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RESEARCH ARTICLE

A STUDY ON CLINICO-ETIOLOGICAL PROFILE OF MYCOTIC KERATITIS IN TERTIARY CARE HOSPITAL AT GOVERNMENT MEDICAL COLLEGE, KOTA (RAJASTHAN)

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Abstract

Introduction: Keratitis is an inflammation of the cornea. Infective keratitis is an ocular emergency that requires prompt and appropriate management to ensure the best visual outcome for the patient. This study was planned to determine the fungal aetiological agents and predisposing risk factors causing corneal ulcer in patients.

Methodology: This study was conducted in department of Microbiology at a tertiary medical facility This Analytical Cross-sectional study, was conducted for the study period of one year from May 2021 to April 2022. Total 100 patients of infective keratitis were enrolled in the study period. Cases who have received treatment previously either systemic or topical antifungal in the last six months duration were excluded from the study.

Results: Trauma was found to be the most common predisposing factors present in almost two third (64%) of cases. The peak of the fungal kerartits cases were seen in September- October and Februrary-March. Sensitivity and specificity of 10% KOH wet mount was 93.75% and 98.5% respectively. Out of 31 culture positive the most common organisms isolated were Aspergillus spp in 16 samples, followed by Fusarium spp in 6 samples, and Candida spp in 6 samples. C.albicans was found 100% sensitive to Clotrimazole, Nystatin and Amphotericin-B, while 75% sensitive to Itraconazole and 50% sensitive to Fluconazole.

Conclusion: Mycotic keratitis has a significant burden in corneal keratitis. The KOH preparation can be used as an ideal technique for revealing fungal elements. The awareness about the ocular hygiene and protection, from occupational hazard needs to be emphasized in case of any ocular trauma and disease.

Introduction:-

Keratitis is an inflammation of the cornea caused by infectious organisms or non-infectious agents or stimuli. Infectious keratitis may be caused by bacteria, viruses, fungi and parasites. Keratitis is the most frequent presentation of ophthalmic mycosis, it often causes corneal scarring and opacification.[(1)]

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Mycotic keratitis is an infection of the cornea by fungi. It is a suppurative, ulcerative, and life threatening infection of the cornea and sometimes leads to loss of the eye.[2] It is described by synonyms like fungal keratitis, keratomycosis and fungal corneal ulcer.

Corneal ulcerations constitute the second most common cause of preventable blindness after cataract in tropical developing countries.[3] According to the World Health Organization report, ocular trauma and corneal ulceration result in almost 1.5 to 2 million new patients of corneal blindness annually, causing a major health problem for developing countries.[4]The reported incidence of corneal ulceration in India is 1130 per million population.[5]Incidence of fungal agents causing corneal ulcer has been increasing in recent years [6,7].

In the tropical areas, two third of ulcers may be due to filamentous fungi. This may account for more than 50% of all cases of culture proven microbial keratitis and ophthalmic mycosis, especially in tropical and subtropical areas. [8]

The determination of regional etiology is important as the causative fungi differ from region to region and within the same region over a period of time. [9]Corneal infections of fungal etiology are common in India (19-45%). Aspergillus (16–53%) and Fusarium (10–45%) are the common incriminating pathogens.[10]The common predisposing factors are trauma, indiscriminate use of antibiotics, steroids, wearing of contact lenses, presence of ocular and/or systemic illness.[9]Filamentous fungal keratitis appears to occur most commonly in healthy young men engaged in agricultural work or outdoor occupations.[9] Socioeconomic factors like malnutrition, anaemia, alcoholism, illiteracy and lack of facilities also predispose the person.

Fungal corneal ulcers commonly present with symptoms like redness, pain, photophobia, diminished vision, watering, and discharge. The ulcer has a raised, wet, soft, creamy to grayish white infiltrate. [11,12]

Infective keratitis is an ocular emergency that requires prompt and appropriate management to ensure the best visual outcome for thepatient.[11,12] The difficulties in establishing the clinical diagnosis in mycotic keratitis are in the isolation of the causative fungal agent and in the treatment of keratitis with antifungal agents.

