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Study of Keratomycosis at A Tertiary Care Teaching Hospital

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ABSTRACT

Corneal infections are one of the leading causes of ocular morbidity and blindness worldwide. If normal defense mechanisms of the eye are compromised, almost any microorganism can invade the cornea. It is important to know the exact etiology of corneal ulcers to institute appropriate therapy in time, least serious consequences may follow. This is a prospective study conducted in the Department of Microbiology, Shadan Institute of Medical Sciences and Teaching Hospital and Research Center over 6 months. Corneal scrapings taken in the ophthalmology department, from the clinically diagnosed cases of infectious keratitis were sent to the Microbiology department for processing. The patient's age, gender, occupation, history of any trauma, use of topical medicines or use of contact lenses and ophthalmic ultrasound findings (wherever available) were recorded from the patient's clinical records. A total of 90 cases were tested for suspected fungal corneal ulcers during study period and fungal pathogens were identified in 26 cases(28.88%).Among the positive cases of fungal keratitis, males (57.7%) outnumbered females (42.3%) with a ratio of 1.67:1 (Table 1). The maximum number of positive cases was seen in the age group of 21-30 years, followed by the age groups of 31-40 years and 11-20 years. The most common cause of fungal keratitis was *Aspergillus flavus* (30.8 %), followed by *Aspergillus fumigatus* (23.1 %), Fusarium solani and Candida albicans (15.4 % each) and Cladophialo phorabantiana, Curvularia, Mucor and Candida tropicalis (3.8 % each).Filamentous fungi were predominantly associated with mycotic keratitis, accounting for 80.8% of cases, as compared to yeasts which had caused keratitis in 19.2% of cases. The most common precipitating factor associated with fungal keratitis was prolonged usage of topical medications such as corticosteroids /antibiotics (53.8 %), followed by trauma with vegetative matter (38.5%), usage of contact lenses and previous corneal surgery (3.8% each). The ophthalmic ultrasound findings were seen among 26 patients with abnormality detected in 10 patients (cataract in eight patients and PVD and RD in one patient each). Infective keratitis is more common in working males, who are exposed to vegetative trauma. Early detection and treatment with proper antifungals are important to prevent ocular problems and scarring of the cornea.

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Key Words

Infective keratitis, fungal keratitis, streptococcus pneumoniae

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INTRODUCTION

Fungal keratitis or keratomycosis refers to an infective process of the cornea caused by any of the multiple pathologic fungi capable of invading the ocular surface[1]. It is most typically a slow, relentless disease that must be differentiated from other types of corneal conditions with similar presentation; especially its bacterial counterpart, which accounts for the majority of the microbial corneal infections[2]. Keratomycosis is typically disproportionately painful relative to the apparent severity of any corneal lesion[3]. Clinical signs can be nonspecific and include those typically associated with any cause of corneal pain and inflammation, such as blepharospasm, epiphora, conjunctival hyperemia, chemosis, corneal edema, aqueous flare, and miosis[4,5].

Prevalence varies by region and is highest in South India (36.7% of corneal ulcers) but is also common in West India (36.3%) and East India (26.4%). Fungal keratitis is a much less common cause of corneal ulcers in Northern India (7.3%)[6].

Risk factors include trauma, ocular surface disease, and topical steroid use. Risks and types of fungi also might vary by geographic location and climate[7]. In warmer climates, the rule is that the most common organisms are filamentous fungi, like Fusarium spp and Aspergillus spp. with a strong relationship to trauma. Others show the most common isolates in descending order were Fusarium spp in 67%, Aspergillus spp in 10.5%, and Candida spp in 10%. About 40% of the infections were related to trauma[8].

For a definitive diagnosis, scrapings taken from deep within the lesion should be made and inoculated in Sabouraud agar[9]. The shortcoming is that it can take up to 3 weeks to grow and identify the organism. For a faster result, smears with special stains such as Gomori, Periodic Acid-Schiff stain(PAS), acridine orange, calcofluor white, or Potassium Hydroxide(KOH) should be performed[10]. More recently molecular diagnostics have been employed, particularly Polymerase Chain Reaction(PCR), has been employed for rapid identification in infectious keratitis cases[11]. The drawback is that not all laboratories have these stains available and not all providers have access to molecular diagnostics, so, again we might need to rely on the patient's evolution and the physician's clinical acumen. If all labs and cultures are negative, corneal biopsy should be considered to obtain a specimen.

