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EPIDEMIOLOGICAL PROFILE OF FUNGAL KERATITIS IN PATIENTS ATTENDING A TERTIARY CARE CENTRE IN BIHAR

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ABSTRACT

Introduction: Corneal blindness is a major public health problem worldwide and fungal keratitis is one of its predominant causes. The etiological and epidemiological pattern of fungal keratitis varies significantly with patient population, geographical region and prevailing socioeconomic conditions.

Objectives: The objective of the study was to identify the specific pathogenic agents and to study epidemiological characteristics of fungal keratitis presenting at a tertiary care centre in Patna, Bihar.

Materials And Methods: Corneal scrapings were obtained from clinically suspected patients of keratomycosis during the period of 18 months from May 2015 to October 2016. The scraping material was processed and identified by standard laboratory techniques. Demographic and clinical features of the patients were also collected.

Results: Out of total 115 suspected fungal corneal ulcers, 63(54.78%) were positive for fungal etiology. Of these, 53(84.13%) were positive on KOH mount. 40(63.49%) and 35(55.56%) were positive in Gram stain and culture respectively. In culture, aspergillus spp (16;45.71%) were the predominant fungal species, followed by fusarium spp (12;34.29%). Males (35/63;55.56%) were more commonly affected. 22 out of 63 patients (34.92%) were of age group 31-45 years. Majority of patients were farmers (68.25%). Corneal trauma (50.79%) was the most common predisposing factor in which trauma due to vegetative matter (53.13%) was most significant.

Conclusion: Fungal keratitis continues to be a cause of concern to ophthalmologists. Agricultural activity and related ocular trauma are principal causes of mycotic keratitis. A potassium hydroxide (KOH) wet mount preparation is a simple, and sensitive, method for diagnosis.

KEYWORDS : Fungal Keratitis, Aspergillus Species, Epidemiology

INTRODUCTION

Microbial keratitis or infective corneal ulcer is due to the proliferation of microorganisms (including bacteria, fungi, viruses and parasites) and associated inflammation and tissue destruction within corneal tissue. It is a potentially life threatening condition and frequently presents as an ocular emergency[1]. Mycotic keratitis can be caused by a wide variety of fungi[2] and is usually manifested by severe inflammation, the formation of a corneal ulcer, and hypopyon, with the presence of fungal hyphae within the corneal stroma[3].

Fungal corneal ulcers like other fungal infections are commonly present in immunocompromised patients but they have also been reported in healthy humans[4]. For the onset of fungal keratitis, trauma is the most frequent risk factor[1]. Traumatizing agents of plant or animal origin (even dust particles) either directly implant fungal conidia in the corneal stroma or abrade the epithelium, permitting fungal invasion.

Other predisposing factors include immunological incompetence, prior administration of corticosteroids or antibacterial agents, 'allergic conjunctivitis', and the use of hydrophilic contact lenses[5].

Environmental factors like humidity, rainfall, and wind, also influence the occurrence of fungal keratitis[6].

Fungal keratitis remains a diagnostic and therapeutic challenge. Delayed diagnosis is common, primarily because of lack of suspicion; even if the diagnosis is made accurately, management remains a challenge because of the poor corneal penetration and the limited commercial availability of antifungal agents[7].

The increased incidence of fungal keratitis, coupled with a decreased availability of donor cornea in developing countries, warrants further study of the risk factors, host pathogen interactions, antifungal susceptibility testing, and newer pharmacological trials in an effort to strengthen our armamentarium to combat this potentially blinding disease[8].

AIM AND OBJECTIVE

The present study was taken up in the department of Microbiology at Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India with the following aim and objective:

1. To study the prevalence of fungal keratitis among patients attending IGIMS, Patna.
2. To study the epidemiological profile of fungal keratitis.
3. To identify the fungal pathogens in cases of fungal keratitis.

MATERIAL AND METHODS

The present observational study was carried out in the department of Microbiology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar in conjunction with Regional Institute of Ophthalmology (RIO), IGIMS during the period of 18 months from May 2015 to October 2016. The study was approved by Institute Ethics committee vide letter no IGIMS/2015/495/Acad. Dated 29.04. 2015

Clinically diagnosed patients of infective corneal ulcers of different age groups and sex who attended the OPD or admitted in the wards of Regional Institute of Ophthalmology, IGIMS Patna were included in this study.

All patients with infectious keratitis presenting to the RIO OPD underwent a detailed investigation that includes (1) the documentation of a detailed history of the patient (demographic features, duration of symptoms, predisposing factors, therapy received prior to presentation, and associated ocular and systemic diseases), (2) ocular examination using a slit-lamp biomicroscope, and (3) microbiologic workup comprising direct smear examination and culture of corneal scrapings taken under local anaesthesia from the bed and advancing edges of the ulcer.

