

## Retrospective Study

# A retrospective observational study of mycotic keratitis in Saveetha Hospitals, Chennai

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## Abstract

### Aim and objective:

1. To study the manifestations of fungal corneal ulcer in different age groups and sex
2. To study the distribution of fungal corneal ulcer in relation to occupation
3. To know the effect of Natamycin and Fluconazole as anti-fungal agents.

**Materials and methods:** This is a retrospective analysis of microbiology records of patients presenting with suspected microbial keratitis seen between January 2021 and June 2021. Patients with positive fungal cultures were analyzed in detail for the type of fungus isolated.

**Results:** 90 patients with suspected microbial keratitis were reviewed. A microbiological diagnosis of mycotic keratitis was established in 9 (10%) patients over a period of 6 months, based on positive fungal cultures. Filamentous fungi were isolated more often than yeasts. *Aspergillus* species followed by *Fusarium* species were the commonest filamentous fungi isolated.

**Conclusion:** Over a period of 6 months, the cumulative incidence of mycotic keratitis was 10%. The pathogenic organisms most frequently responsible for mycotic keratitis were *Aspergillus* species. When beginning an empirical therapy for mycotic keratitis, etiological factors were helpful. Eight of the 90 patients with corneal ulcers who were admitted to the patient department for treatment had positive fungal cultures in Sabouraud's media. The age range of 50 to 60 years had a high prevalence of illness.

There were 90 total cases of corneal ulcers. Out of those there were 8 (8.8%) incidences of fungal ulcers. More men than women were impacted. Workers in agriculture are more impacted than others.

The main cause of a fungus-induced corneal ulcer was trauma.

Natamycin was the better option for the treatment of fungal keratitis. Filamentous fungi (*Aspergillus* species, *Fusarium*, and *Curvularia*) responded effectively to Natamycin 5% eyedrop.

## Introduction

Slower therapeutic response, delayed diagnosis, and worse visual results are common characteristics of fungal keratitis [1-7]. Geographically speaking, the harmful organisms differ, with yeast being more prevalent in temperate climates while *Fusarium* and *Aspergillus* are more prevalent in tropical latitudes [8-12]. The key to an early diagnosis is clinical suspicion, especially in regions where fungal infections are

relatively uncommon [13,14], Natamycin, voriconazole and amphotericin B are topical medications used to treat fungal keratitis [15]. With trials showing greater results in patients with filamentous fungus, natamycin is regarded as a first-line treatment for fungal keratitis [16,17]. In this retrospective study, we assessed the microbiologic traits, therapeutic approaches, and prognosis of patients who underwent treatment at our tertiary care academic medical centre for fungal keratitis, as determined by culture.

### More Information

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## Materials and methods

Saveetha Medical College's department of ophthalmology conducted this study on mycotic keratitis from January to June of 2021. The outpatient department saw a total of 800 patients, of whom 90 cases (11.25%) of microbial keratitis and 8 cases (8.8%) of keratomycosis were observed. Upper eyelids were everted to exclude foreign body.

Size and depth of the lesions were measured and examined for satellite lesions (Figures 1,2). Prerequisites were: to numb the cornea, topical 4% lignocaine GeL, sterile universal speculum is used to split and fix the lids and to get a clear view of an ulcerated cornea it also guards against contamination from the conjunctiva and lid edge, to remove the ulcer, a disposable no. 15 bard parker scalpel blade was employed, glass slides measuring 10 cm × 4 cm × 0.2 cm, gram's staining products, 10% KOH -related preparatory materials, sterile culture swipes for specimen collection [18]. On Blood sugar and chocolate agar for Aerobic organism, Thioglycolate broth for Anaerobic organisms, and on Saboraud'S agar for fungi [19].

### Methods

1. Applying one drop of 4% Xylocaine every 1ml for 5 - 10 minutes will anaesthetize the cornea.
2. Using a sterile universal speculum, expose the cornea.
3. Scraping the cornea: The ulcer's exudate and necrotic

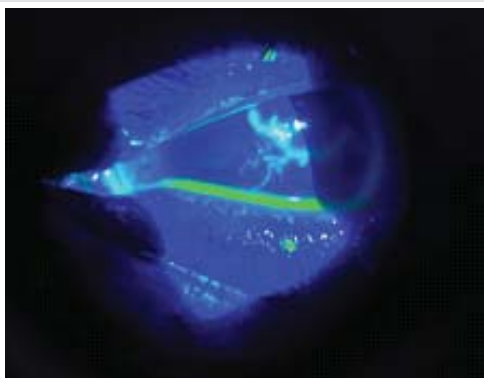


Figure 1: Fluorescein staining showing epithelial erosion.

