

Infectious keratitis in the Midwest region of Santa Catarina (2013–2024): etiological distribution and predisposing factors

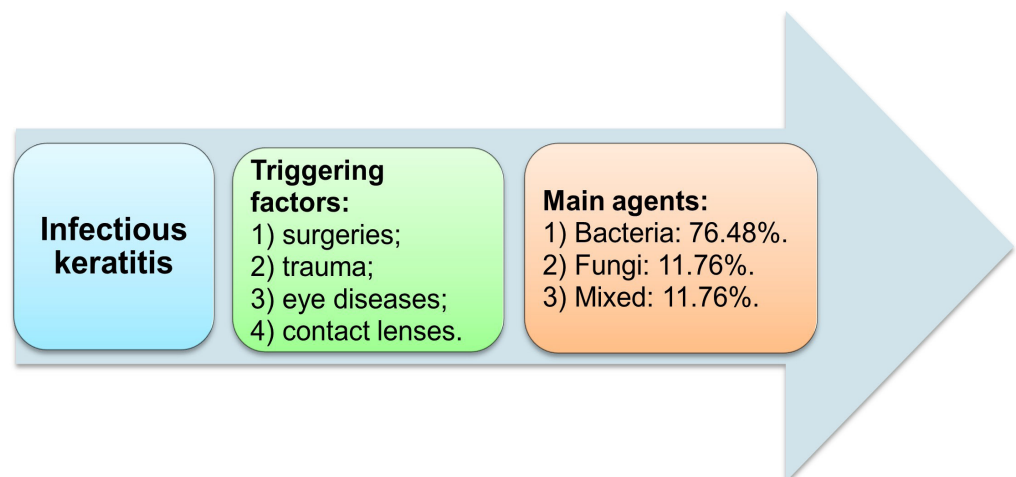
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Highlights

- Among bacteria, there was a predominance of coagulase-negative *Staphylococcus* and, among fungi, of the genus *Aspergillus*, followed by one case of *Candida haemulonii*.
- Culture for bacterial agents was positive in 56% of the samples. Standardization of sample collection contributed to positivity.
- Male agricultural workers are more affected by infectious keratitis.
- The prevalence suggests that empirical treatment should cover bacterial agents, particularly Gram-positive bacteria.
- This was the first study conducted in the region on infectious keratitis.

Graphical Abstract



Abstract

Keratitis ranks among the leading global causes of reduced visual acuity and reversible blindness, affecting patients across all age groups. This study analyzed the etiological profile of infectious keratitis diagnosed at an ophthalmological center in the Midwest region of Santa Catarina, Brazil. Through an 11-year retrospective analysis, 25 samples processed under a rigorous microbiological protocol were evaluated. Culture positivity was observed in 17 (68%) samples. Bacterial etiology predominated in 13 (76.5%) samples, with a higher prevalence of *coagulase-negative Staphylococcus* (CoNS). Fungal and mixed etiologies each accounted for 2 (11.8%) cases. Regarding the sociodemographic profile, 15 (60%) affected individuals were male, predominantly agricultural workers, with a mean age of 58 years. Agricultural activity was the primary occupation, correlating with the main predisposing factors: ocular trauma and prior surgical interventions. The identified scenario indicates a bacterial profile strongly associated with the occupational context of the region, reinforcing the need for preventive actions focused on ocular health among rural workers.

Keywords: Keratitis. Corneal ulcer. Corneal diseases. Epidemiology. Fungi.

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INTRODUCTION

Infectious keratitis, also referred to as corneal ulcer, comprises a process of corneal injury that may be caused by a wide variety of pathogens, including bacteria, fungi, parasites, and viruses¹. Despite its frequency, infectious keratitis is an ophthalmological condition with a high potential to threaten vision, primarily affecting marginalized populations².

Globally, corneal opacities are ranked as the fifth leading cause of blindness, accounting for 3.5% of all individuals classified as blind up to 2015¹. In a recent report, the World Health Organization (WHO) highlighted that, currently, approximately 6 million people worldwide are affected by blindness or visual impairment associated with corneal causes. Additionally, infectious keratitis is estimated to be associated with approximately 1.5 to 2 million cases of monocular blindness per year^{2,3}.