Morbidity in mycotic keratitis tends to be higher because diagnosis is often delayed due to negligence towards ocular trauma, inappropriate treatment and wide spread use of topical antibiotics and steroids. Without adequate treatment, corneal infection leads to blindness through corneal scarring and endophthalmitis.

To minimize ocular morbidity, along with clinical evaluation, microbiological evaluation is very important in the diagnosis and timely treatment of corneal ulcer. [11,12]Culture and direct microscopic detection of causative organisms are the two important microbiological investigations that are widely used. Although culture of microbial pathogens is the gold standard, direct microscopic evaluation of smears provides immediate information about the causative organisms. [11,12]10% Potassium hydroxide(KOH) mount, Gram stain, Fungal culture and Lactophenol cotton blue mount are the commonly employed procedures for diagnosis of fungal diseases[13].

Therefore, keeping in mind the mycotic keratitis and its impact on vision, the present study was conducted to identify the predisposing factors of corneal ulcers and the etiological fungal agent profile in patients attending Ophthalmology OPD/IPD in a tertiary care hospital at Government Medical College, Kota.

Objectives:-

1. To determine the fungal aetiological agents and predisposing risk factors causing cornealulcer in patients.
2. To determine the diagnostic accuracy of 10% KOH wet mount in the diagnosis of fungal corneal ulcer.

Materials & Methods:-

This study was conducted in department of Microbiology, Govt. Medical College and attached Hospital, Kota after being approved by Institutional Ethical committee(Serial no. 25 of order no.44 dated 15.03.2021). This was an Analytical Cross-sectional study, which was conducted for the study period of one year from May 2021 to April 2022. We enrolled 100 cases presented with symptoms of keratitis, who gave informed consent in the Out Patient Department of Ophthalmology and those admitted in inpatient wards during the study period. Cases who have received treatment previously either systemic or topical antifungal in the last six months duration were excluded from the study.

Methodology:-

A proforma was filled for each patient documenting the age, sex, address and clinical information; including chief complaints, duration of symptoms, occupational history, predisposing factors and any previous history of treatment and associated metabolic disorders, were recorded.The corneal scrapings were collected by an ophthalmologist by using standard techniques under all aseptic precautions. Scrapings were collected after anaesthetizing the cornea with 4% lignocaine drops and waiting for 2-3 minutes. With the help of sterile Bard-Parker blade No.15, scraping was done by applying multiple, moderately firm, unidirectional strokes, under slit lamp illumination. Material was collected both from the base as well as from the edge of the ulcer, after retracting the lids properly and after cleaning any discharge or debris from the vicinity of the ulcer. Two samples were collected from each patient and were sent to microbiology laboratory for the analysis by direct microscopy and culture.One sample was used for direct microscopic examination with 10% KOH wet mount and Gram stain for the demonstration of fungal elements.The other sample was inoculated on two Sabauraud`s dextrose agar with chloramphenicol without cycloheximide. By convention, to indicate the site of sample, the sample was inoculated in the form of a 'C' or `S` streak on the culture media. Fungal growth in form of streak ensures that growth is from sample rather than a laboratory contaminant.The media were incubated at 37^0C and 25^0C for 4 weeks in B.O.D. incubator, checked for fungal growth daily during the first week and twice a week for the subsequent three weeks. Any growth obtained was identified using standard laboratory techniques. The sample was labelled as sterile if no growth appears at the end of four weeks of incubation and discarded.In some cases, the culture was repeated more than once and in cases where contamination was suspected, subculture was done.Fungal isolates from the corneal scrapings were identified based on the characteristic colony morphology on SDA slants and microscopic appearance.