The scraping material was inoculated onto solid media such as blood agar, chocolate agar, and Sabouraud's dextrose agar (SDA) in multiple rows of C-shaped streaks. The material obtained from next scraping was spread onto glass slides for 10% KOH mount and Gram-staining.

Blood agar and chocolate agar were incubated aerobically at 37°C and were examined daily and discarded after 7 days if there was no growth. Sabouraud's media was incubated at 25°C and examined daily and discarded if no growth was seen after 21 days.

A definitive diagnosis of fungal keratitis was made if
1. Corneal scrapings revealed fungal elements in smears,
2. Fungus grew in more than one medium in the absence of fungus in smears,
3. Fungus grew on a single medium in the presence of fungus in smears,
4. Confluent growth of fungus appeared at the inoculated site on a single solid medium.

RESULT

In this study, a total of 115 patients of suspected fungal corneal ulcers were investigated for fungal etiology in the Department of Microbiology, IGIMS, Patna over a period of 18 months from May 2015 to October 2016.

Out of 115 cases, 63(54.78%) were found to be positive for fungal etiology. Of these, 40(63.49%) were positive on Gram stain, 53(84.13%) in KOH mount and 35(55.56%) were positive on culture. In 28(44.44%) cases, cultures were found to be sterile despite positive direct microscopic findings, but the results were consistent with clinical signs and symptoms of mycotic keratitis. Significant positive cultures were obtained in 5 (14.28%) samples wherein direct microscopy was found to be negative (Table 1).

Table 1: Correlation Between The Findings Of Direct Microscopy (KOH And Gram Stain) And Fungal Culture

Name of Investigation	Outcome	Number	Presence of fungal growth in culture	
			Positive	Negative
KOH wet mount	Positive	53	30	23
	Negative	10	5	5
	Total	63	35	28
Gram's staining	Positive	40	25	15
	Negative	23	10	13
	Total	63	35	28

Out of 63 cases positive for fungal etiology, 35 (55.56%) were males and 28 (44.44%) were females with a male to female ratio of 1.25:1.Maximum number of cases (22,34.92%) was found in the age group 31 – 45 yrs. Out of 35 fungal isolates, Aspergillus spp. (45.71%) was the most common isolate followed by Fusarium spp (34.29%) (Figure 1).

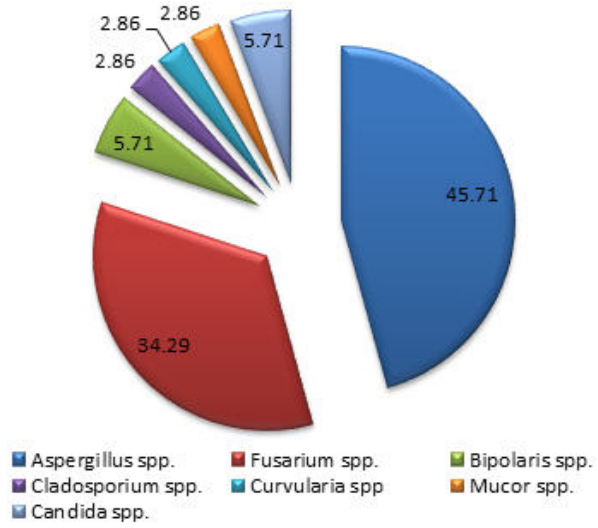

Figure1: Graphical Representation Of Distribution Of Fungal Isolates

Highest incidence of fungal keratitis was found among agricultural workers (68.25%) followed by manual labourer (15.87%) . The most common risk factor for fungal keratitis was found to be ocular trauma (50.79%) followed by previous ocular diseases (15.87%). Trauma due to vegetative matter (53.13%) was the most common agent causing fungal keratitis (Table 2).

Table 2: Occupation, Risk Factors And Traumatising Agents In Patients With Fungal Keratitis.

Occupation (n=63)	Number	Percentage
Agriculture	43	68.25
Manual labourer	10	15.87
Household	4	6.35
Professional	4	6.35
Student	2	3.17
Risk factors (n=63)		
Ocular trauma	32	50.79
Previous ocular disease	10	15.87
Chronic medication	8	12.70
Systemic diseases	3	4.76
No predisposing factors	10	15.87
Traumatising agents (n=32)		
Vegetative matter	17	53.13
Dirt/soil/sand	7	21.88
Cow dung/cow tail	2	6.25
Metal/wood	2	6.25
Others/not known	4	12.5

DISCUSSION

Fungal keratitis continues to be a major cause of visual loss in developing countries. Fungal corneal ulcer is common in India due to the tropical climate and a large agrarian population that is at risk. An understanding of the regional epidemiological features, risk factors, and etiological agents is important in the prevention and appropriate management of this disease entity.

