

## A Hospital Based Observational Assessment of the Clinico Microbiological Profile of Patients with Fungal Corneal Ulcer

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### Abstract

**Aim:** To evaluate the clinical features, laboratory diagnosis and microbiological profile of fungal keratitis.

**Method:** A prospective cross-sectional study was conducted on 50 patients with features of corneal ulcer presenting to the Department of Ophthalmology SKMCH, Muzaffarpur, Bihar, India during the period of 12 months. Corneal ulcer with or without intact epithelium were included in the study. Clinical diagnosis of fungal keratitis was made on the basis of following features: dry raised slough, stromal infiltrate with feathery edges, satellite lesions and thick endothelial exudate. A standardized proforma was filled up for each patient documenting socio-demographic features duration of symptoms, history of trauma, associated ocular and systemic conditions, prior therapy received, and all other clinical findings including visual activity.

**Results:** Out of the 50 patients of corneal ulcers included, mycotic etiology was established in 27 cases [54%]. Out of 30 fungal corneal ulcer cases males (19, 70.4%) were affected more than females (8, 29.6%). Majority of the patients were more than 40 years of age (11, 40.7%) followed by 31-40 years of age group (7, 25.9%). Most patients were from rural areas (17, 62.9%). Corneal trauma (22, 81.5%) was the most common predisposing factor. 4 patients (14.8%) had co-existing ocular diseases responsible for development of fungal keratitis. Use of topical steroids predisposing to fungal keratitis accounted for 3 cases (11.1%) and associated systemic diseases were seen in 7 cases (25.9%).

**Conclusion:** A good clinical evaluation aided by microbiological support will help in better diagnosis and treating the corneal ulcer. In cases of fungal corneal ulcer, *Fusarium* spp is the most common organism responsible followed by *Aspergillus* spp.

**Keywords:** Microbiology, Fungal, Corneal Ulcer, Keratitis

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### Introduction

Corneal ulcer is an inflammatory or, more dangerously, infective disease of the

cornea characterised by epithelial layer breakdown and involvement of the corneal

stroma. A corneal ulcer in ophthalmology typically refers to an infectious aetiology, whereas a corneal abrasion refers to physical abrasions [1]. A fungal corneal ulcer, also known as fungal keratitis or keratomycosis, is an infective condition of the cornea produced by any of the several pathogenic fungi capable of penetrating the ocular surface. It is often a gradual, unrelenting disease that must be distinguished from other forms of corneal disorders with similar symptoms, particularly its bacterial equivalent, which accounts for the vast majority of microbial corneal infections. It might cause temporary blindness and agony.

According to World Health Organisation (WHO) data, corneal ulceration causes 1.5-2 million new cases of corneal blindness each year, constituting a serious public health hazard [2]. Fungi are the most prevalent etiological agents, accounting for 30-40% of all instances of suppurative keratitis, whereas bacteria account for 13-48%; however, this varies by geographical location [3]. The fact that 90% of global incidences of ocular trauma and corneal ulceration leading to corneal blindness occur in developing nations reflects the burden of corneal illness in our country [4].

Corneal ulcer is an ophthalmic condition requiring prompt medical attention. Thus precise knowledge of the causative agents and their susceptibility patterns is important for deciding the proper course of treatment [5]. Infectious corneal ulcers need to be treated as soon as possible to preserve vision. If left untreated, a fungal infection can lead to perforation of the cornea, loss of vision, and even loss of the eye. To evaluate the clinical features, laboratory diagnosis and microbiological profile of fungal keratitis.

### Methodology

A prospective cross-sectional study was conducted on 50 patients with features of corneal ulcer presenting to the Department

of Ophthalmology SKMCH, Muzaffarpur, Bihar, India during the period of 12 months.

### Inclusion Criteria:

Corneal ulcer with or without intact epithelium were included in the study. Clinical diagnosis of fungal keratitis was made on the basis of following features: dry raised slough, stromal infiltrate with feathery edges, satellite lesions and thick endothelial exudate.

### Exclusion Criteria:

Complicated corneal ulcers like those associated with endophthalmitis and perforation, typical viral ulcers, mooren's ulcers, interstitial keratitis, sterile neurotrophic ulcers, and any ulcers associated with autoimmune diseases were excluded from the study.

A standardized proforma was filled up for each patient documenting socio-demographic features duration of symptoms, history of trauma, associated ocular and systemic conditions, prior therapy received, and all other clinical findings including visual activity.