The incidence of infectious keratitis varies worldwide. Studies report rates ranging from 2.5 to 799 cases per 100,000 persons/year, with higher prevalence in developing countries¹. In the United States, infectious keratitis is estimated to account for approximately 1 million medical visits and 58,000 emergency department visits annually^{3,4}.

Regarding etiology, bacteria are the main causative agents of infectious keratitis, with approximately 90% of cases associated with staphylococci, streptococci, and enterobacteria. Fungal etiologies rank second in prevalence, with predominance of filamentous species⁵.

Among the risk factors predisposing to the development of infectious keratitis, the use of contact lenses, topical corticosteroids, systemic immunosuppressants, the occurrence of trauma, and the

presence of ocular surface diseases (OSD) are particularly noteworthy^{6,7,8}.

Cultures of corneal material represent the gold standard method for identifying infectious keratitis pathogens, and the implementation of a standardized collection process is essential to obtain reliable results^{6,8}. Despite the greater accuracy and safety provided by cultures, factors such as time and cost may limit their use in resource-constrained settings. In this context, early empirical treatment emerges as a widely adopted strategy, making knowledge of local microbial distribution patterns crucial for establishing effective therapy^{9,10}.

Despite the existence of robust studies on the prevalence of infectious keratitis in the Southeast and Northeast regions of Brazil, there is a scarcity of studies specifically addressing this topic in Southern Brazil. This lack of epidemiological data is particularly relevant given that climatic, economic, and sociodemographic variations directly influence the pathogenic profile of each locality, which may compromise initial medical management.

In this context, the present study is justified by the need to support empirical therapeutic decisions with robust regional evidence, guiding the selection of protocols appropriate to the local microbiological profile and minimizing adverse outcomes. The objective of this study was to analyze the etiological distribution and predisposing factors, in association with region-specific variables in the Midwest of Santa Catarina, based on laboratory culture results of corneal scrapings from patients treated at a reference ophthalmological center over an 11-year period.

METHODS

This study is a single-center, quantitative, retrospective, observational, and descriptive investigation based on the review of laboratory results of corneal scraping samples from all patients with clinical suspicion of infectious keratitis diagnosed at the Belotto Stock Ophthalmological Center (COBS) in Joaçaba, Brazil, between January 2013 and April 2024. As a monocentric analysis, the results are intrinsically linked to the institution's care

dynamics and the regional etiological spectrum. Although this characteristic limits the generalizability of the findings, it allows for addressing the existing epidemiological gap in the Midwest region of Santa Catarina. This study complies with the provisions of the Declaration of Helsinki and was approved by the Research Ethics Committee of Universidade do Oeste Catarinense/Hospital Universitário Santa Terezinha under protocol number 6,553,581.

Although antimicrobial susceptibility testing is routinely performed at the institution, these data were not included in the present analysis in order to focus strictly on local microbial prevalence and guide initial empirical treatment. Regarding antifungal agents, susceptibility testing was not performed due to technical unavailability. A detailed analysis of microbial resistance profiles will be the subject of future investigation.

All corneal scraping samples collected under sterile surgical conditions, with patient sedation, by a single collaborating ophthalmologist at COBS within the specified period were included. No restrictions were applied regarding the population studied. Samples collected from extra-corneal anatomical sites (conjunctiva, ocular discharge, vitreous humor, or aqueous humor) and those obtained outside a controlled surgical environment were excluded. These inclusion and exclusion criteria, combined with strict aseptic technique and immediate inoculation of collected material into culture media, aimed to minimize the risk of cross-contamination.

