Original Research Article

Changing patterns of first medical contact management profile of corneal ulcers in a developing country: a hospital-based study

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ABSTRACT

Background: Infectious keratitis is a major cause of corneal blindness throughout the world. There are guidelines and protocols for management of infectious keratitis, but these are rarely practiced by the treating physician. The aim of this study is to find the first medical contact management profile in a tertiary care Centre in north India and compare it to the previous studies to see the changing patterns of first contact management in our country.

Methods: The data for the study was collected by retrospective data review of 100 consecutive patients with infectious keratitis. Various parameters were studied and statistical correlation established, where it was felt necessary. The parameters were age and sex distribution, first medical contact, initial treatment prescribed, time interval for first medical contact, inciting factors for corneal ulcer, bacterial and fungal culture spectrum, visual recovery after medical and surgical treatment.

Results: Data review of 100 consecutive patients with infectious keratitis was done. More than 70% of patients were above 40 years of age. In 54% of patients, no inciting agent could be identified. The first medical contact for majority of patients was ophthalmologists in independent practice (48%). Time interval for first contact to any health professional varied from one day to 75 days with mean 4.63 days. Moxifloxacin hydrochloride eye drops was the most commonly used drug. *Staphylococcus epidermidis* was the commonest isolate grown in the culture (38.9%).

Conclusions: Early diagnosis and appropriate management of infectious keratitis is important and role of first medical contact of patient is most crucial in final outcome.

Keywords: First medical contact, Infectious keratitis**,** Keratoplasty

INTRODUCTION

Infectious keratitis is a major cause of corneal blindness throughout the world. World Health Organisation (WHO) has recognized infectious keratitis leading to corneal blindness as a major cause of visual disability.[1] The spectrum of infectious keratitis varies in different parts of the world in relation to geographical location, local climate, occupational risk factors, socioeconomic factors, literacy and awareness about eye care.[2]

Corneal ulceration has been recognized as a silent epidemic in developing countries, especially the South-east Asia Region. Indian subcontinent has a much higher incidence and prevalence of infectious keratitis and its sequelae compared to developed countries.[3] There are very few studies published in the literature about the

incidence of infectious keratitis in the Indian population.[4] In 1996, Gonzales et al reported the annual incidence of corneal ulceration of 11.3 per 10 000 population in Madurai District, Tamilnadu, south India and by extrapolation of these figures, about 1.5 to 2.0 million people in India develop corneal ulcers annually.[5]

There are guidelines and protocols for management of infectious keratitis but these are rarely practiced by the treating physicians. Vajpayee et al, in 2001, studied first contact management profile of infectious keratitis patients reporting to a tertiary care ophthalmology center and concluded that failure of implementation of standard management protocols in management of infectious keratitis at the first contact is the major factor contributing to the ocular morbidity in India.[6] There have been tremendous transformation over last fifteen years in terms of health awareness, development and availability of newer topical antibiotics and ease of access of information over the internet for both patients as well as ophthalmologists.[7-9] The aim of this study is to find the first contact management profile in a tertiary care centre in north India and compare it to the previous studies to see the changing patterns of first contact management in our country.

METHODS

The study was a retrospective study, carried out in a tertiary eye care centre, New Delhi, India. The data for the study was collected by retrospective review of 100 consecutive patients with presumed infectious keratitis, who had presented to cornea services of our tertiary care hospital. The data was analyzed using SPSS Statistics software version 26.0.The study duration was from 01 January 2017 to 31 December 2019. Ethical clearance was taken from the hospital ethical committee. All patients were examined on slit lamp biomicroscope and infectious keratitis was defined as epithelial defect with underlying stromal infiltration. Corneal ulcers were graded as moderate if ulcer did not encroach the visual axis, less than half of corneal depth or less than half of corneal area was involved (Figure 1). Severe infectious keratitis were those ulcers that involved visual axis, infiltrated deeper than half of cornea or covered more than half of area of corneal surface (Figure 2). All the patients had undergone corneal scraping and specimens were sent for Gram stain, KOH mount, culture and antibiotic sensitivity. Bacteria and fungus were identified using standard protocols and antibiotic susceptibility was determined by determining minimum inhibitory concentration (MIC) using serial dilution technique. Positive cultures were identified if there was a single colony of virulent organism or at least three colonies of organisms which were not considered so pathogenic (such as *Staphylococcus epidermidis*) for ocular surface.

All the patients with severe infectious keratitis were started on combination of fortified eye drops (Cephazolin sodium 5% and tobramycin sulphate 1.3%, freshly

prepared in hospital pharmacy) on half hourly basis for 48 hrs. Subsequent management was guided by the microbiological results. Fungal keratitis was managed by natamycin eye drops 5% and/ or voriconazole eye drops 1% one hourly during daytime and two hourly during the night. Patients with severe infectious keratitis, not responding to maximal medical therapy had undergone therapeutic keratoplasty.

