

## ORIGINAL RESEARCH

# Clinical and Microbiological Profile of Bacterial and Fungal Suspected Corneal Ulcer

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### ABSTRACT

**Background:** The present study was conducted to evaluate the clinical and microbiological profile of bacterial and fungal suspected corneal ulcer.

**Material and methods:** This study was conducted to evaluate the clinical and microbiological profile of bacterial and fungal suspected corneal ulcer. Qualified resident physicians used a pretested structured questionnaire to collect information on each participant's sociodemographic characteristics, potential risk factors, as well as clinical results. We gathered clinical information and noted the best-corrected visual acuity (BCVA). Every patient had a complete biomicroscopic slit-lamp examination, with the cornea receiving particular attention. The location, size, kind, and margins of the corneal ulcer, as well as any satellite lesions, corneal vascularization, and hypopyon, were all evaluated and recorded.

**Results:** This research included a total of 100 cases of suspected bacterial and fungal corneal ulcers. The mean age of the participants was 35 years, and most of them were between 18 and 50 years of age (85%). By occupation, the majority of participants were male (80%) and farmers (75%). Almost 90% of the cases were from rural areas. Around 78% of respondents had no formal schooling. Relatively larger numbers of cases were observed between April and July (59%).

**Conclusion:** Trauma was the most common risk factor for infected corneal ulcers. Fungi were the most common microbiological isolate discovered from all corneal ulcer cases that were also accompanied by bacterial development.

**Keywords:** clinical profile, microbiological profile, cornea, ulcer, fungal.

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### INTRODUCTION

A corneal ulcer, a defect of the corneal epithelium involving the underlying stroma, is a potentially vision-threatening ocular emergency.<sup>1</sup> Even with prompt treatment patients can suffer significant morbidity with complications including corneal scarring or perforation, development of glaucoma, cataracts or anterior and posterior synechiae, and vision loss. Untreated bacterial keratitis may result in endophthalmitis and subsequent loss of the vision.<sup>2</sup> The annual incidence of corneal ulcers in the United States alone is estimated to be between 30000 and 75000, and approximately 12.2% of all corneal transplants performed are for management of infectious keratitis.<sup>3,4</sup> It is therefore essential that this condition is rapidly recognized so that prompt treatment can initiate and an urgent or emergent ophthalmologic evaluation arranged. Almost any organism can invade the corneal stroma if the normal corneal defence mechanisms, i.e., lids, tear film and corneal epithelium are compromised. While viral infections are the leading cause of corneal ulcer in the

developed nations (with Acanthamoeba infection in contact lens wearers), bacteria, fungi and Acanthamoebae are important aetiological agents in the developing world. The spectrum of corneal pathogens shows a wide geographical variation. At PMCH, Patna, 71.9% of all cases of ulcerative keratitis were culture positive. Of the culture positive cases 63.9% were bacterial, 33% were fungal, 2.1% were parasitic, and 6.2% were due to mixed infection.<sup>5</sup> Hence, this study was conducted to evaluate the Clinical and Microbiological Profile of Bacterial and Fungal Suspected Corneal Ulcer.

### MATERIAL AND METHODS

This cross-sectional study was conducted between January 2023 to August 2023 at the microbiology laboratory of Patna Medical College and Hospital, Patna to evaluate the clinical and microbiological profile of bacterial and fungal suspected corneal ulcer. A pretested structured questionnaire was used to collect information on each study participant's sociodemographic characteristics,

potential risk factors, as well as clinical results. We gathered clinical information and noted the best-corrected visual acuity (BCVA). Every patient had a complete biomicroscopic slit-lamp examination, with the cornea receiving particular attention. The location, size, kind, and margins of the corneal ulcer, as well as any satellite lesions, corneal vascularization, and hypopyon, were all evaluated and recorded. In cases where endophthalmitis was suspected, patients underwent a B-scan ultrasonography examination of the posterior segment. A senior ophthalmologist used systematic sample methods to scrape the cornea. Topical Tetracaine or proparacaine 0.5% without preservatives was applied to provide corneal anaesthesia. Using an aseptic approach and a kimura spatula that was specifically made, the sample was directly extracted from the object's base or bulk. Treatment was halted and the inquiry was postponed for 24 hours for individuals who were receiving antibiotics at the time of their clinic visit in order to participate in this study. The laboratory diagnostic was performed in accordance with standard operating protocols by a medical laboratory technologist and a medical microbiologist. A corneal scrape was applied to two slides to prepare them for Gram staining and

unstained KOH. Both the scraping and the inoculated portion of the 0.5 ml brain heart infusion broth were given to the Department of Microbiology. All the results were recorded in Microsoft excel sheet followed by statistical analysis.