Collection and laboratory procedures followed a standardized methodology. After instillation of topical anesthetic (0.5% proxymetacaine hydrochloride – Anestalcon), ulcer margins were scraped using a number 15 blade, and the collected material was distributed into primary inoculation media (chocolate agar, blood agar, and enrichment broth – thioglycolate) and onto glass slides for Gram staining. When corneal material was scarce, priority was given to the enrichment broth. A new corneal scraping was performed for each culture medium. All microbiological analyses were conducted at Cepac Laboratory, also located in Joaçaba, by the same microbiologist. Blood agar, chocolate agar, and thioglycolate broth inoculated with the collected material were incubated at $36^{\circ}\text{C} \pm 1^{\circ}\text{C}$ for 2 days, with monitoring for bacterial and fungal growth throughout the incubation period. After this initial incubation period, in cases without observed growth, subcultures from thioglycolate broth were

performed onto non-selective media (blood agar, chocolate agar, and Sabouraud agar), along with preparation of new bacterioscopy slides, followed by continued monitoring. Blood and chocolate agar plates were further incubated for two additional days at $36^{\circ}\text{C} \pm 1^{\circ}\text{C}$, while Sabouraud agar was incubated at 25°C for up to 30 days, the period required to confirm negative results. Following subculture, growth of fungi and bacteria was reassessed, and in positive cases, all bacterial and fungal isolates were identified using standard laboratory techniques (colony characteristics, Gram staining, morphology, growth rate, and biochemical test results).

Laboratory results were analyzed according to etiological diagnosis and divided into two main groups: culture-negative and culture-positive keratitis. The culture-negative group comprised patients with clinical features of infectious keratitis without microbial growth in culture. The culture-positive group included patients with clinical features of infectious keratitis who met at least one criterion for significant growth, subsequently subdivided into bacterial or fungal etiologies. These data were correlated with epidemiological information obtained from patient medical records, including sex, age, and predisposing factors. Predisposing factors were categorized into five groups: physical trauma (including foreign body injuries), surgical trauma (postoperative cases), prior ophthalmological diseases (e.g., keratoconjunctivitis sicca, keratoplasty, among others), and contact lens use. Patients not fitting any of these categories were classified as “no predisposing factor.”

Data analysis was performed using descriptive statistical techniques, including frequency tables and graphical representations. The chi-square test was applied to assess associations between socio-demographic variables and infection-related factors, including fungal and corneal infections. Data were tabulated in electronic spreadsheets and analyzed using SPSS software. Results with $p < 0.05$ were considered statistically significant.

RESULTS

A total of 42 suspected cases of infectious keratitis were identified between January 2013 and April 2024, of which 25 met all selection criteria and were included in the study. Table 1 presents the sociodemographic distribution of the 25 partic-

ipants, stratified by profession and sex. A predominance of males was observed ($n = 15$; 60%), particularly among agricultural workers. Among females ($n = 10$; 40%), retirees were the most prevalent group.

Table 1 - Profession and sex of individuals affected by infectious keratitis.

Profession	Female		Male		Total	
	n	%	n	%	n	%
On leave	–	–	1	6.67	1	4.00
Farmer	2	20.00	6	40.00	8	32.00
Retired	3	30.00	1	6.67	4	16.00
Warehouse worker	–	–	1	6.67	1	4.00
Homemaker	2	20.00	–	–	2	8.00
Businessperson	–	–	1	6.67	1	4.00
Metallurgist	–	–	1	6.67	1	4.00
Driver	–	–	1	6.67	1	4.00
Not reported	1	10.00	0	–	1	4.00
Teacher	2	20.00	1	6.67	3	12.00
Public servant	–	–	1	6.67	1	4.00
General services	–	–	1	6.67	1	4.00
Total	10	100.00	15	100.00	25	100.00

The mean age of the analyzed population was 58 ± 16.8 years, ranging from 19 to 82 years. Individuals aged over 60 years represented the largest proportion of the sample (n = 12; 48%), followed by those aged between 41 and 60 years (n = 8; 32%); in both groups, an equal sex distribution (1:1) was observed. Finally, patients aged up to 40 years (n = 5; 20%) were identified, all of whom were male (n = 5).

Considering all cultures performed, positivity was observed in 17 (68%) samples, whereas 8 (32%) were negative. Among the 17 positive cultures, 13 (76.48%) showed exclusively bacterial growth, 2 (11.76%) exclusively fungal growth, and 2 (11.76%) mixed growth of fungi and bacteria. Table 2 presents the culture results according to age group and sex of the participants.

Table 2 - Culture positivity according to age group and sex of participants.