In the present study, out of 115 cases, 63(54.78%) were found to be positive for fungal etiology. Of these, 40(63.49%) were positive on Gram stain, 53(84.13%) in KOH mount and 35(55.56%) were positive on culture. In the present study, 28(44.44%) samples remained sterile on culture despite positive direct microscopic findings which is similar to study done by Chander et al[9] in which 46.86% samples remained sterile. These were considered as positive because the direct microscopic findings corroborated with the clinical findings of the patients. The reasons for cultures to be sterile even when the direct microscopy was positive could be that the patients were already using topical steroids or antifungal agents before the corneal scraping samples were taken.

In this study, KOH mounts of corneal scrapings were found to be positive in 85.71% (30/35) of subsequently culture positive cases, whereas Gram-stained smears as a diagnostic aid in mycotic keratitis were positive in 51.42% of cases. In a similar study by Srinivasan[10], it was reported that sensitivity of 10% KOH wet mount was higher (99.23%) than that of Gram-stained smears (88.73%).

The most frequently implicated fungi in mycotic keratitis appear to vary depending on the geographical location. In the present study, *Aspergillus* species (45.71%) have been reported as the most frequent cause in consonance with various studies (Table 3) .

Table 3: Comparative Studies On Mycotic Keratitis

Place	Author	Year	No. Of cases with fungal isolates	Organism 1	Organism 2
Varanasi	Tilak *et al*[11]	2004-2008	41	Aspergillus flavus	Fusarium solani
Rajshahi	Akter *et al*[12]	2006-2007	33	Aspergillus fumigatus	Aspergillus flavus
Bangalore	Anusuya *et al*[13]	2009-2011	38	Fusarium spp	Aspergillus fumigates
Chandigarh	Punia *et al*[14]	2003-2012	44	Aspergillus flavus	Fusarium spp
Present study		2015 – 2016	63	Aspergillus spp	Fusarium spp.

Although in several parts of the world *Aspergillus fumigatus* is the commonest infective agent, *Fusarium* species and *Candida albicans* have also been reported as the predominant agents. A retrospective review of culture-proven fungal keratitis seen over a 3-year period by Bharathi *et al*[15] (2003) have found *Fusarium spp.* (42.82%) to be the predominant species followed by *Aspergillus* spp (286; 26%). Similarly another study from South India by Gopinathtan *et al*[16] (2002)

have reported *Fusarium species* (37.2%) to be the predominant fungal pathogen.

Gopinathan *et al*[16] from India have reported *Candida* spp. as a rare fungal corneal pathogen (0.7%). In the present study, *candida spp.* was found in 5.71% of the isolates. This is in contrast to studies in western world where *candida* spp. is the leading cause of fungal keratitis[17]. Basak et al[18] reported 1.1% incidence of *Candida* positive patients among 509 mycotic keratitis patients.

Dematiaceous fungi have been reported as the third most common cause of keratitis in a number of other studies[10,16,19]. In the present study, their prevalence was found to be 12.12%.

The fungal corneal ulcers may be reported at any age and in the present study, the age of the patients ranged from 12 to 85 years. However, the most susceptible age group was 31 – 60 years which is similar to reported by Lixin Xie et al[20] and Bharathi et al[15] who found that maximum patients (66.85%) were between the ages 21 to 50 years. In addition, keratomycosis was found to be more common in men (55.56%) than in women (44.44%), similar to previous studies[21,22]. Men, in this age group, have greater exposure to the fungal agents due to maximal outdoor activity.

Corneal trauma has been listed as the most common risk factor for mycotic keratitis. In the present study also, the commonest risk factor was corneal trauma 32 (50.79%) and that too with vegetative matter 17 (53.13%). Several reports on fungal keratitis describe an antecedent injury of the cornea caused by leaves, paddy grain, cow tail, tree branch, and metal pieces[10,23]. Other predisposing risk factors were chronic antibiotic usage and use of topical corticosteroids (12.70%). Reason could be easy over-the-counter availability of these antibiotics and steroid eye drops in our country. Moreover, due to illiteracy, patients keep on using these eye drops continuously for longer periods, many times even without prescription.

CONCLUSION

Fungal keratitis is a leading cause of visual loss and blindness worldwide. This condition remains a diagnostic challenge and a difficult management problem for treating ophthalmologists. Awareness of this condition together with knowledge of risk factors is an important key for early diagnosis. As there is often delay or misdiagnosis of fungal keratitis, aggressive diagnostic efforts and maximal therapeutic strategies should be exercised in cases having high suspicion or in failure of keratitis to respond to conventional adequate antibacterial therapy. New areas of research and development into both diagnostic and therapeutic methods may lead to prompt initiation of specific treatment and improved prognosis with better management of the fungal infection.

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