Results:-

In the present study, around one fourth (26%) cases were of 31-40 years age group, followed by 41-50 years age group (21%). The mean age of the study population was 34.2 years.The male to female ratio comes out to be 2.7. Right eye was involved in 58%, whereas left eye was found to be affected in 42%. More than three fourth (78%) cases were from rural area. More than half (57%) of cases were agricultural farm worker and the least 6% were student. Trauma was the most common predisposing factors present in almost two third (64%) of cases and 21% cases had history of foreign body.

Figure 1 depicts that peak of the fungal kerartits cases were seen in September- October and Februrary- March with maximum number in September month.

In the present study, most commonly presenting symptom was redness in the eye (91%) followed by pain in the eye (84%), diminished vision (61%), photophobia (37%), watering (32%) and discharge in 14% cases. Out of 100 samples, 10% KOH wet mount was positive for fungal elements in 32 samples and fungal culture growth was positive in 31% cases. Sensitivity and specificity of 10% KOH wet mount was 93.75% and 98.5% respectively.

Figure 2 depicts pattern of fungal isolates in positive culture growth, out of 31 culture positive the most common organisms isolated were Aspergillus spp in 16 samples, followed by Fusarium spp in 6 samples, and Candida spp in 6 samples.

In the present study, among Candida spp. isolated most common species was Candida albicans (66.66%), followed by Candida tropicalis (33.34%) on HiCrome Candida Differential Agar.

Figure 3 depicts the antifungal sensitivity profile of Candida species. C.albicans was found 100% sensitive to Clotrimazole, Nystatin and Amphotericin-B, while 75% sensitive to Itraconazole and 50% sensitive to Fluconazole. C.tropicalis was found 100% sensitive to Clotrimazole, Nystatin, Amphotericin-B and Itraconazole and 50% sensitive to Fluconazole.

Table 1:- Sociodemographic variables and Predisposing risk factors.

Variables		Number	Percentage
Age Group (Years)	0-10	6	6
	11-20	15	15
	21-30	19	19
	31-40	26	26

	41-50	21	21
	51-60	8	8
	>60	5	5
Sex	Male	73	73
	Female	27	27
Residential area	Rural	78	78
	Urban	22	22
Occupation	Agricultural farm worker	57	57
	Manual labourer	26	26
	Skilled worker	11	11
	Student	6	6
Predisposing factors	Ocular trauma/injury (vegetative matter)	64	64
	Foreign body	21	21
	Diabetes mellitus	9	9
	Steroid use	4	4
	Ocular surgery	2	2

Figure 1:- Monthly variation in Mycotic Keratitis.

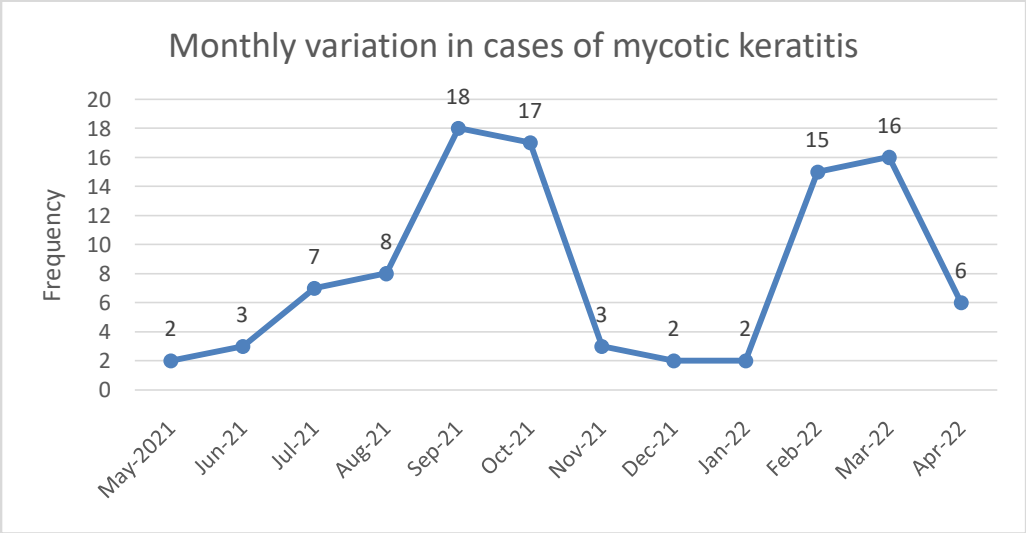


Figure 2:- Pattern of Fungal isolates in culture growth.

