing factor of corneal ulcer in developing countries.<sup>10</sup> This is in concurrence with that of Panda et al<sup>10</sup>.

Male preponderance is present in this study which was also found in many studies<sup>11,12</sup>. This may be because males are more involved in outdoor activities and also males are preferred over females to seek medical advice. Most of the ulcer presenting to us are of severe grade and late presentation is mainly responsible for this. Patient's accessibility to eye care services is the main barrier for early consultation followed by cost, social belief, and ignorance about the disease. More than 2/3rd of the patients had vision <3/60 in affected eye at initial presentation. Similar results were noted in other studies.<sup>10</sup>

Large numbers of fungal infection were found in our hospital, which was higher than that found in other studies<sup>11, 13, 14</sup>. Agriculture trauma is responsible in our study. Similar results are also seen in other studies<sup>15, 11, 16</sup>. Percentage of mixed bacterial and fungal infection is also high. About 67.1% of fungal infections are having coinfection with the bacteria. Recent studies found bacteria in 5% to 25% of keratomycosis.<sup>11</sup>, 20-23 But other laboratories in Asia and South America have isolated bacteria in approximately 30% to 60% of corneal specimen during fungal keratitis.<sup>15</sup> This diverse prevalence estimate may indicate non-conformity in distinguishing microbial co-infection, and dual infections, but could be due to differences in risk factors, climate & access to care also. The detection of fungal filaments in 10% KOH mount has 90-99% sensitivity.<sup>13,17</sup> while sensitivity & specificity of bacterial detection in Gram's stain is inferior to that of culture method.<sup>18</sup> This could also be a reason for less bacterial detection in our series. Microbiological work-up is now recommended in all suspected cases of microbial keratitis and its importance is proved in many studies, but most general ophthalmologist do not practice the recommendations.<sup>19</sup> In a study only 10% ophthalmologist were found to have the facility of only in nonresponding cases.<sup>19</sup> This practice can be applied if bacterial infection is the dominating cause of ulcer but places like India and other countries where fungal ulcers are more common<sup>11,13,14</sup> this approach is not recommended. Jones DB's suggestions of initial therapeutic treatment on the basis of corneal smear, clinical features and severity of keratitis are very much applicable in areas with high prevalence of fungal corneal infections. To grade the ulcer prior to its management is an important parameter, as severe ulcer requires closer observation. 32% ulcers were more than 5mm size and, 26% were having ulcer of depth more than 50%. 84.2% of ulcer were involving central part of cornea. Other studies<sup>10</sup> have found a similar percentage of severe grades of ulcer. Treatment was given as Natamycin 30 drops & systemic fluconazole in deeper penetration of suspected fungal corneal ulcers. Suspected bacterial ulcers were treated with either moxifloxacin eye drops or combination fortified cefazoline & tobramycin eye drops<sup>20,21</sup>. Major limitation of our study was patients poor compliance for follow-up. Only 2/3rd patients came for follow-up, but 75% follow up were clinically in healing stage. Though 33.33% were still with poor vision but 66.67% had improvement in snellen's acuity. Less follow up may be because most patients coming to our hospital are poor and coming from far places.

## CONCLUSION

With this study we conclude that corneal ulcer is major cause of visual morbidity which mostly affects the rural population of agricultural and labourer occupation in which leading cause of corneal ulceration is ocular trauma. In these areas medical facilities with ophthalmologists are already lacking and ignorance as well as inappropriate use of corticosteroids makes corneal ulceration severe and difficult to save vision leading to blindness. So, the prevention of predisposing factors, appropriated diagnosis at early stage & proper medical management can help greatly in treating microbial keratitis properly. A community-based awareness program regarding risk factors like trauma to eye and proper use of advised medications may create a difference in overall scenario of ulcer presentation.