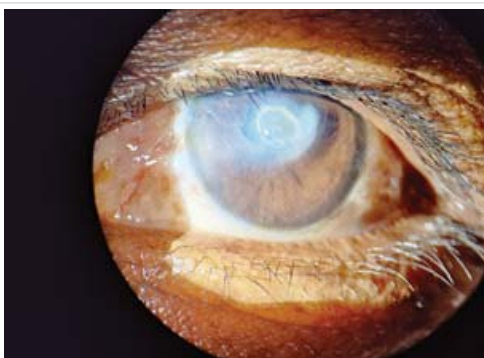


Figure 2: Satellite lesion with white feathery irregular margins.

debris are taken out. The corneal ulcer base and margin are later scraped with a sterile No. 15 Scalpel blade, being careful not to let the blade touch the eyelid or conjunctiva. Vigorous scraping is not performed in descemetocoele cases.

4. Smear preparation involves spreading the scraped corneal ulcer material onto glass slides. The smear is next allowed to dry in the air before being heat-fixed by being passed gently over a flame a couple of times. Gram's staining is done on the heat-fixed slides.

#### • Gram's staining:

1. Spray methyl violet over the smear and leave for 30 to 60 seconds.
2. Pour the stain away and use Gram's iodine to cleanse. Put Gram's Iodine on top and wait for 30 - 60 seconds.
3. Rinse the iodine with the decolorizer (acetone or alcohol) until the colour stops leaking from the smear. It takes less than ten seconds to complete this.
4. After washing with water, counter-stain for 30 to 60 seconds with safranin, neutral red, or diluted carbol fuchsin.
5. Rinse again with water, dry in the air, and examine while submerged in oil.

Gram negative bacteria are pink, while gram positive bacteria are violet. Gram's stain provides the clearest illustration of yeast-like fungi, such as *Candida*. They resemble developing Gram-positive cells [20].

- **10% KOH Mount:** One or two drops of 10% KOH solution are applied over the smear, a cover glass is placed carefully on top to prevent air bubbles, and the sample is then viewed under a microscope.
- **Sabouraud's agar:** Corneal scrapings from the ulcer were injected into two slopes of Sabouraud's agar. One was kept at 25 degrees Celsius while the other kept at ambient temperature [13,21]. The growth is seen every day. The organisms were identified by colonial characteristics, microscopy, and biochemical changes after at least 48 hours [22]. The kind of mycelium, spore formation pigmentation, chlamyospore generation on corneal agar, etc. served to identify the organism [23]. The biochemical processes were then carried out to verify the species types. To develop the fungus, the cultures are repeated every 4 to 7 days [24]. Prior to certifying a case as an ulcer caused by a fungus, at least two cultures must be obtained [25] Table 1.

Table 1: Incidence of corneal ulcers in our OPD.

Census	No. of cases	Percentage (%)
OPD patients	800	100%
Corneal microbial keratitis	90	11.25%
Keratomycosis	8	8%

Fungal corneal ulcers were discovered to be more common in the current investigation. It might be caused by the current widespread usage of stronger antibiotics and local steroids after eye injuries from agriculture.

### Incidence of age

The age incidence of keratomycosis in the current study shows (Table 2) that the age range of 51 to 60 years has the highest incidence (3), followed by 21 to 30 years (2), 41 to 50 years (1), 31 to 40 years (2), 11 to 20 years (0) and 0 to 10 years (0).

Due to the majority of agricultural workers working in the fields neglecting to seek medical attention when injured, cases are most prevalent in people between the ages of 50 and 60.

### Sex incidence

In this study, there were 5 affected males (62.5%) and 3 affected females (37.5%). Males were more severely impacted than females. The ratio of men to women was 3:2 Table 3.

#### Incidence of fungal ulcer in relation to occupation

In the current study, agricultural labourers have the highest incidence of fungal ulcers [6], i.e. 80%, others (20%, or 2 cases) (Rickshaw drivers, students, and business people) Table 4.

