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TO STUDY OF THE RISK FACTORS AND MICROBIOLOGICAL DIAGNOSIS OF DIFFERENT TYPES OF CORNEAL ULCER

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Abstract

Objective: To study the epidemiology and microbiological diagnosis of different types of corneal ulcer among patients visiting the OPD of Ophthalmology Dept. Muzaffarnagar Medical College.

Methodology: This hospital-based observational study was conducted at the Department of Ophthalmology, Muzaffarnagar Medical College and Hospital, covering a population of aged 20-80 years visiting the Ophthalmology OPD. Data collection spanned 18 months, with a sample size of 180. Patients were diagnosed with corneal ulcers on slit lamp examination were subjected to a standardised proforma, documenting sociodemographic details including name, age, sex, occupation, address, presenting complaints, history of trauma, duration of symptoms, predisposing factors and associated conditions, corneal scrapings were taken and sent for microbiological analysis of microoraganisms causing these infections

Results: The study found that corneal trauma (61.1%) is the most common predisposing factor and highest prevalence of fungal infections (53.9%), particularly Aspergillus (42.2%) and Fusarium (27.8%). Out of 180 patients with corneal ulcers, 76.67% had positive culture reports. Majority of patients were in the age group of 50-61 years of age, agricultural workers, most of them were belonging to lower socio-economic status and rural background with the majority of cases occurring in males (56.1%).

Conclusion: This study emphasizes the dominance of fungal infections in corneal ulcers, the critical role of trauma prevention, and the need for early microbiological diagnosis to ensure timely and effective treatment. The findings can aid clinicians in developing targeted therapeutic strategies and enhancing patient outcomes in corneal ulcer management.

Keywords: Corneal Ulcer, Staining, corneal scraping, Culture, Trauma.

INTRODUCTION

The WHO defines blindness as visual acuity below three out of sixty in the better eye after maximum refractive correction or a visual field narrower than ten degrees around central vision. Experts currently estimate that worldwide blindness affects 45 million people in both eyes.[1] Corneal blindness is a significant contributor to global visual impairment, affecting over 40 million people, with 90% of these cases occurring in developing countries[2]. Corneal blindness in India, is responsible for approximately 1.5 to 2 million cases annually, with fungal keratitis being a leading cause.[3]

Corneal blindness predominantly affects individuals in their most productive years, such as farmers and labourers, leading to economic hardships for families reliant on subsistence incomes. The demographic distribution of corneal ulcers varies significantly across different age groups, genders, and regions. 4]

Gender differences in the prevalence of corneal ulcers are evident in several studies, females comprised a higher percentage of corneal ulcer patients, PUK had a higher prevalence in males. [5]

The distribution of various corneal ulcer types shows substantial regional differences. Developing regions face significant challenges as trauma.[6] Developed nations show bacterial corneal ulcers from contact lens usage than viral ulcers which demonstrates how lifestyle choices influence disease patterns. [7].

Corneal ulcers are influenced by various predisposing factors and affect specific risk groups. Ocular trauma, especially in agricultural settings, is a significant predisposing factor. Pre-existing Ocular Conditions such as keratopathy, lid diseases, ocular surface disorders, previous ocular surgeries, and the use of topical corticosteroids are notable risk factors.[8]
Identifying the specific pathogens, environmental triggers, and patient demographics at highest risk can lead to more targeted prevention strategies and therapeutic interventions.(9) Additionally, the rising incidence of antimicrobial resistance and the misuse of topical corticosteroids in the treatment of corneal ulcers further complicates management, making early and accurate microbiological diagnosis essential for optimal outcomes. Hence the current study was planned to determine the risk factors and microbiological diagnosis of different types of corneal ulcer.(10)

MATERIALS AND METHOD

All patients with corneal ulcer who attended the Ophthalmology (OPD) were included in the study. An informed written consent was taken after taking clearance from ethical committee .For each patient, a standardised proforma was filled out documenting sociodemographic details including name, age, sex, occupation, address, presenting complaints, history of trauma, duration of symptoms, predisposing factors and associated conditions was obtained.

