“Regional Variation of Epidemiological and Microbiological Profile of Microbial Keratitis in India”

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Summary
A cross sectional study of 208 patients was done to find the regional variation of the epidemiological and microbiological profile of patients with suspected microbial keratitis. Sociodemographic data and risk factors were noted, clinically examination was done and corneal scrapings for stain and cultures were taken. Maximum patients were between the age group 41–60 years, male patients more than females. Trauma especially due to vegetative matter, in farmers residing in rural part was the most common predisposing factor. Bacterial keratitis was more than fungal keratitis with Staphylococcus aureus being the predominant bacterial and Aspergillus predominant fungal pathogen. Thus, this difference in microbial etiology for corneal ulceration in different regions of our country should be borne in mind when treating microbial keratitis.

Keywords: microbial keratitis, predisposing factors, epidemiology, regional variation

Introduction
Prevalence of microbial keratitis and the associated risk factors predisposing to it in different regions of India has been reported. Diagnosis and treatment of corneal ulcer is challenging as the culture reports of corneal scraping is sometimes inconclusive. Knowledge about the regional variation can be a guide to give early treatment as corneal ulceration and its sequelae are important causes of visual loss. Thus, the present study was undertaken to determine the epidemiological and microbiological profile of microbial keratitis at our center and compare the results with the rest of the country.

Material & Method
Analysis of 208 patients presenting between January 2012 to December 2013 was done. Ethical committee approval was taken and informed written consent was obtained. Information regarding sociodemography, symptoms, risk factors and occupation was taken and documented. Clinical evaluation was done with slit-lamp biomicroscope. Corneal scraping was done under aseptic conditions either on slit lamp or under operating microscope. The eye was anesthetized with 0.5% proparacaine hydrochloride. Bard Parker no. 15 blade was used for scraping. The material was smeared on two glass slides, one for potassium hydroxide and the other for Gram’s stain. Swab for culture and sensitivity was taken. Patients with no history of previous treatment were included in the study. Patients with history of previous treatment, other causes of corneal ulcers were not included.

Observation
Epidemiological characteristics (Table 1) shows maximum patients were from the age group 41–60 years. 58.6% patients had corneal ulcers in the right eye, 41.4% in the left eye. There were 69.7% rural residents and 30.3% urban residents. The occupational profile of the study group consisted mainly of farmers 35.57%, followed by labourers 23.55%, at home 22.11%, and factory workers 18.75%. (Table 2) Predisposing factors for microbial keratitis are listed in Table 3. A history of corneal injury was recorded in 46.15% patients, out of whom 31.73% had history of injury with vegetative matter, 5.28% injury by wooden particle, 6.25% injury by stone and 6.25% injury by rust/iron foreign body. Co-existing ocular diseases were identified in 10.57% cases, out of which bullous keratopathy was most common in 2.40% cases, 7.69% patients with history of prior treatment with topical corticosteroids were noted, 6.73% patients were known diabetics. In 27.40% patients the exact cause of corneal ulcer was not known. In this group 10.57% cases that had history of applying cow’s milk, honey or ash for treatment. Microbial culture (Table 4) was positive in 126/208 (60.57%) samples. Bacteria were isolated in 59.52% samples and fungus in 40.47% samples. Out of the total number of positive bacterial cultures, 67.99% were Gram-positive cocci (GPC) and 31.99% were Gram-negative bacilli (GNB). No Gram-positive bacilli (GPB) were observed. The predominant fungal species was Aspergillus flavus followed by Aspergillus Niger. In a relatively smaller incidence Candida spp. were also isolated.

Table 1. Demographic details of patients

| Age     | 1-20 | 21-40 | 41-60 | > 61 | Total |
|---------|------|-------|-------|------|-------|
| Male    | 08   | 52    | 68    | 13   | 141   |
| Female  | 02   | 28    | 33    | 04   | 67    |

Table 2. Occupational profile of the study group

| Occupation | labourer | farmer | Factory worker | at home | Total |
|------------|----------|--------|----------------|---------|-------|
| Male       | 32       | 55     | 26             | 28      | 141   |
| Female     | 17       | 19     | 13             | 18      | 67    |
Discussion

In our study, maximum patients were between the age group 41–60 years. Male patients were more than females similar to other studies.1,6,8 The preponderance of keratitis in male patients is because they are more involved in outdoor work.

Farmers were most commonly affected especially during cotton harvesting season. As farmers mostly reside in rural areas thus the incidence of keratitis was more common in rural population similar to other studies.2,3,6,8 These patients from rural areas, did not have any access to primary treatment thus delaying initiation of treatment.