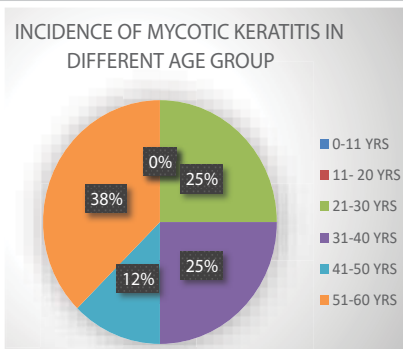
Incidence of various fungi along with species variation (Table 5).

**Effect of antifungal agents:** The current investigation revealed that Fluconazole is effective against *Candida Albicans* and Natamycin 5% eye drops are effective against *Aspergillus* species [26].

All of the straightforward fungal corneal ulcers, or those lacking hypopyon, responded well to natamycin eye drops [27] Table 6.

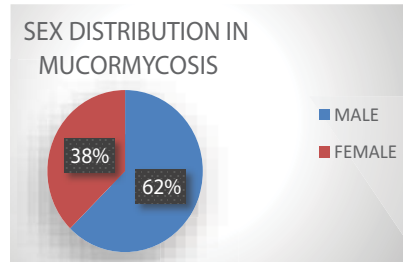
**Table 2:** Age incidence of keratomycosis.

S.NO	Age group	No. of cases	Percentage (%)
1	0-10 years	0	0%
2	11-20 years	0	0%
3	21-30 years	2	25%
4	31-40 years	2	25%
5	41-50 years	1	12.5%
6	51-60 years	3	37.5%



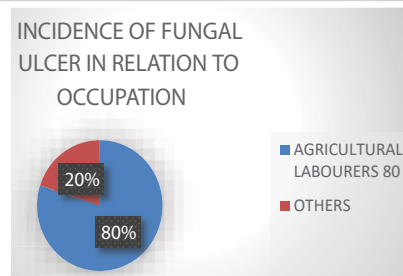
**Table 3:** Sex incidence of keratomycosis

Sex	No. of Cases	Percentage (%)
Male	5	62.5%
Female	3	37.5%



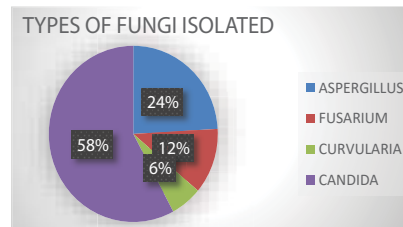
**Table 4:** Incidence of fungal ulcer in relation to occupation.

Occupation	No. of cases	Percentage (%)
Agricultural Labourers	6	80%
Others	2	20%



**Table 5:** Types of fungi isolated in the present series.

Fungi isolated	No of cases	Percentage (%)
Aspergillus	4	50%
Fusarium	2	25%
Curvularia	1	12.5%
Candida	1	12.5%



**Table 6:** Effect of antifungal agents against various fungal species.

S.NO	Anti-Fungal agent	Targeted Species
1	5% Natamycin	Aspergillus, Fusarium, Curvularia.
2	0.3% Fluconazole	Candida

## Discussion

Mycotic keratitis is a condition that affects a lot of people. This retrospective clinical study was conducted to determine the prevalence of corneal ulcers among various age groups, sexes, and occupations [9,10]. This study also addresses the impact of the antifungal medications Natamycin & Fluconazole.

8.8% of the corneal ulcers in our study were mycotic, out of the total. Today's indiscriminate topical steroid use and increased antibiotic use as a result of agricultural eye injury during cultivation are to blame for the increased occurrence

of fungal corneal ulcers [23]. Keratomycoses and systemic mycoses are becoming more common everywhere in the world. The crowded continents of Asia and Africa are seeing an increase in the occurrence of fungal keratitis. One of the main causes of vision loss and blindness, according to the World Health Organization, is corneal illness [28].

An estimated 1.5 to 2 million new cases of corneal blindness occur each year as a result of ocular trauma and corneal ulcers [12,13]. According to a study by Bibhudutta Rautaraya, et al. Mycotic keratitis is a major contributor to corneal blindness worldwide, including in India. The profile of fungal illnesses is known to be influenced by geographic location and climate. India's tropical environment makes fungus-caused corneal ulcers frequent [29].

According to Badiee P, et al. economic and climatic factors are associated to the epidemiological variance and vast geographic distributions. Mycotic keratitis involving the cornea can cause significant visual damage or perhaps blindness and is challenging to treat [30]. Although it is widespread throughout the planet, the tropics and subtropics are where it is most prevalent [31].