Demographic characteristics	Positive cultures	Negative cultures
Total number of cases	17	8
Age group		
≤ 30	2	0
31–40	1	2
41–60	7	1
61–70	3	3
≥ 70	4	2
Sex		
Male	9	6
Female	8	2

Culture for the investigation of bacterial agents was performed in all 25 selected patients, yielding positive results in 15 (56%). Culture for the investigation of fungal agents was performed in 20 samples, with positivity observed in 4 (20%) of them.

In the laboratory analyses, 7 bacterial species were identified; in one of the samples, there was concomitant growth of *coagulase-negative Staphylococcus* (CoNS) and *Escherichia coli*. The results of cultures for bacterial and fungal agents are presented in Table 3.

Table 3 - Etiology of infectious keratitis among 25 patients in the Midwest region of Santa Catarina.

Agent	Total	%
Bacteria	16	100
Gram-positive	13	81.25
<i>Staphylococcus coagulase negativo</i>	7	43.75
<i>Pseudomonas aeruginosa</i>	2	12.50
<i>Staphylococcus aureus</i>	2	12.50
<i>Streptococcus viridans</i>	1	6.25
<i>Streptococcus pneumoniae</i>	1	6.25
Gram-negative	3	18.75
<i>Escherichia coli</i>	2	12.50
<i>Serratia marcescens</i>	1	6.25
Fungi	4	100
<i>Aspergillus spp.</i>	2	50
<i>Aspergillus terreus</i>	1	25
<i>Candida haemulonii</i>	1	25

Note: In one of the 15 positive bacterial cultures, concomitant growth of CoNS and *Escherichia coli* was observed, resulting in a total of 16 microorganisms being counted; in two of the 17 positive cultures, mixed growth of bacterial and fungal agents was observed.

For the evaluation of the mechanisms of infection affecting the cornea, the samples were categorized into five predisposing factors: physical trauma (subdivided into trauma caused by organic or inorganic material), surgical trauma (subdivided

into corneal transplantation or other procedures), prior ophthalmological disease, contact lens use, and, for patients not fitting any of these categories, the term “no predisposing factor” was assigned, as shown in Table 4.

Table 4 - Predisposing factors and their distribution among etiological agents of infectious keratitis in 25 patients from the Midwest region of Santa Catarina.

Predisposing factor	Bacterial	Fungal	Mixed	Negative	%
Physical trauma					
Organic material	2	0	0	1	12
Inorganic material	0	0	1	2	12
Surgical trauma					
Transplant	3	0	1	1	20
Other	0	0	0	1	4
Prior ophthalmological disease	3	0	0	2	20
Contact lenses	3	1	0	0	16
No predisposing factor	2	1	0	1	16
Total	13	2	2	8	100

The analysis of the Chi-square test of independence showed no statistically significant association between the predisposing factor for infection and sex ($\chi^2(5) = 5.3571$; $p > 0.05$), nor with participants' age ($\chi^2 = 12.5717$; $p = 0.249$). Conversely, a significant association was found between the variable occupation and the mechanism of infection, with a Chi-square value of 82.3214 and $p = 0.01$, indicating that occupations are differently affected.

Additionally, a test was performed to verify the association between fungal infection and occupation, which was not significant ($\chi^2 = 11.0218$; $p = 0.4414$),

as well as with age ($\chi^2 = 1.0844$; $p = 0.5815$) and sex ($\chi^2 = 0.0000$; $p = 1.000$). Specifically for the occupation of farmer, the results also did not demonstrate an association with fungal infection ($\chi^2 = 0.0000$; $p = 1.000$).

Table 5 details the etiological agents identified according to each predisposing factor. Among the 25 (100%) samples, physical trauma was associated with 6 (24%), surgical trauma with 6 (24%), ophthalmological diseases with 5 (20%), contact lens use with 4 (16%), and in 4 (16%) cases the predisposing factor was unknown.

Table 5 - Correlation between mechanisms of infection and etiological agents identified in participants from the Midwest region of Santa Catarina.