Ophthalmic examination:

Patients underwent a complete ocular examination including:

1. BCVA on a Snellen scale.
2. Detailed SLE along with fluorescent staining.
3. The size of the epithelial defect was measured and recorded in millimeters, along with the shape and the depth of stromal infiltratation.
4. Ulcer margin, floor, thinning, satellite lesions, pigmentation on the ulcer surface, any impacted foreign body was noted.
5. A coloured sketch of each ulcer was drawn using functional and cross- sectional diagrams.
6. The presence of hypopyon and its height was recorded in millimeters.
7. Other ocular predisposing conditions such as lid abnormalities, dacrycystitis, dry eyes, or ocular surface were noted.
8. Corneal sensitivity testing.

Laboratory investigations:

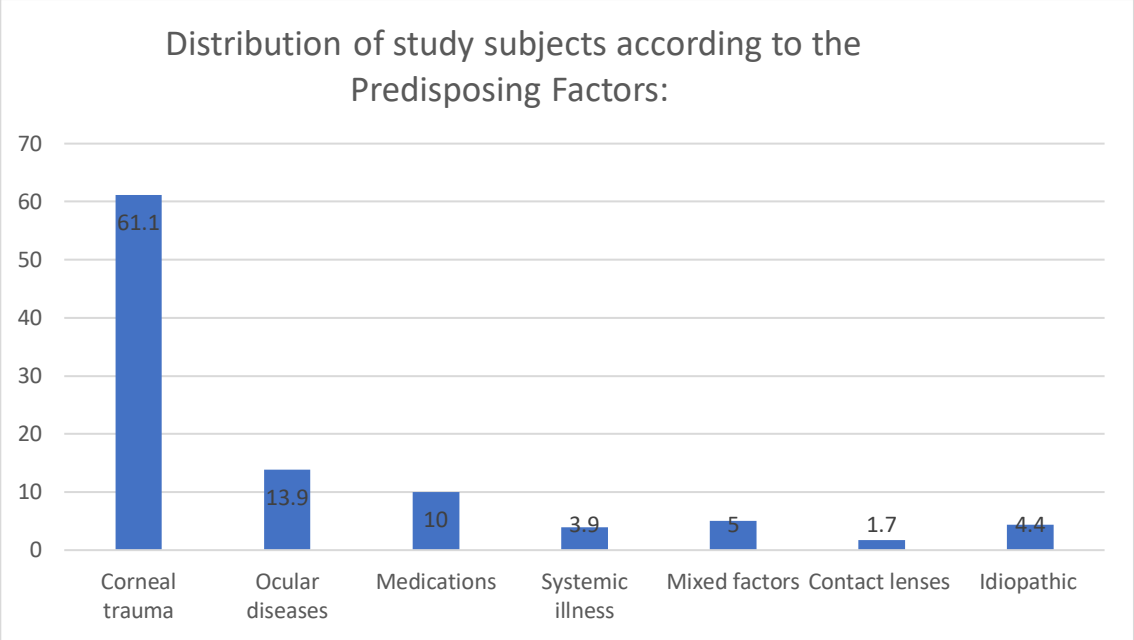
Corneal scrapping material was collected before starting any specific therapy, under slit lamp microscope using a sterile surgical blade number 15 and was sent for gram staining, 10%KOH mount and for culture and sensitivity on SDA to see fungal growth (examined daily, and discarded after 3 weeks if there was no growth) and on blood agar and chocolate agar for bacterial growth (evaluated at 24 hours, and then discarded if no growth was seen until 1 week.). The specific identification of pathogens were based on microscopic morphology, staining characteristics and biochemical properties using standard laboratory criteria, in Department of Microbiology, MMCH under standard protocols. Empirical therapy was started on the basis of clinical examination & microbiological lab results. If the patient did not respond to the treatment within 48 hours, specific treatment was started according to the culture and antibiotic sensitivity reports.
Follow up of patients: All the patients were admitted and seen daily for a week and discharged to follow up after 10 days of initiation of therapy & second follow up is after 2 - 3 weeks.

RESULTS

1. **Age Distribution:** The highest prevalence in the 51-60 age group (50.6%), followed by 16.7% in those above 60 years. The mean age of the participants was 54.7 ± 13.1 years, with a statistically significant difference ($p = 0.002$), indicating that age plays a crucial role in the occurrence of corneal ulcers.
2**. Gender Distribution:** Males (56.1%) were more frequently affected than females (43.9%), with a statistically significant difference ($p = 0.001$). This suggests that gender may influence susceptibility to corneal ulcers, potentially due to occupational or behavioral risk factors.