The prognosis for keratomycosis varies depending on factors such as the promptness of treatment, the type of fungus involved and the extent of corneal damage. Early diagnosis and treatment usually lead to a good outcome with minimal vision loss. However, delays in treatment can result in permanent vision impairment or even loss of the eye in severe cases.

Therefore, we first studied the characteristics of Fungal keratitis, the clinical diagnosis of Fungal keratitis and the conventional and laboratory diagnosis techniques of Fungal keratitis.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Microbiology, Shadan Institute of Medical Sciences and Teaching Hospital and Research Center over 6 months.Corneal scrapings taken in the ophthalmology department, from the clinically diagnosed cases of infectious keratitis were sent to the Microbiology department for processing. The patient's age, gender, occupation, history of any trauma, use of topical medicines or use of contact lenses and ophthalmic ultrasound findings (wherever available) were recorded from the patient's clinical records.

The Corneal Scrapings are Processed as per Standard Techniques:

Direct Microscopy was Performed for the Presence of Fungus:

- **Potassium hydroxide (KOH) Mount:** Wet mounts of corneal scrapings were prepared in 10% KOH. to observe the presence of fungal filaments
- **Culture:** The material from corneal scrapings was inoculated directly onto sheep blood agar and chocolate agar in rows of 'C'- shaped streaks and incubated at 37°C for upto 48 hours. The portion of the sample was inoculated onto Sabouraud's dextrose agar (SDA) without cycloheximide in duplicate tubes and incubated at 25°C and 37°C, respectively, for 4 weeks.

Identification of Fungal Growth was Done as Per Standard Mycological Techniques: Molds were identified by their colony characteristics on SDA and sporulation pattern on lactophenol cotton blue mount. Slide cultures were put up for non-sporulating molds.

Yeasts were identified conventionally by their growth on SDA, germ tube test, microscopic findings on cornmeal agar, colony characteristics on Chrom agar sugar fermentation and assimilation tests, and by using an Automated Vitek 2 YST identification card, as per manufacturer's instructions.

RESULTS AND DISCURSION

A total of 90 cases were tested for suspected fungal corneal ulcers during study period and fungal pathogens were identified in 26 cases(28.88%).

Among the positive cases of fungal keratitis, males (57.7%) outnumbered females (42.3%) with a ratio of 1.67:1 (Table 1).The maximum number of positive cases was seen in the age group of 21-30 years, followed by the age groups of 31-40 years and 11-20 years (Table 1).

Table 1: Age and gender-wise distribution of cases of fungal keratitis (n=26)

Age (in years)	Total no. of positive cases	Male	Female
0-10	0	0	0
11-20	5	5	0
21-30	10	5	5
31-40	7	3	4
41-50	2	1	1
51-60	1	1	0
≥61	1	0	1
Total	26	15	11

Table 2: Distribution of fungal agents isolated from the cases of keratomycosis (n=26)

Fungal agent	Number of cases	Percentage of cases (%).
Aspergillus avus	8	30.8
Aspergillusfumigatus	6	23.1
Fusariumsolani	4	15.4
Cladophialophorabanana	1	3.8
Curvularia	1	3.8
Mucor	1	3.8
Candida albicans	4	15.4
Candida tropicalis	1	3.8

Table-3: Aetiology of mycotic Keratitis:- Molds versus Yeasts (n=26)

Fungus	Number of cases	Percentage of cases (%).
Molds	21	80.8
Yeasts	5	19.2

Table 4: Precipitating factors associated with cases of keratomycosis (n= 26)

Risk factor	Positive cases(n=26)	Percentage (%)
Prolonged usage of topical medications	14	53.8
Trauma with vegetative matter	10	38.5
Usage of contact lens	1	3.8
Previous corneal surgery	1	3.8

Table 5: Ophthalmic USG ndings in clinically diagnosed cases of infectious keratomycosis (n= 60)

Ultrasound findings	No.of patients(%)
Normal	16 (61.5%)
Cataract	8 (30.7%)
Posterior vitreous detachment	1(3.8%)
Posterior retinal detachment	1(3.8%)

The most common cause of fungal keratitis was Aspergillus flavus (30.8 %), followed by Aspergillus fumigatus (23.1 %), Fusarium solani and Candida albicans (15.4 % each), and Cladophialophorabantiana, Curvularia, Mucor and Candida tropicalis (3.8 % each) (Table 2).