Clinical examination: Each patient was subjected to a detailed slit-lamp examination. The ulcer was stained with 2% sodium fluorescein dye and its size was measured with variable slit on the slit lamp, the longest vertical and the widest horizontal dimensions were recorded in millimeter (mm). The size and depth of the infiltrate was also recorded. Hypopyon when present was recorded and its height measured in mm. Other features of the ulcer like margins, floor, and presence of satellite lesions, retained foreign body and pigmentation over the ulcer were noted. Use of contact lenses and topical corticosteroids/ antibiotics were also recorded. Under aseptic precautions corneal scrapings were taken by an experienced ophthalmologist. The procedure was performed after instillation of 4% topical lignocaine under slit-lamp

magnification, using a sterile no.15 bard-parker blade. The material was first obtained from the leading edge and then one more scraping from the base of the ulcer was inoculated into the surface of solid media such as sheep's blood agar, chocolate agar and Sabouraud's Dextrose Agar (SDA) in a row of C-shaped streaks. The material was also smeared on 2 separate glass slides one for gram stain and the other for 10% KOH preparation [6]

Microbiological examination: Aerobic incubations were done for all inoculated media [7]. Sabouraud's dextrose agar (SDA) were incubated at 27°C and after daily examination they were discarded after 3 weeks, if there was no growth. The blood agar, chocolate agar were incubated at 37°C examined at 24 hrs and 48 hrs and then discarded if there was no growth [7]. All laboratory methods were performed following standard protocols [6, 7]. Microbial cultures were considered positive if at least one of the following criteria were met; Growth of the same organism was demonstrated on 2 or more solid medial or confluent growth at the site

of inoculation on one solid medium or Growth on one medium consistent with direct microscopic observations as in KOH preparation or Gram stain [6, 7]. Fungi were identified by their colony characteristics on SDA and by their microscopic appearance in lactophenol cotton blue (LPCB).

### Results

Out of the 50 patients of corneal ulcers included, mycotic etiology was established in 27 cases [54%]. Out of 30 fungal corneal ulcer cases males (19, 70.4%) were affected more than females (8, 29.6%). Majority of the patients were more than 40 years of age (11, 40.7%) followed by 31-40 years of age group (7, 25.9%). Most patients were from rural areas (17, 62.9%). Corneal trauma (22, 81.5%) was the most common predisposing factor. 4 patients (14.8%) had co-existing ocular diseases responsible for development of fungal keratitis. Use of topical steroids predisposing to fungal keratitis accounted for 3 cases (11.1%) and associated systemic diseases were seen in 7 cases (25.9%).

**Table 1: Demographic details, predisposing factors and traumatic agents in all the cases.**

| Variables            |                            | Number | %    |
|----------------------|----------------------------|--------|------|
| Gender               | Male                       | 19     | 70.4 |
|                      | Female                     | 8      | 29.6 |
| Age                  | <21                        | 3      | 11.1 |
|                      | 21-30                      | 6      | 22.2 |
|                      | 31-40                      | 7      | 25.9 |
|                      | >40                        | 11     | 40.7 |
| Lifestyle            | Rural                      | 17     | 62.9 |
|                      | Urban                      | 10     | 37.1 |
| Predisposing factors | Corneal trauma             | 22     | 81.5 |
|                      | Co-existing ocular disease | 4      | 14.8 |
|                      | Topical steroids use       | 3      | 11.1 |
|                      | Systemic diseases          | 7      | 25.9 |
| Traumatic agent      | Vegetative matter          | 14     | 51.8 |
|                      | Foreign body               | 7      | 25.9 |
|                      | Insects                    | 3      | 11.1 |
|                      | Others                     | 3      | 11.1 |

Out of 50 patients, pure mycotic growth was detected in 27 cases (54%), 3 cases (6%) showed bacteria mixed with fungus, and Pure bacterial etiology was established in 9 cases (18%). 11 cases were culture negative (22%). 20 out of 27 (74.1%) positive fungal culture were hyaline (non-pigmented) group and 7 cases (25.9%)

were dematiaceous (pigmented) group. The most commonly isolated fungal species out of non-pigmented group was *Fusarium* species (11 cases, 40.7%) followed by *Aspergillus* species (6 cases, 22.2%) and in pigmented group, most common isolated species was *Cladosporium* species (4 cases, 14.8%).