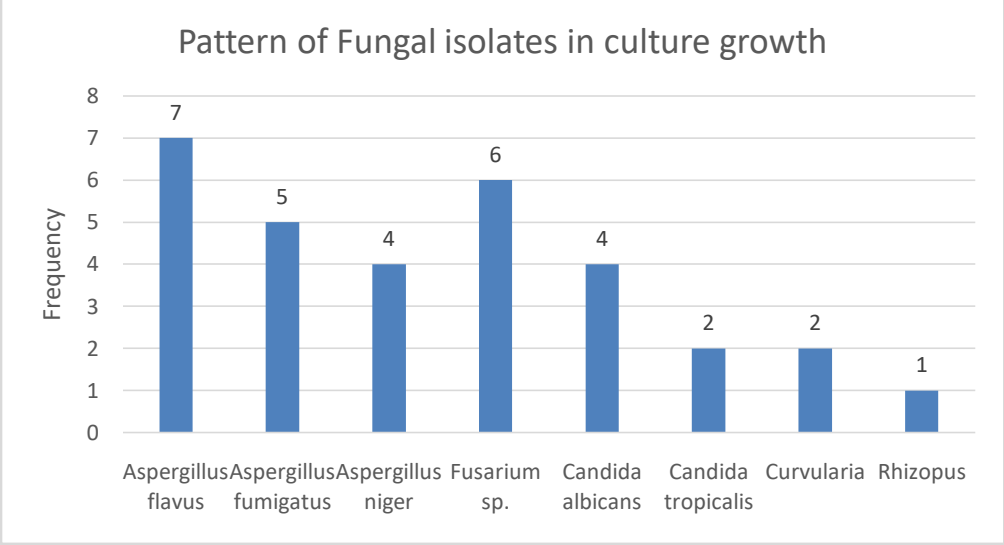
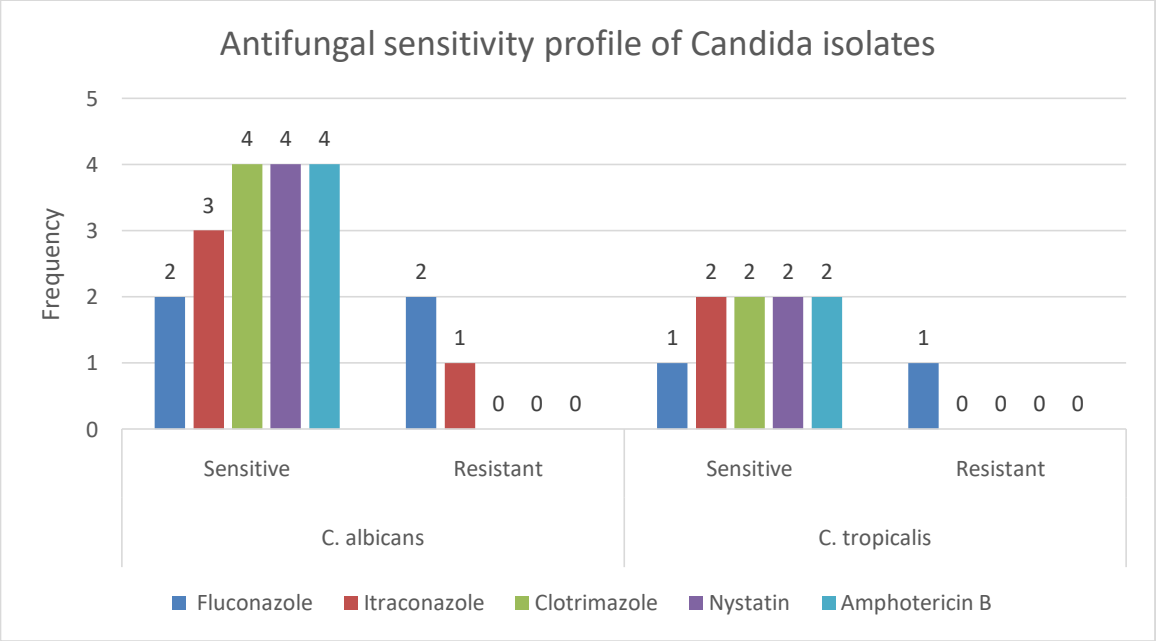