Mechanisms of infection	Identified microorganisms	n
Physical trauma	<i>Streptococcus viridans</i>	1
	<i>Streptococcus pneumoniae</i>	1
	<i>Escherichia coli</i>	2
	<i>Aspergillus spp.</i>	1
Surgical trauma	<i>Staphylococcus coagulase negativo</i>	3
	<i>Candida haemulonii</i>	1
	<i>Serratia marcescens</i>	1
Prior ocular disease	<i>Staphylococcus coagulase negativo</i>	1
	<i>Pseudomonas aeruginosa</i>	1
	<i>Staphylococcus aureus</i>	1
Contact lens use	<i>Staphylococcus coagulase negativo</i>	2
	<i>Pseudomonas aeruginosa</i>	1
	<i>Aspergillus spp.</i>	1
No predisposing factor	<i>Staphylococcus coagulase negativo</i>	1
	<i>Staphylococcus aureus</i>	1
	<i>Aspergillus spp.</i>	1

Note: In one culture, growth of two bacterial agents was observed, and in two cultures, mixed growth of fungal and bacterial agents was identified.

Finally, Table 6 summarizes the data of all patients included in this study, facilitating the correlation between age, sex, predisposing factors, and the respective etiological agents when identified.

Table 6 - Individual clinical-laboratory profile of patients with infectious keratitis: correlation between sociodemographic data, predisposing factors, and identified etiological agents.

Age	Sex	Predisposing factor	Etiological agent
19	M	No predisposing factor	<i>Aspergillus spp.</i>
30	M	Surgical trauma	CoNS
35	M	Surgical trauma	Negative culture
39	M	Prior ocular disease	Negative culture
39	M	Contact lens use	CoNS
45	M	Contact lens use	CoNS
49	F	Contact lens use	<i>Aspergillus terreus</i>
50	M	Physical trauma	SGV, <i>E. coli</i> e <i>Aspergillus spp.</i>
51	M	No predisposing factor	CoNS
55	M	No predisposing factor	Negative culture
57	F	Prior ocular disease	<i>Pseudomonas aeruginosa</i>
57	F	No predisposing factor	<i>Staphylococcus aureus</i>
58	F	Contact lens use	<i>Pseudomonas aeruginosa</i>
62	M	Physical trauma	Negative culture
64	F	Physical trauma	Negative culture
66	M	Physical trauma	Negative culture
67	M	Physical trauma	<i>Streptococcus pneumoniae</i>
69	M	Surgical trauma	<i>Serratia marcescens</i>
70	M	Physical trauma	<i>Escherichia coli</i>
72	F	Prior ocular disease	CoNS
77	F	Surgical trauma	Negative culture
77	F	Surgical trauma	CoNS
78	M	Prior ocular disease	Negative culture
82	F	Prior ocular disease	<i>Staphylococcus aureus</i>
82	F	Surgical trauma	CoNS, <i>Candida haemulonii</i>

Legend: SGV: *Streptococcus viridans*. *E. coli*: *Escherichia coli*. CoNS: *coagulase-negative Staphylococcus*.

DISCUSSION

The mean age of participants in the analyzed samples was 58 years, consistent with the study by Duarte *et al.*¹¹, whose mean was 51.2 years, and with Suwal *et al.*⁴, in which 40% of patients with positive cultures were between 51 and 60 years old. This age group is subject to greater exposure to various predisposing factors for infectious keratitis, including occupational factors⁴.

In the present study, males comprised 60% of the total sample, with a male-to-female ratio of 1.5:1. Among positive samples, males accounted for 52.94%. However, in the study by Duarte *et al.*¹¹, the male-to-female ratio reached 4:1, whereas Suwal *et al.*⁴ observed a female predominance, with 58% of positive cultures and a male-to-female ratio of 0.7:1. These differences likely reflect variations in occupational and behavioral profiles of the studied populations, as well as possible methodological differences among studies.

The growth of at least one etiological agent was identified in 17 (68%) of the analyzed samples, a rate higher than that reported by Suwal *et al.*⁴, in which 44.55% of cultures showed microbial growth. Among positive samples, 11.76% presented concomitant growth of fungal and bacterial microorganisms, a value close to that observed in the meta-analysis by Ahmadikia *et al.*¹², in which the prevalence of mixed infections was 9.29%. The occurrence of polymicrobial infections may be related to more extensive corneal lesions or more significant impairment of ocular defense barriers, allowing simultaneous colonization by different pathogens.

