Section: Ophthalmology

Original Research Article

ANALYSIS OF DEMOGRAPHIC AND ETIOLOGICAL FACTORS OF INFECTIVE KERATITIS AT A TERTIARY CARE CENTRE IN NIZAMABAD, TELANGANA: A CROSS SECTIONAL STUDY

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Abstract

Background: Assessing demographic, occupational, and etiological factors is crucial in understanding the trends and risks associated with infective keratitis in distinct populations. The study aimed to explore the demographic, occupational, and causative factors of infective keratitis and its implications. **Materials and Methods:** Factors like age, gender, literacy, demographic origin, occupation, traumatic events, and causative agents were evaluated among participants. **Result:** The majority of the subjects, about 53%, were aged between 31-50 years. Males were predominantly affected, making up 79% of the study group. Illiteracy was pronounced at 74%. A significant number, 72%, originated from rural backgrounds. In terms of occupation, farmers made up the largest proportion at 48%, hinting at potential risks from agricultural practices. Among traumatic causes, vegetative matter was the major contributor at 52%, suggesting significant agricultural or environmental influences. From an etiological perspective, fungal infections led the chart at 60%, while bacterial and viral causes were at 23% and 11%, respectively. The presence of mixed infections in 6% of cases indicated potential complex infection interplays. **Conclusion:** The study highlights the substantial influence of demographic and occupational aspects on the incidence of infective keratitis. The dominance of fungal causative agents and trauma from vegetative matter emphasizes the vulnerabilities related to farming and environmental interactions. More in-depth studies are recommended to identify precise contributing factors and develop effective prevention strategies.

INTRODUCTION

Infective keratitis is a leading cause of ocular morbidity, with its roots found in a variety of demographic, occupational, and socio-environmental factors.[1,2] Factors such as diabetes and a compromised immune system further predispose individuals to this condition, heightening the risk. Recognizing the significant potential for visual impairment, it's crucial to gain a comprehensive understanding of these contributory elements. This knowledge will aid in crafting prevention strategies and enhancing treatment outcomes tailored to specific populations.[3,4]

Demographic variables, such as age, gender, and literacy levels, can significantly influence the risk and outcomes of infective keratitis.[5] Age, for instance, can influence the ocular tissue's resilience and susceptibility to infectious agents. Gender dynamics, encompassing biological, sociocultural, and accessibility factors, can shape the risk profile and health-seeking patterns concerning ocular conditions.[6] Additionally, literacy, beyond reading and writing abilities, impacts the capacity to comprehend, act upon, and adhere to ocular health recommendations.

Occupationally, certain groups, notably those working outdoors like farmers, may face heightened risks of ocular trauma and subsequent infections.[7] Prolonged exposure to environmental agents, harmful UV rays, or even specific agricultural practices can predispose this demographic to

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infective keratitis8. Therefore, a granular understanding of occupation-specific risks is crucial for targeted interventions.[8]

Further, trauma, especially involving organic matter like plant debris, can act as a gateway for infectious agents, including fungi and bacteria. Analysing the primary traumatic and etiological agents in populations at risk for infective keratitis is pivotal in anticipating potential hazards, guiding clinical diagnosis, and tailoring management strategies.[9]

Given the backdrop of Nizamabad, Telangana – an area with its unique demographic and occupational makeup – there's a pronounced need to dissect these factors concerning infective keratitis. Such insights can serve as a foundation for region-specific ocular health interventions.

Aim and Objectives: This study aims to meticulously examine the demographic, occupational, and etiological factors influencing the incidence and outcomes of infective keratitis in Nizamabad, Telangana.

The specific objectives are:

To investigate the age distribution and discern its implications for infective keratitis susceptibility.

To comprehend gender disparities and assess their influence on disease prevalence and healthcare access.

To gauge literacy levels and deduce their effects on ocular health literacy and proactive health behaviours.

To demarcate rural vs. urban differences in Nizamabad and evaluate their impact on infective keratitis risk factors and outcomes.

To study occupation-specific exposures, especially in vocations like farming, and their resultant ocular health implications.

To pinpoint the dominant traumatic agents leading to infective keratitis in the region.