RESULTS

Data review of 100 consecutive patients with infectious keratitis was done. Out of all, 71 % were male and 29% female. 18 patients had moderate degree of corneal ulcer whereas 82 patients had severe corneal ulcer, few with hypopyon also. Age of patients varied from 01 year to 78 years (Table 1). More than 70% of patients were above 40 years of age. In 54% of patients, no inciting agent could be identified. Out of the remaining 46 patients, 29 (63%) had history of trauma with vegetative matter/ foreign body/ sand. There were five patients with history of nail injury, three with cow tail injury and one with history of contact lens use (Table 2).

Table 1: Age distribution of the patients.

Age	Frequency (%)
<20 years	9 (9)
20-40 years	28 (28)
40-60 years	40 (40)
> 60 years	23 (23)
Total	100 (100)

Table 2: Inciting factor for keratitis.

Inciting factor	Frequency (%)
Not Identified	54 (54)
Trauma with veg matter	15 (15)
Trauma with insect	8 (8)
Trauma with sand particle	14 (14)
Nail injury	5 (5)
Cow tail injury	3 (3)
Contact lens use	1 (1)
Total	100 (100)

Table 3: Nature of first medical contact of the patients with infectious keratitis.

First contact	Frequency (%)
Chemist	22 (22)
General practitioner	13 (13)
Ophthalmologist private practioners	48 (48)
Tertiary eye care centre	6 (6)
Our tertiary eye care centre	11 (11)
Total	100 (100)

The first medical contact for majority of patients with infectious keratitis after developing symptoms, was ophthalmologist in independent practice (48%) (Table 3). However, 22% of patients went directly to chemists to take eye drops without prescription. 13 % patients went to non-ophthalmologist general practitioners, 6 % to tertiary eye care centers excluding our centre and 11% reported to our Centre. Time interval for first contact to any health professional varied from one day to 75 days with mean 4.63 days and 95% CI 2.6-6.6 (Median 2, IQR =3) (Table 4).

Table 4: Time interval for first contact with health professional.

Time interval of First Contact	Frequency(%)
0-1 day	29 (29)
1-2 days	26 (26)
3-7days	36 (36)
≥ 7 days	9 (9)
Total	100 (100)

Total 55% of patients reported to health professionals within 48 hours of developing symptoms whereas 9% patients reported after one week. Patients used various types of antibiotic regimen based on availability and prescription (Table 5).

Table 5: Use of antibiotic eye drops/ steroids at first contact.

Antibiotic/ steroid use	Frequency (%)
Moxifloxacin	39
Ciprofloxacin	3
Gatifloxacin	12
Fortified eye drops	8
Azithromycin	2
Gentamicin	2
Besifloxacin	3
Levofloxacin	2
No records	5
Steroids/ antibiotic steroid combinatio	32

Table 6: Visual acuity after treatment.

Visual acuity	Frequency (%)
>6/18	5 (5.5)
6/24 – 6/60	41 (45)
<6/60	45 (49.5)
Total	91 (100)

Records were not available for five patients. Moxifloxacin hydrochloride eye drop was the most commonly used in 39% of patients. Out of the total patients, 32 (32%) were prescribed topical drops containing steroid. Scraping was done for 12 patients at the time of first contact. Out of these eight were done in

our centre and two each at other tertiary eye care center and by the ophthalmologist in independent practice. The average time taken to reach our tertiary centre by patients was 30.9 days (95% CI: 24.7-37.1). It varied from one day to 117 days.
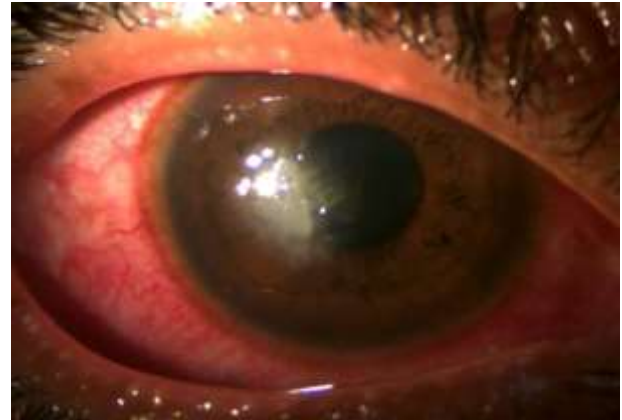

Figure 1: Moderate corneal ulcer.
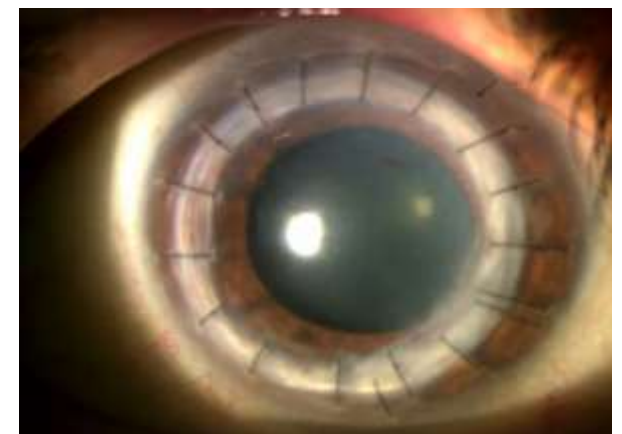

Figure 2 : Severe corneal ulcer.