Figure 3:- Antifungal sensitivity of Candida species.



Discussion:-

In the present study, around one fourth (26%) cases were of 31-40 years age group, followed by 41-50 years age group (21%). The mean age of the study population was 34.2 years. The majority of the patients were in the age group of 31 to 40 years in a study done by Ragini Tilak et al at Banaras University, Varanasi.[14]In the present study, males (73%) were affected more than females (27%).Jadhav S.V has reported that the proportion of fungal keratitis was more in males (70.58%) than in females.[1]The predominance of fungal corneal infections in the younger age group and among males could be due to their greater involvement in outdoor activities and hence more chances of having corneal injury with external agents.

In the present study incidence of fungal keratitis was more common in patients from rural area (78%) than patients from urban area (22%). Most of the patients with fungal keratitis were from rural areas (80.27%) in a study done by M.Jayahar Bharathi et al from South India.[15] The high incidence of fungal keratitis in rural area patients could be due to involvement of people in agricultural activities which predispose them to trauma with vegetable matter and other types of traumas with causative agent contaminated with fungus and hence they were more vulnerable to fungal infections.

In the present study fungal keratitis was commonly observed in agricultural farm workers (57%) followed by manual labourers (26%), skilled workers (11%) and students (6%) . Similar observations were made by the other authors. Bandyopadhyay S et al has reported agricultural work in 49.12% of patients with fungal keratitis.[16]This high incidence of fungal keratitis in agricultural farm workers could be due to the corneal trauma by vegetative matter. Paddy, tree branches and broom sticks were the main vegetative matter that can cause corneal injuries.

In the present study, among various predisposing factors, history of ocular trauma or injury with vegetative matter was most common, followed by history of foreign body. A history of recent trauma to the affected eye was obtained in 54.4% of patients and a history of dust falling in to the eye was identified in 11.4% of patients in a study conducted by Usha Gopinathan et al.[17] Katara RS et al[18] found trauma 44.45%, diabetes mellitus 29.5% & steroid 3.70% in their study.As most of the patients were agricultural workers and farmers, trauma due to vegetative matter was most common.Other risk factors include prolonged use of topical steroids or antibacterials, systemic diseases such as diabetes mellitus and pre-existing ocular disease.

In the present study, peak incidence of cases was reported in the months of February-March and September-October.S.L. Sharma et al in their study reported peak incidence of cases in the months of February, March, September and October.[19] There is increased incidence in the number of cases of fungal corneal ulcer during the

monsoon season and during crop harvesting season.This highlights that there will be an increased chance of getting injury or trauma to the eyes while working in the fields and also the humidity of monsoon will favour the condition for the growth of fungal agents.

In the present study the fungal isolates were obtained in 31% of patients with corneal ulcers. Sanjeev H et al reported fungal etiology in 34.65% of patients with infectious keratitis during 2009-2010 in his study at K.S. Hegde Medical Academy, Mangalore.[20] Fungal etiology came in 37.23% of patients in a study by Namrata Kumari et al at Indira Gandhi Institute of Medical Sciences, Patna. [21]Fungal etiology was reported in 38.06% of patients with microbial keratitis in a study done by Suman Saha et al during 2008 from West Bengal, India.[22] A prospective and observational study was conducted in Bikaner by Abhishek Binnani et al, on corneal scrapings of 480 patients during July 2005 to June 2012, fungal etiology was reported in 37.5% of patients.[23]The epidemiological pattern of corneal ulceration differs significantly from region to region. There are distinct patterns of geographical variation in the etiology of mycotic keratitis and there is considerable variation in the proportion due to fungi that has been documented.