To determine the chief etiological agents and provide region-specific recommendations for prevention and management.

MATERIALS AND METHODS

Study Design and Duration: This research was conceived as a cross-sectional study executed within the confines of a hospital environment. The study's duration extended over 18 months, commencing in January 2021 and concluding in June 2022.

Study Setting and Participants: Patients were selected from those presenting at the Ophthalmology OPD of the Government General Hospital-Nizamabad. The cohort consisted of 100 individuals, all of whom demonstrated varying degrees and types of infectious corneal ulcers.

Inclusion and Exclusion Criteria:

Inclusion Criteria

Patients manifesting any category of infectious corneal ulcer, which includes bacterial, viral, fungal, and protozoal origins.

Exclusion Criteria

Corneal ulcers in the resolution phase.

Peripheral ulcerative keratitis.

Perforated corneal ulcers prohibiting scraping.

Sterile neurotrophic ulcers.

Individuals with pre-established corneal disorders.

Ulcers associated with autoimmune diseases.

Sample Size and Determination: Our patient sample comprised 100 individuals. The foundation for this sample size was laid by the study from Bajracharya L et al., which recorded a bacterial isolate prevalence of 47.26%. The size was computed using the formula:

Formula: $n = z\alpha 2 * pq / d2$

The resultant 'n' value approximated 96 but was adjusted to a round figure of 100 for the convenience of the study.

Data Collection and Clinical Evaluation: An exhaustive documentation process was deployed for every patient, encapsulating socio-demographic specifics, the clinical timeline of symptoms, historical treatment regimens, underlying ocular predispositions, and risk factors.

Clinical assessments entailed torch inspections complemented by slit-lamp examinations. Detailed evaluations were made on the ulcer's features: size, shape, topography, and depth. Observations on corneal vascularization and tactile sensitivity were also registered. A 2% Fluorescein stain facilitated the visualization of the ulcer's expanse and intricacies. Concurrently, the patency of the lacrimal sac was verified via sac syringing.

Sample Collection: For the acquisition of ulcer samples, a 4% Lignocaine was instilled as a local anaesthetic, post which scraping was carried out. Collected specimens were cultured in an assortment of media, namely blood agar, Chocolate agar, and Sabouraud's Dextrose agar. Alongside, smears were prepared on separate glass slides intended for gram staining, Giemsa staining, and 10% KOH mount microscopy.

Additional Laboratory Investigations: Complementary laboratory assessments involved blood glucose assays (both fasting and random variations) coupled with urinalysis. The latter aimed at detecting glucose presence, albumin concentration, and performing microscopic scrutiny.

Data Analysis: Compilation and processing of data was orchestrated using Microsoft Excel 2013. The data, particularly the categorical components, were primarily represented in the forms of percentages and proportions for clarity and coherence.

Ethical Approval: The study was approved by the Institutional Ethics Committee, Government Medical College, Nizamabad, Telangana, India.

RESULTS

An extensive investigation into the demographic, occupational, and etiological factors related to infective keratitis at a tertiary care centre in

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Nizamabad, Telangana, has produced significant observations that may contribute to understanding the disease's prevalence and predisposing factors.

Age Distribution [Table 1]: The age category most affected by infective keratitis was the middle-aged segment, especially the 31-50 years group. This observation suggests that individuals within this age range might be engaged in activities or possess certain physiological factors that render them more susceptible to this eye condition.

The relatively smaller percentages among the younger and older populations could indicate less exposure to risk factors or a possible protective mechanism specific to their age groups.

Gender Distribution [Table 2]: The disparity between males (79%) and females (21%) suggests that men might be engaging more frequently in risk-prone activities or occupations predisposing them to infective keratitis. This highlights the need to investigate gender-specific behaviors or roles that might be contributing to the disparity.

Literacy Levels [Table 3]: A notable predominance of illiteracy (74%) among the affected indicates that limited educational attainment might be related to reduced awareness of preventive measures, inadequate healthcare access, or other socio-economic factors that enhance vulnerability to infective keratitis.