Figure 3: Therapeutic keratoplasty.

Bacterial Culture, sensitivity testing and fungal cultures were done for most of the patients. Reports of 89 patients were available for analysis. 57 positive cultures were obtained. Out of these, 45 cultures were positive for

bacterial growth while 12 were positive for fungal growth. *Staphylococcus epidermidis* was the commonest isolate grown in the culture (38.9%) followed by *Pseudomonas aeruginosa* (4.2%). 13 cases of Infectious keratitis showed fungal growth and *Aspergillus fumigatus* was the commonest fungus grown in the culture (6 cases) followed by Fusarium (4 cases) and Alternaria (2 cases).

In 86 cases infectious keratitis healed completely on medical management. 14 patients had undergone therapeutic keratoplasty due to corneal melting or perforation (Figure 3). Final visual acuity was known for 91 patients (Table 6). 46 patients had achieved visual acuity better than 6/60 while 45 had worse than that.

DISCUSSION

Infectious keratitis has been recognized as a silent epidemic in developing countries like India.[3] Ocular trauma especially corneal injury has been recognized as the most significant precipitating factor for developing infectious keratitis. In our study, 63% of patients with known precipitating factors had history of trauma with vegetative matter, foreign body and sand. In a previous study from south India by Gopinathan et al, corneal injury was identified as a cause of infectious keratitis in 70.88% patients and most of these patients were involved in agriculture-based activities.[4]

Early diagnosis and appropriate management of infectious keratitis is important and role of first contact of patient is most crucial in final outcome. In our study 22% of patients after developing symptoms of infectious keratitis went to a chemist shop without a physician's prescription and most of them were prescribed steroid containing eye drops, which worsened the severity of infectious keratitis. 65% of patients went to Ophthalmologist as first contact whereas 13% went to general practitioners. Corneal scraping was done in 12% of patients at first contact (most of these were done at a tertiary eye care centre). Only 8% patients were started on combination of fortified eye drops as per conventional teaching of management of corneal ulcer, 92% received monotherapy mostly in inadequate dosage schedule.

In the previous study by Vajpayee et al, none of the patients received fortified eye drops combination at the first contact and corneal scraping was not done in any of the patients. Moxifloxacin was the most common antibiotic prescribed to patients in our study whereas Vajpayee et al, in their study found ciprofloxacin as the commonest antibiotic prescribed 15 years back.[6] Park et al studied community practice patterns for evaluation and management of bacterial corneal ulcers in united states ophthalmologists.[10] They found that the most popular antibiotic for the treatment of less severe ulcers was moxifloxacin (55.4%), and the most popular treatment of more severe ulcers was fortified broad-spectrum antibiotics (62.7%). Cornea specialists were significantly more likely than non-cornea specialists to prescribe fortified antibiotics for more severe corneal ulcers (78.1% vs. 53.7%, P<0.0001). A greater number of cornea specialists stated that fourth-generation fluoroquinolones were less effective than fortified antibiotics for the treatment of more severe corneal ulcers (79.6% of cornea specialists vs. 60.9% of non-cornea specialists, P<0.001).

In our study, steroids were prescribed in 32% patients at the first contact. Most of these patients developed fulminant infection which necessitated therapeutic penetrating keratoplasty in many of these patients (25% in steroid users compared to 7.3% in non-steroid users). Vajpayee et al found that 30% patients in their study received topical steroid containing eye drops.[6] There was no significant difference between two studies about use of topical steroid containing eye drops. Basak et al identified topical corticosteroid use as a precipitating factor in 19.28% patients.[11]

Commonest bacteria isolated in our study was Staphylococcus epidermidis in 38.9% cases followed by Pseudomonas Aeruginosa in 4.2% cases. Fungal cultures were positive in 12 cases (12%). Commonest fungal isolates included *Aspergillus* (50%), *Fusarium* (33.3%) and *Alternaria* (16.7%).

Despite better public health awareness, easy access to healthcare information to both ophthalmologists and patients, better availability of newer antibiotics, there has been little improvement in the evaluation and management of corneal ulcer cases in India over last fifteen years. Although corneal scraping and use of fortified eye drops for management of corneal ulcers has shown increase at the first contact but still far from satisfactory and failure of appropriate management at first contact is still probably a major contributory factor for ocular morbidity in India, as was concluded by Vajpayee et al fifteen years back. Our study further reinforces the importance of management of infectious keratitis at first contact, as appropriate early management is linked to favorable outcome. The limitation of our study is a smaller number of subjects. Hence a study comprising of a greater number of subjects are needed in future.

CONCLUSION

The study suggests that early diagnosis and appropriate management of infectious keratitis is important and role of first medical contact of patient is most crucial in final outcome. If the treatment is offered in correct way at first medical contact, further progression and complications of corneal ulcer can be avoided. It is the need of the hour to follow the correct prescribed methodology in the management of corneal ulcers.

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