Filamentous fungi were predominantly associated with mycotic keratitis, accounting for 80.8% of cases, as compared to yeasts which had caused keratitis in 19.2% of cases (Table 3).

The most common precipitating factor associated with fungal keratitis was prolonged usage of topical medications such as corticosteroids /antibiotics (53.8 %), followed by trauma with vegetative matter (38.5%), usage of contact lenses and previous corneal surgery (3.8% each) (Table 4).

The ophthalmic ultrasound findings were seen among26 patients with abnormality detected in 10 patients (cataract in eight patients and PVD and RD in one patient each).(Table 5)

The present study was conducted for 6 months at a hospital attached to Shadan Medical College, Hyderabad to determine the microbiological pro le of infective keratitis prevalent in the region. Shifting trends in the microbiological profile of keratitis have been reported in studies in some parts of the world[12]. Hence, it is important to carry out studies periodically to assess local organisms and the sensitivities pattern.

In the present study incidence of fungal keratitis was seen as most common in the age group 21-30 years at 38.4% followed by 31-40 years with 26.92% Which is supposed to be comparable with studies conducted by Amrutha[13] had 41-50 years as the most common age group with 38.8%, Gotekar R.B study stated 56-70 years as the most affected age group with 35%[14].

Present study the percentage of males affected 57.7% compared to females at 42.3% and a male-female ratio of 1.67:1, males were more affected may be due to more exposure outdoors and hard labor in dry dusty areas. This was by studies done by Waghmare AS, Metha S and Jayashree MP[15-17].

In our study, the most common cause of fungal keratitis was Aspergillus avus (30.8 %), followed by Aspergillus fumigatus (23.1 %), Fusarium solani and Candida albicans (15.4 % each) and Cladophialo phorabantiana, Curvularia, Mucor and Candida tropicalis(3.8%) each. Similar findings were seen in studies conducted by Vasudha CL et al study showed aspergillus as the most common fungal isolate with 39.3%[18].

Two studies from the southernmost state of India-Tamil Nadu, have reported 34% culture-proven mycotic keratitis from clinical suspects. Both studies have reported Fusarium to be the most common isolate (42.8% and 14.5% respectively)[19]. One of the studies has commented that the spectrum of fungal isolates over 10 years has been stable; the other has shown a non-significant increase in culture isolation during monsoon[20]. In a small study from Kerala (West Coast India), 36% of clinically suspected cases of fungal keratitis were culture positive; Aspergillus spp (24%) and Candida spp (8%) were the most common isolates reported[21]. Another study from Hyderabad-has reported 39.8% positivity of fungal culture with Fusarium (37.2%)being the most common isolate followed by Aspergillus (30.7%). Also, an increase in positivity has been reported during the monsoon and winter months[22].

The infection probably starts when the epithelial integrity is broken either due to trauma or ocular surface disease and the organism gains access into the tissue and proliferates. Proteolytic enzymes, fungal antigens, and toxins are liberated into the cornea with the resulting necrosis and damage to its architecture thus compromising the eye's integrity and function.

The disease takes a turn for improvement after administration of antifungal agents which promote the ulcers to heel gradually. So it is proved that early diagnosis and timely intervention with antifungal drugs are vital to good therapeutic effects in fungal keratitis[23].

CONCLUSION

Keratomycosis is one of the most difficult of microbial keratitis for ophthalmologists to diagnose and treat. The diagnostic work up is tedious and the topical antifungals are not as effective as antibiotics in bacterial keratitis. Immediate diagnosis is helpful in the detection of the type of microorganisms by KOH mount of corneal scrapings. Early detection and treatment with proper antifungals are important to prevent ocular problems and scarring of the cornea.

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