Demographic Origin [Table 4]: The pronounced number of cases emerging from rural settings (72%) as compared to urban areas (28%) underscores potential environmental or occupational factors distinct to rural areas. It prompts further exploration into rural-specific activities, sanitation standards, or environmental exposures.

Occupational Distribution [Table 5]: Farmers, representing nearly half (48%) of the cases, indicates a potential nexus between farming activities and the onset of infective keratitis. This correlation might be due to exposure to soil-borne pathogens, agricultural chemicals, or vegetative matter.

The spread among other occupations, such as labourers, mechanics, and drivers, suggests varied occupational hazards that need focused attention.

Traumatic Agents [Table 6]: The predominance of vegetative matter (52%) as a traumatic agent underscores the potential risks associated with agricultural or environmental activities. This finding emphasizes the importance of protective measures during such engagements.

Metallic substances being responsible for 14% of the traumas might hint at occupational hazards associated with machinery, tools, or certain work environments.

The equal prominence of animal matter and unspecified agents underscores potential risks from fauna and the need to identify the elusive agents for better preventative strategies.

Etiological Agents [Table 7]: The dominant presence of fungal infections (60%) suggests that the environment or specific occupational exposures might be fostering fungal growth or transmission. It underlines the importance of understanding and tackling the conducive conditions for these fungi.

Bacterial (23%) and viral (11%) infections also play a substantial role, highlighting the multifaceted nature of infective keratitis etiologies.

The presence of mixed infections in 6% of the cases raises questions about possible co-infections or intricate infection dynamics that complicate diagnosis and treatment.

Table 1: Age Distribution of Subjects

Age Group	Frequency (Patients)	Percentage
20-30 years	18	18%
31-40 years	26	26%
41-50 years	27	27%
51-60 years	19	19%
61-70 years	9	9%
71-80 years	1	1%

Table 2: Gender Distribution

Gender	Frequency (Patients)	Percentage
Male	79	79%
Female	21	21%

Table 3: Literacy Levels

Literacy Level	Frequency (Patients)	Percentage
Literate	26	26%
Illiterate	74	74%

Table 4: Demographic Background

Background	Frequency (Patients)	Percentage
Rural	72	72%
Urban	28	28%

Table 5: Occupation Distribution

Occupation	Percentage
Farmers	48%

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Labourers	22%
Mechanics	8%
Drivers	7%
Others	15%

Table 6: Traumatic Agents

Traumatic Agent	Percentage
Vegetative matter	52%
Metallic	14%
Animal matter	13%
Unknown	13%
Finger nail	8%