## RESULTS

This research included a total of 100 cases of suspected bacterial and fungal corneal ulcers. The mean age of the participants was 35 years, and most of them were between 18 and 50 years of age (85%). By occupation, the majority of participants were male (80%) and farmers (75%). Almost 90% of the cases were from rural areas. Around 78% of respondents had no formal schooling. Relatively larger numbers of cases were observed between April and July (59%).

In the first two weeks of the illness, about 59% of patients presented, and 41% of cases did so between 15 to 30 days. 90% of patients had ulcers larger than 3 mm, and in 46% of cases, hypopyon was evident. In 71% of instances, clinically suggested risk factors were found. In 46% of cases, trauma was the most prevalent risk factor, followed by keratitis in 13% of cases.

**Table: 1 Sociodemographic characteristics of the study participants among bacterial and fungal suspected corneal ulcers (n = 100)**

Characteristics	Frequency
<b>Age (in years)</b>	
10-17	12
10-30	23
36-50	65
<b>Sex</b>	
Males	80
Females	20
<b>Residence</b>	
Rural	90
Urban	10
<b>Education</b>	
Educated	22
Non-educated	78

**Table: 2 Clinical characteristics of the study participants among bacterial and fungal suspected corneal ulcers (n = 100).**

Clinical profile	Frequency
<b>Duration at presentation</b>	
1-7 days	43
7-14 days	16
15-30 days	27
>30 days	14
<b>Symptom</b>	
Pain	98
Blurred vision	96
Tearing	92
Redness	94
Whitish appearance	91
<b>Location of ulcers</b>	
Central	51
Paracentral	26

Peripheral	19
Whole	04
<b>Size of ulcers</b>	
<3 mm	10
>3 mm	90

**Table: 3 Microbiological characteristics of corneal scrape samples for studying clinical and microbiological profile among bacterial and fungal suspected corneal ulcers. (n = 100).**

Characteristics	Frequency
<b>Corneal scrape culture result (n=100)</b>	
Pure fungi growth	50
Pure bacterial	35
Mixed bacterial and fungal growth	05
No growth	10
<b>Bacterial isolates (n = 35)</b>	
S. aureus	15
Streptococcus species	08
Pseudomonas species	08
Proteus vulgaris	04
<b>Fungal isolate (n = 50)</b>	
Aspergillus species	21
Penicillium and Aspergillus species	08
Candida species	03
Penicillium species	08
Fusarium spp.	06
Rhizopus species	04

90% of the corneal scrape tests yielded cultures that were favourable, demonstrating the development of both bacteria and fungus. In 50% of all cases of corneal ulcer, fungi were the main pathogens discovered, followed by bacteria in 35% of cases. *Aspergillus* species (42% of all isolates) was the most prevalent fungus. Eight *Penicillium* species, three candida species, and four *Rhizopus* species were among the additional fungi that this investigation identified. Gram-positive cocci made up the majority of the bacterial isolates, with *S. aureus* and *Streptococcus* species making up 42.8% and 22.8%, respectively, of all bacterial isolates. The most prevalent Gram-negative rod, which made up 22.8% of all bacterial isolates, was *Pseudomonas* species.

## DISCUSSION

Corneal ulcer, an inflammatory or more seriously, infective condition of the cornea involving disruption of its epithelial layer with involvement of the corneal stroma, is one of the major causes of monocular blindness after unoperated cataract in many of the developing nations in Asia, Africa and the Middle East.<sup>6, 7</sup> It is a sight threatening disorder that affects both males and females across all age groups worldwide. In our study, the majority of patients were male, who were significantly older than females. Of the 90 culture-proven corneal ulcers, offending microorganisms in 50% of the cases were fungi and in 35% of the case, these were bacteria. Of the 35 bacterial corneal ulcers, the majority (65.71%) were caused by Gram-positive bacteria, of which 22.8% were *Streptococcus spp.*, and in the Gram-negative