**Table 2: Fungal pathogens isolated from microbiological examination.**

| Type of fungi       | Species name             | Number | %    |
|---------------------|--------------------------|--------|------|
| Hyaline fungi       | <i>Fusarium</i> spp.     | 11     | 40.7 |
|                     | <i>Aspergillus</i> spp.  | 6      | 22.2 |
|                     | <i>Mucor</i> spp.        | 2      | 7.4  |
|                     | <i>Rhizopus</i> spp.     | 1      | 3.7  |
| Dermatiaceous fungi | <i>Cladosporium</i> spp. | 4      | 14.8 |
|                     | <i>Curvularia</i> spp.   | 2      | 7.4  |
|                     | <i>Biopolaris</i> spp.   | 1      | 3.7  |

**Table 3: Correaltion between clinical diagnosis and microbiological diagnosis.**

| Results  | Detection of fungal elements in 10% KOH smear | Detection of fungal elements in gram-stained smear | Clinical suspicion of fungal keratitis on slip lamp examination |
|----------|---|--|---|
| Positive | 27  | 25   | 31  |
| Negative | 23  | 25   | 19  |
| Total    | 50  | 50   | 50  |

## Discussion

A fungal infection of the cornea is known as fungal keratitis, and it can result in permanent vision loss [8]. It manifests itself clinically as a painful red eye and vision disturbances in most cases. Additionally, there is an increase in the sensitivity to light, as well as an increase in the amount of tears or discharge. Eye pain, impaired vision, and redness of the eye are the typical initial manifestations of fungal keratitis, which typically develops over a period of five to ten days. There is an increase in tear production or discharge, as well as a heightened sensitivity to light. When contrasted with symptoms of a comparable bacterial ulcer, these ones are noticeably milder [9]. Edoema and redness can be seen on the affected eyelids and adnexa, and the conjunctiva has been chemosed. There is a possibility of ulcer. It

seems to be a dry ulcer on the cornea, and there are satellite lesions in the cornea surrounding it. In most cases, a fungal ulcer will be accompanied by hypopyon, which has the appearance of predominantly white fluffy flakes. In extremely rare cases, it may spread to the posterior region, resulting in endophthalmitis in later stages and ultimately leading to the destruction of the eye.

Trauma with a vegetable or organic matter is the event that sets off the cascade of events that leads to fungal keratitis. Injuries caused by thorns or by accidental contact with wheat plants while harvesting are rather common among people who work in agriculture. This causes the fungus to become embedded directly within the cornea. It takes the fungus a long time to spread through the cornea, but once it

does, it can be found in both the anterior and posterior stromal layers. It is possible for the fungus to penetrate the membrane of the descemet's sac and enter the anterior chamber. The patient eventually presents with symptoms of fungal keratitis a few days or weeks later. According to the findings of our study as well, vegetative matter was the traumatic agent in 51.8% of cases, out of 81.5% total instances that accounted for corneal trauma. In a similar vein, corneal damage has been found to be the primary cause of fungal keratitis in a number of studies [10–12].

Out of 30 fungal corneal ulcer cases males (19, 70.4%) were affected more than females (8, 29.6%) in this study. Similarly according to study conducted by Titiyal et al [13] and Shubhra Mehta [14], males were more affected compared to females. But in a study conducted by Upadhyay et al in Nepal [15], they have found almost equal distribution among both the sexes. In our study, 40.7% patients belonged to age group of more than 41 years. A similar study by Li et al. also noted that the age group which is highly presented as corneal ulcer belongs to age group 50-59 years, accounting for 83.21% [16] and Sharmila Suwal et al also reported 40% of their corneal ulcer belongs to age group of 51 to 60 years of age.[17] In contrast to this, Rumpa Saha from new Delhi Showed most affected age group was 31-40 years [18].

The species of *Fusarium* spp. 11 (40.7%), followed by the species of *Aspergillus* spp. 6 (22.2%), was the one that was isolated the most frequently during the course of our research. In contrast to the findings of the study carried out by Alkatan et al [19], which found that *Aspergillus* spp had a greater prevalence of 27.6% than *Fusarium* spp's 17.2%. Similar findings were found by Idiculla et al in their research, which showed that *Fusarium* spp made up fifty percent of the fungal isolates, and *Aspergillus* spp made up thirty-four and a half percent of the total. [20] The

difference in the rates at which various fungal infections are isolated can be explained by the fact that the climate and natural environment of individual places are distinct from one another. Studies conducted in the southern part of India have revealed a higher prevalence of *Fusarium* as compared to studies conducted in the western or northern regions of India. [21]

### Conclusion

A thorough clinical examination, backed by microbiological assistance, will aid in the identification and treatment of corneal ulcers. *Fusarium* spp. is the most prevalent organism responsible for fungal corneal ulcers, followed by *Aspergillus* spp. KOH wet mount preparation is more sensitive than gram stain smear and aids in the early identification of fungal infection-causing species.

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