Table 7: Etiological Agents

Etiological Agent	Percentage
Fungal	60%
Bacterial	23%
Viral	11%
Mixed	6%

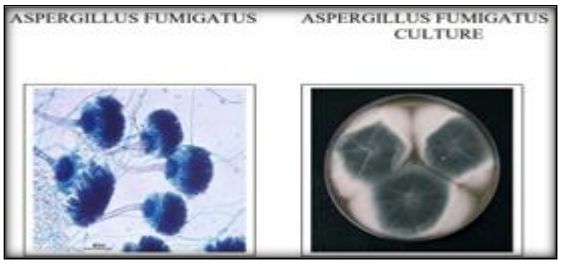

Figure 1: Aspergillus Fumigatus and its Culture

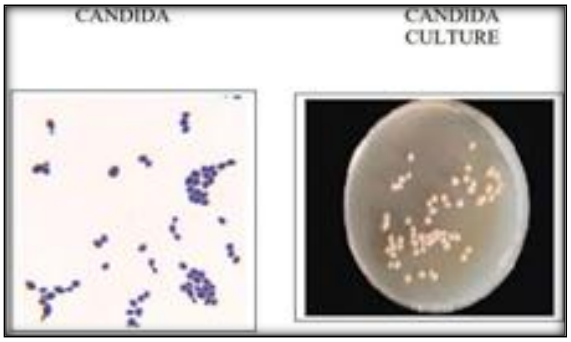

Figure 2: Candida Nd Its Culture

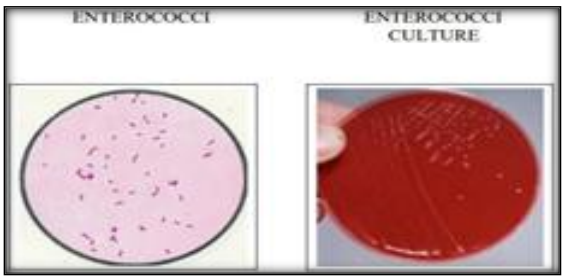

Figure 3: Enterococci and Its Culture

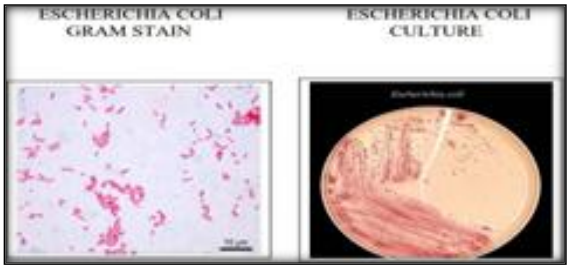

Figure 4: Escherichia Coli and Its Culture

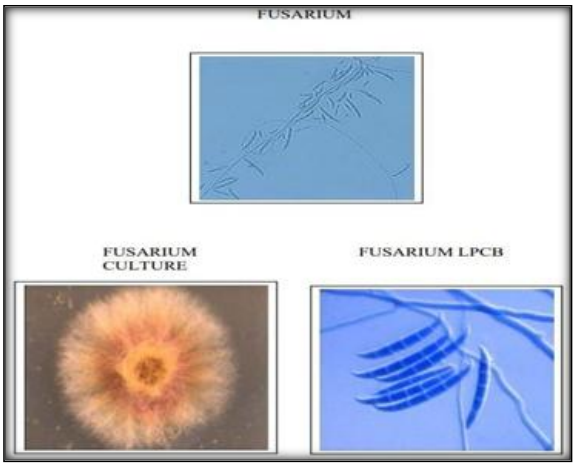

Figure No:5 Fusarium and its culture

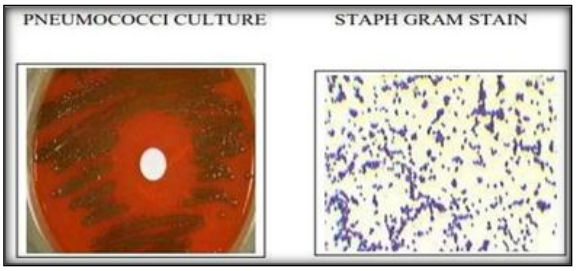

Figure No:6 Pneumococci Culture & Staphylococci Gram Stain

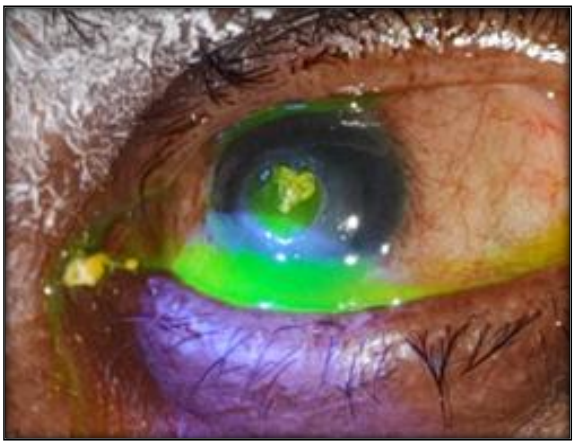

Figure No: 7 Fungal Corneal Ulcer

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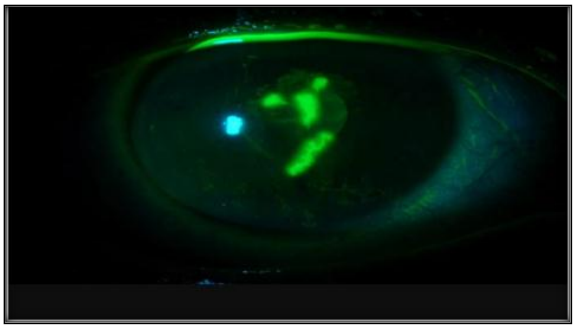

Figure 8: Herpes Simplex Virus Epithelial Keratitis

DISCUSSION

Our study embarked on an exploration of the etiology underlying corneal ulcers and probed into the diverse demographic aspects related to infective keratitis. Globally, corneal afflictions emerge as potent contributors to blindness, with keratitis being a key corneal inflammatory condition leading to vision impairment. Though trauma remains a dominant non-infectious trigger for keratitis, it is also precipitated by microbial invaders, notably fungi, bacteria, viruses, and amoebae. Despite advances, the diagnosis of infectious keratitis continues to challenge clinicians due to its multifaceted manifestations and consequential visual outcomes.