Among positive cultures, 15 (88.2%) showed bacterial growth, consistent with Zaccaron *et al.*¹³, who reported prevalence rates ranging from 65% to 90%. Cabrera-Aguas *et al.*¹, however, describe percentages between 38% and 66% in different regions worldwide, similar to that observed by Suwal *et al.*⁴, in which 56% of positive cultures were of bacterial etiology.

The present study demonstrates a statistical correlation between rural activities and bacterial infection, highlighting the increased susceptibility of agricultural workers to this occupational risk. The higher prevalence of ophthalmological diseases among rural workers is associated with a combination of environmental, occupational, and socio-economic factors that increase the risk of corneal injury and infection. Prolonged exposure to dust, ultraviolet radiation, organic particles, and soil microorganisms contributes to a higher incidence of ocular surface alterations and infectious corneal diseases.

Direct contact with vegetation and soil increases the likelihood of ocular trauma caused by plant material, considered one of the main predisposing factors for the development of infectious keratitis, particularly of fungal etiology. Additionally, low adherence to personal protective equipment (PPE) among this group – often neglected due to climatic discomfort, limited access, or underestimation of occupational risks – further exacerbates vulnerability. Structural factors, such as reduced availability of specialized ophthalmological services in rural areas, also influence the higher prevalence and severity of cases in this population¹⁴.

Although a greater number of affected individuals were male, no statistically significant difference between sexes was observed, similar to the findings of Zaccaron *et al.*¹³, in which 54.3% of patients with corneal infections were male and 45.6% female.

In ophthalmological samples, particularly corneal tissue, specimen volume is inherently limited. This constraint necessitates prioritization of laboratory procedures following discussion between the ophthalmologist responsible for sample collection and the infectious disease specialist.

The ocular surface harbors a characteristic microbiome which, together with natural barriers, maintains local homeostasis. When this homeostasis is disrupted, as in pathological insults, the commensal flora itself becomes a predominant source of pathogens¹⁵. Thus, both epidemiology and clinical presentation are used to guide laboratory investigation of causative organisms, increasing the accuracy of diagnostic testing^{15,16}. Consequently, most samples in this study showed positive cultures for Gram-positive bacteria, consistent with global trends and regional Brazilian analyses^{13,17}. The main bacteria isolated in our sample were *coagulase-negative Staphylococcus*, accounting for 43.75%.

A more detailed examination of physiological ocular flora shows that *coagulase-negative Staphylococcus* accounts for 34% to 74.8% of all bacterial isolates and is considered the primary agent in bacterial keratitis^{2,15}. According to a review by Ting *et al.*², other microorganisms commonly associated with infectious keratitis include *Staphylococcus aureus* (5%–36%), *Streptococcus* spp. (7%–16%), and *Pseudomonas aeruginosa* (5%–24%), all of which were also identified in the present study.

Regarding fungal growth, positivity was observed in 20% of samples, similar to values reported by Suwal *et al.*⁴ (19.8%) and Ibrahim *et al.*¹⁸ (23.3%) in the Southeast region. In the study by

Bezerra, Höfling-Lima, and Oliveira⁷, the value was 6.19%, whereas Duarte *et al.*¹¹ reported 40% in the South. These findings contrast with the national scenario described by Kase *et al.*¹⁹, who identified prevalence rates of 4.67% to 5.3% in the Southeast, reaching higher levels in the Northeast, such as 30% in Maranhão and 42% in Rio Grande do Norte.

The relatively high proportion of fungal microorganisms as causative agents of infectious keratitis in southern regions, where the climate is known to be milder, contrasts with the prevailing literature, which reports predominance of such agents in warmer areas¹. Among possible contributing factors is the increasing availability and use of topical corticosteroids, due to their efficacy in controlling inflammatory processes of the ocular surface^{20,21}. However, the literature demonstrates that corticosteroid use — especially when empirical — may favor the development or worsening of infectious keratitis, as well as complications such as cataract and glaucoma. These drugs exert local immunosuppressive effects, reducing inflammatory response and immune cell activity in the cornea, thereby facilitating microbial proliferation and delaying epithelial healing. In fungal keratitis in particular, prior corticosteroid use has been described as a relevant predisposing factor, associated with deeper corneal infection, delayed diagnosis, and poorer visual outcomes²².