The main risk factor is trauma [32], which is then followed by ocular and systemic abnormalities, previous corticosteroid usage, and extended use of antibiotic eye drops. The condition was more prevalent in people between the ages of 51 and 60. The fact that most patients at our hospital come from rural backgrounds may be the cause.

Here, there were 3 (37.5%) girls and 5 (62.5%) males who were afflicted. More men than women were impacted. The gender ratio is 3:2. Males have a higher frequency since they are exposed to more outdoor activities and visit hospitals more frequently.

Some of the fungi enter the corneal stroma [33]. In conditions like herpes keratitis, even minor damage to any vegetative material can quickly lead to a subsequent fungal infection [34]. Additionally, diabetes mellitus is the primary risk factor, and corticosteroid users are more susceptible to a fungal infection [35]. In this group of patients, it was thought that a special risk factor for a fungal infection of the cornea was trauma from plant material. Fungi that have been contaminated with them can enter the anterior chamber or the posterior section and damage the tissue using specialised mechanisms including proteolytic enzymes and mycotoxins.

The prognosis of this illness will be improved by a thorough understanding of the agent and host variables involved in these infections. The most typical fungus found was *Aspergillus flavus*, followed by *Fusarium solani*. Human fungal corneal ulcers are frequently brought on by filamentous fungus [36].

The aetiological agents of fungal keratitis have been determined to be more than 105 species of fungi, grouped

into 56 genera [37]. A deep and serious corneal ulcer can be brought on by fungal keratitis. *Aspergillus* spp., *Fusarium* spp., *Candida* spp., *Rhizopus*, *Mucor*, and other fungus are responsible for its development [38].

Empirical treatment with broad-spectrum antibiotics may not always produce the best results [39]. Treatment based on accurate bacterial identification by culture and sensitivity assessment may. In order to customise therapy for patients who fail empirical therapy, culture results are also crucial [40]. The medicine of preference for topical therapy is natamycin suspension (5 mg/mL).

A topical antifungal drug along with systemic antifungal medications [41] were used in the treatment of patients with immunological disorders and those who have severe infections. Topical medications should be used hourly at first, then modified according on the outcome [30]. Typically, four weeks of intensive therapy are required [31].

When treating fungal keratitis, natamycin was a better option, particularly in the early stages of *Fusarium* infections [42]. The most effective medication for fungal keratitis involves topical antifungal drops like Natamycin and topical amphotericin B [43]. The gold standard for the treatment of fungal keratitis has not yet been identified [15,44]. Therapeutic penetrating keratoplasty is required for acute corneal perforation and vision recovery. Three kinds of antifungal medications are used to treat fungal keratitis: polyenes, triazoles and echinocandins. Prior to natamycin development, a polyene, Amphotericin B 0.15% was used in dilution with sterile water [17]. The most crucial agent in the treatment of fungal keratitis is thought to be the tetraene polyene 5% natamycin. Due to the easy and ready availability of natamycin, it has been chosen in this study. It works by forming a bond with ergosterol, a crucial element of the fungal cell wall and inhibiting microbial development [45]. Other antifungals including azoles like fluconazole are not active against *Fusarium* [46-86].

## Conclusion

Out of 800 patients who attended Saveetha medical college and hospitals between January 2021 and June 2021, 90 incidences of corneal ulcers were found for this study. Eight of the 90 patients with corneal ulcers who were admitted to the patient department for treatment had positive fungal cultures in Sabouraud's media. The age range of 50 to 60 years had a high prevalence of illness.

There were 90 total cases of corneal ulcers. There were 8 (8.8%) incidences of fungal ulcers out of those. More men than women were impacted. Workers in agriculture are more impacted than others.

The main cause of a fungus-induced corneal ulcer is trauma. More filamentous fungus than yeast are found. All filamentous



fungus were dominated by *Aspergillus* species. Ulcers with a mix of bacteria and fungi were also found. People with impaired immune systems and diabetes were most affected.

Natamycin was the better option for the treatment of fungal keratitis. Filamentous fungi (*Aspergillus* species, *Fusarium*, and *Curvularia*) responded effectively to Natamycin 5% eyedrops. Cases that received good responses revealed corneal opacity. The medications utilised in the current RCTs differed from one another, and the small sample size made it difficult to determine which agent was more successful for treating fungal keratitis.

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