Demographics: Age Distribution: In our study, the preeminent age group affected by infectious keratitis was 41-50 years, accounting for 27% of cases, trailed by the 31-40 year bracket. These statistics resonate with Lakra et al10 observations, where the age group 46-60 accounted for 45% of cases, succeeded by the 31-45 age group at 18%.

Gender Prevalence: Males predominantly accounted for the cases in our cohort, making up 79%, while females represented 21%. A possible explanation for this disparity might be the heightened exposure of males to outdoor activities. These findings harmonize with Tewari et al,[11] study which recorded 68% males and 32% females. Similarly, Manish Singh et al,[12] reported a male-to-female ratio of 1.4:1.

Occupational Impact: Farmers, at 48%, constituted the bulk of our cases, followed by laborers (22%), mechanics (8%), and drivers (7%). This pattern mirrors findings by Mohod P et al,[13] which highlighted farmers (42.04%) as the prime occupational group affected, followed by household workers (29.54%) and laborers (15.90%). Bajracharya L et al,[14] also reported a heightened prevalence of infective keratitis among farmers, clocking 64.1%.

Literacy Levels: Literacy appeared as a significant demographic marker in our study, with illiterate patients dominating at 74% versus the literate ones at 26%. This is in alignment with Bajracharya L et al,[14] findings, which observed a higher representation of illiterates at 55% as opposed to literates.

Geographical Distribution: Our patient set predominantly hailed from rural backgrounds, accounting for 72%, while urban inhabitants comprised the remaining 28%. This spatial distribution is analogous to that documented by Bajracharya L et al,[14] wherein a notable 79.2% of cases hailed from rural settings, 14.4% from urban territories, and 6.3% from neighbouring nations.

Etiological Insights: Causative Agents: Fungal pathogens were the chief culprits in our study, registering in 60% of cases. Bacterial agents were implicated in 23%, viruses in 11%, and a combination of these in 6%. Bajracharya L et al,[14] echoed a similar trend with fungi responsible for 53.9% of cases, bacteria for 43.4%, and mixed microbial agents in 2.7%. Mohod P et al,[13] findings also paralleled ours, denoting fungal keratitis as the predominant etiology (59.09%), overshadowing bacterial (19.31%), viral (17.4%), and mixed etiologies (4.54%). Trauma, specifically due to vegetative material, emerged as a common antecedent in 49% of the cases. Our analysis unveiled that plant-based trauma (52%) was the most recurrent, succeeded by metallic injuries (14%), animal-related trauma (13%), and nail-induced injuries (8%). Khan N et al,[15] further underlined the predominance of fungal etiology, reporting 65.8% fungal cases against bacterial ones at 34.14% among the 41% culture-positive specimens.

CONCLUSION

The study results revealed a predominantly male population, primarily concentrated in the 20-50 age group, with a significant number being illiterate and hailing from rural areas. Among the various occupational groups, farmers exhibited the highest incidence of corneal ulcers, likely due to their frequent exposure to plant and animal matter. Fungal growth was the most common finding on culture, followed by bacterial growth.

Corneal ulcers represent a critical ophthalmic emergency, especially in a developing nation like India, where the burden of corneal blindness is substantial. It underscores the importance of promptly subjecting corneal scraping samples to microbiological investigations to facilitate the initiation of appropriate treatment. Furthermore, there is a pressing need to raise awareness within the community about the risk factors associated with corneal ulcers and promote the use of protective eye gear, masks, and face shields. Additionally, curbing the inappropriate use of topical corticosteroids can play a pivotal role in preventing corneal blindness.

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