bacterial corneal ulcers, most of the cases (66.66%) were caused by *Pseudomonas aeruginosa*. In Tewari's study, bacterial agents caused 65% of the culture-proven corneal ulcers, and the fungus was the offending microorganism in 35% of the cases, and similar to the present study, Gram-positive cocci were the most common bacteria, and among the Gram-negative bacteria, *Pseudomonas aeruginosa* was the most common. Similar to the present study, among the gram-positive bacteria, *Staphylococcus aureus* and among fungal causes, *Aspergillus spp.* followed by *Penicillium spp.* were the most common, which could be due to similarity in risk factors among the two studies. Among 50 cases of fungal corneal ulcers, *Candida albicans* was detected in three patients (6%), *Aspergillus spp.* in twenty one patients (42%) and *Fusarium spp.* in six patient (12%) as the offending fungus. In the current study, culture proven microbial corneal ulcers were detected in 90% of corneal scrapings. This was higher than reports from Nepal [17], Ghana [18], South India [19], and Bangladesh [20], which was 45.5%, 57.3%, 70.6%, and 81.7%, respectively. In the United States alone, 930,000 cases seek outdoor medical attention and 58,000 cases visit the emergency department.<sup>8</sup> The annual financial burden borne in United States in direct health care expenditures due to cases related to corneal ulcer and keratitis is estimated to be \$175 million.<sup>8</sup> In the developing countries, the financial burden related to this disease is undetermined but speculated to be calamitous.<sup>9</sup> Infectious keratitis is a leading cause of corneal blindness in developing countries.<sup>10</sup> Corneal ulceration results in 1.5–2

million new cases of corneal blindness annually, posing a major public health problem according to the World Health Organization (WHO) reports.<sup>11</sup> Fungi are the most common etiological agents which account for 30–40% whereas bacteria account for 13–48% of all cases of suppurative keratitis; this varies by geographical area.<sup>12</sup> These pathogens lead to corneal damage directly or by release of toxins and enzymes or by activating the host immune system.<sup>13</sup> An intact corneal epithelium acts as a barrier for the majority of microorganisms. Microorganisms can penetrate through a breach in the epithelium either due to penetrating or perforating ocular trauma or due to surgery. Various risk factors have been implicated for increased incidence of fungal keratitis including widespread use of antibiotics and steroids, use of contact lenses, and postoperative infections.<sup>14</sup> Hence, this study was conducted to evaluate the Clinical and Microbiological Profile of Bacterial and Fungal Suspected Corneal Ulcer. This research included a total of 100 cases of suspected bacterial and fungal corneal ulcers. The mean age of the participants was 35 years, and most of them were between 18 and 50 years of age (85%). By occupation, the majority of participants were male (80%) and farmers (75%). Almost 90% of the cases were from rural areas. Around 78% of respondents had no formal schooling. Relatively larger numbers of cases were observed between April and July (59%). In the first two weeks of the illness, about 59% of patients presented, and 41% of cases did so between 15 to 30 days. 90% of patients had ulcers larger than 3 mm, and in 46% of cases, hypopyon was evident. In 71% of instances, clinically suggested risk factors were found. In 46% of cases, trauma was the most prevalent risk factor, followed by keratitis in 13% of cases. 90% of the corneal scrape tests yielded cultures that were favourable, demonstrating the development of both bacteria and fungus. In 50% of all cases of corneal ulcer, fungi were the main pathogens discovered, followed by bacteria in 35% of cases. *Aspergillus* species (42% of all isolates) was the most prevalent fungus. Eight *Penicillium* species, three *Candida* species, and four *Rhizopus* species were among the additional fungi that this investigation identified. Gram-positive cocci made up the majority of the bacterial isolates, with *S. aureus* and *Streptococcus* species making up 42.8% and 22.8%, respectively, of all bacterial isolates. The most prevalent Gram-negative rod, which made up 22.8% of all bacterial isolates, was *Pseudomonas* species. Ranjini CY et al<sup>15</sup> identified the prevalence and microbial profile of infectious keratitis in a tertiary eye care hospital, and to test for the in vitro antimicrobial resistance of the bacterial isolates.

## CONCLUSION

Trauma was the most common risk factor for infected corneal ulcers. Fungi were the most common microbiological isolate discovered from all corneal

ulcer cases that were also accompanied by bacterial development. The most prevalent fungal isolates were of the *Aspergillus* species. *S. aureus* and *Streptococcus* species were the most frequently isolated bacterial pathogens, while Gram-positive cocci made up the majority of the bacteria identified. The most frequent isolation of Gram-negative bacteria from corneal ulcer cases was *Pseudomonas* species.

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