## REFERENCES

- Whitcher JP, Srinivasan M, Upadhyay MP. Corneal blindness: a global perspective. *Bull World Health Organ* 2001; 79:214-21.
- Whitcher J P, Srinivasan M. Corneal ulceration in developing world - a silent epidemic. *Br J Ophthalmol* 1997; 81:622-3.
- Government of India. National survey on blindness. 1991-2001. Report 2002.
- Agarwal V, Biswas J, Madhavan HN, et al. Current perspectives in infectious keratitis. *Indian J Ophthalmol* 1994; 42:171-92.
- Al-Yousuf N. Microbial keratitis in Kingdom of Bahrain: clinical and microbiology study. *Middle East Afr J Ophthalmol* 2009; 16:3-7.
- Upadhyay MP, Karmacharya PC, Koirala S, et al. Epidemiologic characteristics, predisposing factors, and etiologic diagnosis of corneal

- ulceration in Nepal. *Am J Ophthalmol* 1991; 111:92-9.
- Basak SK, Basak S, Mohanta A, Bhowmick A. Epidemiological and microbiological diagnosis of suppurative keratitis in Gangetic West Bengal, Eastern India. *Indian J Ophthalmol* 2005; 53:17-22.
- Gopinathan U, Sharma S, Garg P, et al. Review of epidemiological features, microbiological diagnosis and treatment outcome of microbial keratitis: experience of over a decade. *Indian J Ophthalmol*. 2009;57:273-279. doi:10.4103/0301-4738.53051.
- Bharathi MJ, Ramakrishnan R, Meenakshi R, et al. Microbial keratitis in South India: influence of risk factors, climate, and geographical variation. *Ophthalmic Epidemiol*. 2007;14:61-69. doi:10.1080/09286580601001347.
- Panda A, Satpathy G, Nayak N, Kumar S, Kumar A. Demographic pattern, predisposing factors and management of ulcerative keratitis: evaluation of thousand cases at a tertiary care centre. *Clinical and experimental ophthalmol* 2007;35(1):44-49.
- Srinivasan M, Gonzales CA, George C, Cevallos V, Mascarenhas JM, Asokan B. Epidemiology & aetiological diagnosis of corneal ulceration in madurai. *Br J ophthalmol* 1997; 81(11):965-71.
- Gonzales CA, Srinivasan M, Whitcher JP, Smolin G. Incidence of corneal ulceration in madurai. *Ophthalmic epidemiol* 1996; 3(3):159-66.
- Bharathi M, Ramakrishnan R, Vasu S, Meenakshi R, Palaniappan R. Epidemiological characteristics and laboratory diagnosis of fungal keratitis: A three year study 2003; *IJO*: 51(4), 315-321.
- Chander J, Sharma A. Prevalence of fungal corneal ulcer in northern India. *Infection* 1994; 22(3):207-209.
- Upadhyay M, Karmacharya PC, Koirala S, Shah DN, Shakya S, Shrestha JK, Bajracharya H, Gurung CK, Whitcher JP. The Bhaktapur eye study: ocular trauma and antibiotic prophylaxis for prevention of corneal ulceration in Nepal. *Br J Ophthalmol* 2001;85(4):388-92.
- Thylefors B. Epidemiological pattern of ocular of ocular trauma. *Aust NZ J ophthalmol* 1992(2); 20:95-98
- Vajpayee RB, Angra SK, Sandramouli S, Honavar SG, Chhabra VK. Laboratory diagnosis of keratomycosis Comparative evaluation of direct Microscopy and culture results. *Ann Ophthalmol* 1993;25(2):68-71
- Wahl J, Katz, H and Abrams D. Infectious Keratitis in Baltimore. *Ann Ophthalmol*, 23(6):234, 1991.
- McDonnell FNobel J, Gauderman W, Lee PAiello A, Trousdale M. Community care of corneal ulcers. *Am J Ophthalmol* 1992; 114(5):531-8.
- O'Brien TP, Maguire MG, Fink NE, Alfonso E, McDonnell PE. Efficacy of Ofloxacin vs Cefazoline and tobramycin in the therapy of bacterial keratitis report from the bacterial keratitis study group. *Arch Ophthalmol*. 1995; 113(10): 1257-1265.
- Morlet N, Daniell M. Microbial keratitis: What the preferred initial therapy? View: 2. Empirical fluoroquinolone therapy is sufficient initial treatment. *Br J Ophthalmol* 2003;87(9);1169-72.