Trauma was the most common predisposing factor especially with vegetative matter similar to the study from western, eastern and southern India.4,5,8 Among the pre-existing ocular diseases bullous keratopathy was most common in 2.40% cases. The risk factor for ulcer development in bullous keratopathy was steroid use, presence of bullae and bandage soft contact lens use, 7.69% patients with history of prior treatment with topical corticosteroids were noted with medications purchased either over the counter or prescribed by general medical practitioners. In 27.40% patients the exact cause was not known. This group included 22 patients having history of applying cow’s milk, honey or ash for treatment. Because of unavailability of proper primary treatment there was history of foreign body removal by quacks, some even removed with tongue, suggesting poor healthcare facilities in rural India.

The microbial culture (Table 4) was positive in 60.57% cases. Various studies from India reports that 59.33%, 1, 67.7%, 68.4%, 70.6% and 52.5%, 60.4% of culture are only positive. In our region bacterial etiology was more common than fungal similar to the study by Aarti et al1 and Usha Gopinathan et al8 but in study by Basak et al2 fungal infection was more common. Srinivasan et al4 reported bacterial and fungal infections occurred in equal numbers.

In our study the incidence of GPC was 67.99% of the total bacterial etiology similar to other studies.1,3,4 Staphylococcus aureus was the most common GPC isolated same as reported in western region1 and in Gangetic West Bengal.2 However Streptococcus pneumoniae was the predominant species in south India3,4 and Kashmir.8 Streptococcus was not isolated in our study similar to study by Aarti et al.1 done in western region of India which could be due to same geographic region. In study by Usha Gopinathan8, staphylococcus epidermidis was more common similar to Sharma et al from South India. GPB were not observed in the present study similar to study by Aarti et al.1 This differs from various other studies.2,5 In our study Pseudomonas was the most common GNB in line with other studies1,4 but its incidence was low in Kashmir.8 Some studies show the presence of other gram negative bacteria which were not found in our study.

Fungal isolates (Table 4) were seen in 40.47% of total corneal ulcer cases similar to other studies.1,3,6,7 Studies from West Bengal2 and South India6,7 showed a relatively higher percentage of fungal etiology. The most common fungal species isolated was Aspergillus which matched other studies from western India1,7 and eastern India2, whereas in South India, fusarium was the most isolated fungal species.3,4,5,8 Similar to study by Aarti et al2 our study also had relatively higher yeast infection as compared to others. Thus to conclude, we found that trauma due to vegetative matter especially in farmers residing in rural areas is the most common predisposing factor for keratitis. Bacterial keratitis was more than fungal keratitis with Staphylococcus aureus being the predominant bacterial pathogen and Aspergillus flavus being the predominant fungal pathogen. Findings of our study show difference in epidemiology and microbial etiology. Regional differences should be borne in mind while treating microbial keratitis in culture negative cases.

Table 3. Predisposing Factors for Microbial Keratitis

| SN | Predisposing Factors | Number (%) |
|----|---------------------|------------|
| 1. | Injury              | 96 (46.15%)|
|    | by vegetable matter | 66 (31.73%)|
|    | by finger nail      | 03 (1.44%) |
|    | by stone            | 08 (3.84%) |
|    | by wooden stick     | 11 (5.28%) |
|    | by iron particle    | 13 (6.25%) |
| 2. | PRE-EXISTING OCULAR DISEASES | |
|    | herpetic keratitis  | 03 (1.44%) |
|    | bullous keratopathy | 05 (2.40%) |
|    | trichiasis          | 03 (1.44%) |
|    | exposure keratopathy| 04 (1.92%) |
|    | preexisting corneal opacity | 12 (5.76%) |
| 3. | TOPICAL CORTICOSTEROID | 16 (7.69%) |
| 4. | DIABETES MELLITUS   | 14 (6.73%) |
| 5. | UNKNOWN             | 57(27.40%) |

Table 4. Causative micro-organisms responsible for corneal ulcers

| Organism  | Species   | Number | (%) of same group | (%) of total culture positive |
|-----------|-----------|--------|-------------------|------------------------------|
| BACTERIAL | Staphylococcus aureus | 32     | 42.66             | 52.59                        |
|           | CONS      | 19     | 25.33             | 15.07                        |
|           | Pseudomonas | 22    | 29.33             | 17.46                        |
|           | E.coli    | 2      | 2.66              | 1.58                         |
|           | A. flavus | 28     | 54.90             | 22.22                        |
| FUNGAL    | Candida   | 04     | 7.84              | 3.17                         |

Cite This Article as: Gupta AKR, Gupta RKR. "Regional Variation of Epidemiological and Microbiological Profile Of Microbial Keratitis In India". Delhi J Ophthalmol 2016;27;151-3.

Acknowledgements: None

Date of Submission: 20/7/2016          Date of Acceptance: 29/08/2016

Conflict of interest: None declared

Source of Funding: Nil
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