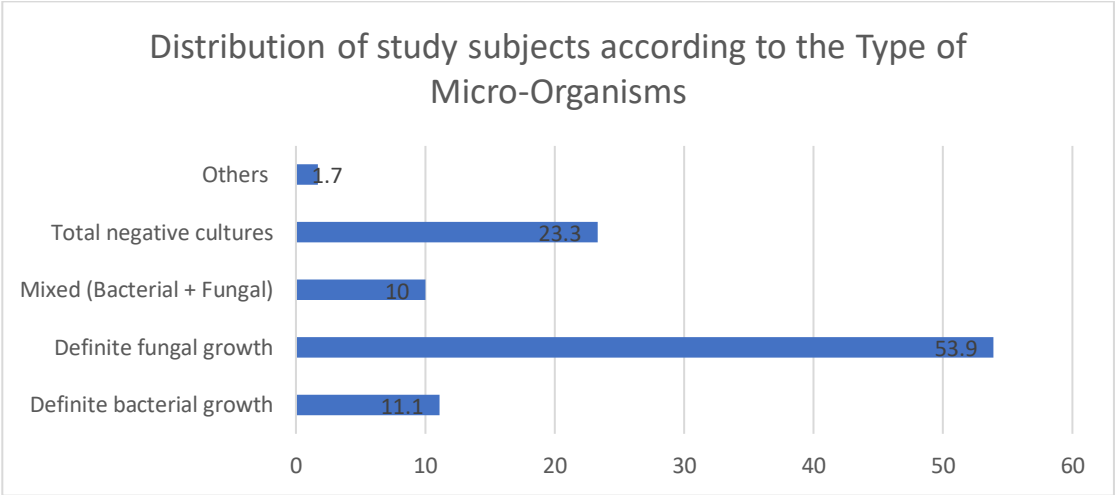
3. Predisposing Factors

The most common predisposing factor was corneal trauma (61.1%), followed by ocular diseases (13.9%), medications (10.0%), and systemic illnesses (3.9%).



4. Microbial Etiology

Fungal infections were the predominant cause, with definite fungal growth detected in 53.9% of cases. Bacterial infections (11.1%) and mixed bacterial-fungal infections (12.2%) were less common. A statistically non-significant difference (p = 0.279) was observed in microbial distribution.

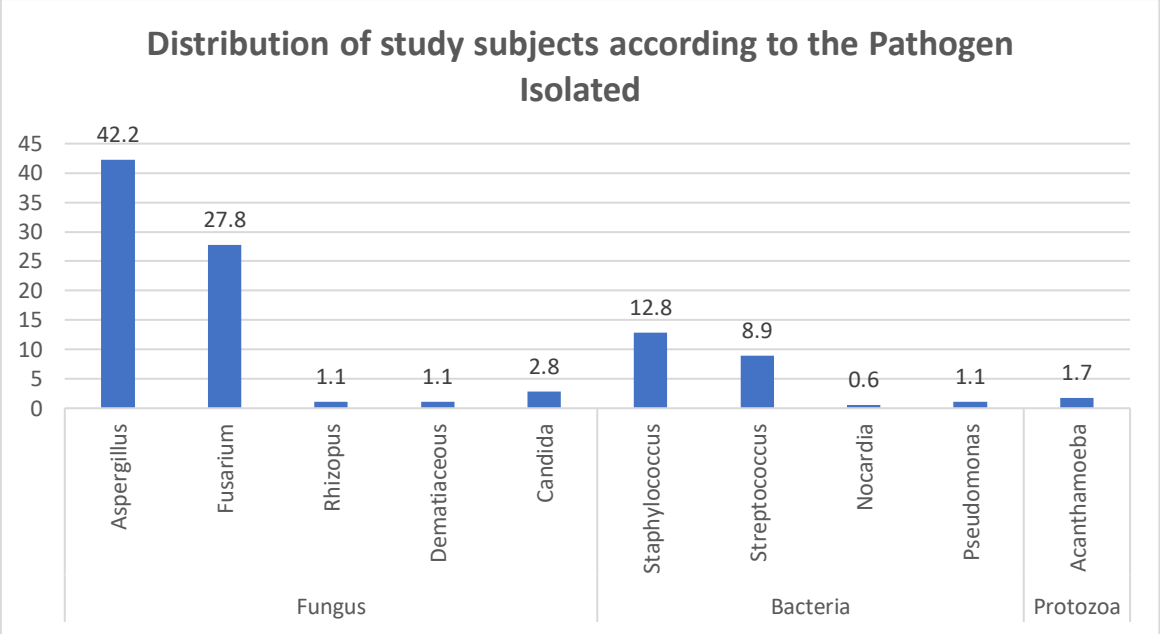


5. Ulcer Edge Appearance

The most common ulcer edge type was irregular (60%), followed by feathery (12.8%) and elevated edges (11.1%). A significant association (p = 0.004) was found, suggesting that ulcer edge characteristics may correlate with etiology and disease severity.