In the present study,out of 31 culture positive, the most common organisms isolated were Aspergillus spp in 16 samples (51.61%) followed by Fusarium spp in 6 samples (19.35%) and Candida spp in 6 samples (19.35%). Curvularia spp was isolated from 2 samples (6.45%) and Rhizopus spp isolated from 1 sample (3.25%). Vijaya S Rajamane et al reported that the most common fungal isolate was Aspergillus spp (18.91%) followed by Fusarium spp (5.4%) and Curvularia spp (2.7%).[24]The most common fungal isolate in Bandyopadhyay S et al study was Aspergillus spp (37.84%) followed by Fusarium spp (20.3%).[16]Aspergillus spp (55.4%) and Candida spp (18.91%) were found to be the major etiologic agents of fungal keratitis in Suman Saha et al study from west Bengal.[27]In a study conducted by Reema Nath et al during 2007 and 2009 in Assam, the common fungal isolate was Fusarium spp (25%), followed by Aspergillus(19%), Curvularia (18.5%) and Penicillium(15.2%).[25] The predominant fungal species isolated was Fusarium spp (45.85%) followed by Aspergillus spp (24.37%) in a study by M Jayahar Bharathi during 1999 and 2001, at Aravind Eye Hospital, Tamil Nadu, India.[26] The pattern of fungal isolates in various studies could be attributed to regional variations of etiological agents due to differences in climate and the natural environment.

In the present study the sensitivity and specificity of 10% KOH preparation, was 93.75% and 98.5% respectively. The sensitivity of 10% KOH wet mount preparation was 99.23% in the detection of fungal elements in a study done by M Jayahar Bharathi et al.[15]The sensitivity of 10% KOH preparation was 91.0% in a study done by Usha Gopinathan et al.[17]The value of 10% KOH wet mount preparation in the diagnosis of fungal keratitis lies in its ability to clear the scraping of cellular debris, there by rendering hyphal fragments more refractile on microscopic examination.

In the present study Candida was isolated from 6 (19.35%) out of 31 culture positive cases. Among Candida species isolated, 66.66% (4 out of 6) of isolates were C.albicans and 33.34% (2 out of 6) were C.tropicalis. In studies by Suman Saha et al [22], Iyer et al [27], Chander J et al [28] and Namrata Kumari et al [21], isolation of Candida spp. was in 18.91%, 14%, 6.4%,8.82% and 9.21% of cases respectively. In the present study Candida sp. was isolated mostly from the cases having diabetes and old age group (age above 50 years). This could be due to the immunosuppression seen in such conditions.

Conclusion:-

Self-medication by topical steroids and antibiotics, and delay in initiating antifungal therapy makes visual outcome unfavourable in most patients. These reasons have made fungal corneal ulcers as one of the most important causes of blindness in developing countries.Mycotic keratitis has a significant contribution (31%) in corneal keratitis, so this should be suspected in every patient with a corneal lesion and should be ruled out promptly to save sight and before commencing steroids and antibiotics.This study highlights the vital role of microbiological evaluation in the management of mycotic keratitis, since the clinical features alone are not adequate to confirm infection. Considering the cost effectiveness, easy availability of reagents, ease of preparation of the reagent and the sensitivity of the method, the KOH preparation comes out to be an ideal technique for revealing fungal elements in smears of corneal scrapings. The awareness among the general public about the ocular hygiene and protection, from occupational hazard needs to be emphasized together with early visit to the hospital in case of any ocular trauma and disease.A major factor in the improved management of fungal infection will be the ability to detect fungus, thus facilitating the clinicians in the selection of appropriate therapy.

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