6. Pathogen Distribution

Among fungal isolates, Aspergillus (42.2%) and Fusarium (27.8%) were the most common, while Candida (2.8%), Rhizopus (1.1%), and Dematiaceous fungi (1.1%) were rare. Among bacteria, Staphylococcus (12.8%) and Streptococcus (8.9%) were the most prevalent.



DISCUSSION

In our study examining the demographic distribution of corneal ulcers, the majority of cases were observed in the 51-60 age group. This suggests that corneal ulcers are more prevalent among middle-aged and elderly individuals. Several studies have reported similar findings, reinforcing the trend of higher prevalence in older adults, supporting our observation that corneal ulcers predominantly affect older individuals.

In agricultural regions, younger adults may be at increased risk due to frequent outdoor activities and exposure to vegetative trauma, whereas in urban or tertiary care settings, older individuals may present with corneal ulcers due to systemic comorbidities such as diabetes and ocular surface diseases.

In our study, males (56.1%) were more affected by corneal ulcers than females (43.9%), indicating a male predominance. This gender disparity suggests that men may have higher exposure to risk factors such as outdoor work, trauma, and occupational hazards, which could contribute to the increased incidence of corneal ulcers.

Corneal trauma was the most common predisposing factor(61.1%) followed by ocular diseases (13.9%), medications (10.0%), and systemic illnesses (3.9%), emphasizing the need for preventive strategies, particularly in high-risk occupations.

In our study, 159 (88.33%) had positive bacterial or fungal cultures. Fungal infections were the predominant cause(53.9%), bacterial infections (11.1%) and mixed bacterial-fungal infections (12.2%) were less common. These findings highlight the significant role of microbial infections in the etiology of corneal ulcers, with a slightly higher prevalence of fungal infections compared to bacterial ones.

In our study, fungal infections were more prevalent than bacterial infections, with Aspergillus (42.2%) being the most commonly isolated fungal pathogen, followed by Fusarium (27.8%). Among bacterial isolates, Staphylococcus (12.8%) were the most frequent. These findings suggest that fungal keratitis predominates over bacterial keratitis, especially in cases linked to ocular trauma, environmental exposure, and agricultural settings.

CONCLUSION

This hospital-based observational study provides valuable insights into the risk factors, microbial etiology, and clinical outcomes of corneal ulcers. The findings highlight that corneal trauma (61.1%) is the most common predisposing factor, emphasizing the need for preventive measures and protective strategies. The high prevalence of fungal infections (53.9%), particularly Aspergillus (42.2%) and Fusarium (27.8%), underscores the critical role of antifungal therapy in corneal ulcer management. Bacterial pathogens, including Staphylococcus (12.8%) and Streptococcus (8.9%), were also significant contributors, reinforcing the need for comprehensive microbiological diagnosis and targeted treatment. The study revealed that age and gender play a crucial role, with the majority of cases occurring in males (56.1%) and individuals aged 51-60 years (50.6%), showing statistical significance ($p = 0.002$, $p = 0.001$). Most ulcers had favorable healing outcomes (86.1%), but 7.8% progressed and 3.9% led to perforation, highlighting the importance of early intervention. The presence of hypopyon (11.1%) and its statistically significant association ($p = 0.033$) suggests that it may serve as a marker for severe infections requiring intensive management. The study also found that superficial ulcers (76.1%) were more common than deep ulcers (23.9%), and the most frequent ulcer edge appearance was irregular (60%), suggesting variability in disease presentation. The significant association between ulcer edge characteristics and pathogen

distribution ($p = 0.004$, $p = 0.002$) further supports the importance of detailed corneal examination in guiding treatment approaches. This study emphasizes the dominance of fungal infections in corneal ulcers, the critical role of trauma prevention, and the need for early microbiological diagnosis to ensure timely and effective treatment. The findings can aid clinicians in developing targeted therapeutic strategies and enhancing patient outcomes in corneal ulcer management. Future research should focus on long-term outcomes, emerging resistance patterns, and newer therapeutic interventions to further optimize management approaches.

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