Regarding fungal agents, the findings of this study are consistent with the international scenario, in which filamentous fungi predominate in tropical and subtropical climates^{1,2}. In our sample, *Aspergillus* predominated, contrasting with most reports in which *Fusarium* is identified as the most common causative agent^{5,18,19}. However, according to Ibrahim *et al.*¹⁸, *Aspergillus* predominates in certain regions, such as northern India, Nepal, and Bangladesh. Additionally, our sample showed 25% positivity for fungi of the genus *Candida*. Although less prevalent, yeast-like fungi tend to be more relevant in temperate climates²³, consistent with the geographic context of this study.

Analysis of predisposing factors revealed that 84% of the population had at least one risk factor for developing infectious keratitis, similar to findings reported by Zaccaron *et al.*¹³ (83.1%). Among evaluated patients, 24% had a history of ocular trauma. In a 10-year study conducted by Lin *et al.*²⁴ in Taiwan, similar positivity was observed (23.5%). In Brazil, studies conducted in São Paulo and Uberlândia reported prevalence rates of 36% and 40%, respectively, often associated with

organic residues^{18,25}. Trauma disrupts corneal epithelial integrity and facilitates direct inoculation of microorganisms.

Previous ophthalmological surgeries also represent significant risk factors². Mechanisms include persistent epithelial defects and prolonged use of corticosteroids in the postoperative period, which may favor microbial colonization of the cornea^{19,26}. Among analyzed patients, 24% had a history of prior ocular procedures, particularly corneal transplantation. Similar findings were reported by Carillo *et al.*²⁶ in São Paulo, where patients with prior ophthalmological surgery had a 30% higher likelihood of culture positivity, with *coagulase-negative Staphylococcus* as the predominant agent^{2,27}.

Regarding fungal agents, individuals with a history of prior ophthalmological surgery were 1.46 times more likely to develop fungal keratitis, including infections caused by *Candida*, also identified in one sample of the present study^{1,19}.

Previous ophthalmological diseases were identified in 20% of participants, predominantly among women. Ocular surface diseases are commonly associated with Gram-positive bacteria, particularly *coagulase-negative Staphylococcus*, followed by *Staphylococcus aureus*, consistent with the findings of this study^{2,28}. Contact lens use is another relevant predisposing factor for infectious keratitis, associated with improper storage, inadequate hand hygiene, smoking, among other factors²⁹. These conditions favor the formation of microbial biofilms on lenses or storage cases, increasing the risk of corneal colonization and infection. The incidence of microbial keratitis among daily contact lens users is estimated at 2 to 5 cases per 10,000 users per year³⁰. In the present study, 16% of the sample consisted of contact lens users, with equal distribution between sexes, consistent with the review by Ting *et al.*², which reported prevalence rates of up to 18%.

The most common etiology in contact lens-related keratitis is *Pseudomonas aeruginosa*⁶. This pattern was not reproduced in our study, in which *coagulase-negative Staphylococcus* predominated in 50% of cases. Although fungal keratitis is less frequent among contact lens users, such cases tend to be more severe.

Finally, beyond identifying etiological agents, an important aspect in the management of infectious keratitis is the growing challenge of antimicrobial resistance. Although susceptibility testing was not included in this study, as previously mentioned, clinical practice and the literature demonstrate a progressive increase in resistance among

microorganisms associated with ocular infections, both bacterial and fungal. The frequent use of broad-spectrum topical antimicrobials, often initiated without adequate empirical justification, may favor the selection of resistant strains and compro-

mise therapeutic response. This scenario reinforces the importance of continuous microbiological surveillance and studies that include not only etiological profiles but also antimicrobial susceptibility patterns.

CONCLUSION

The epidemiological and demographic characterization of infectious keratitis in the Midwest region of Santa Catarina highlights the predominance of bacterial etiologies, particularly *coagulase-negative Staphylococcus* (CoNS). A higher prevalence was observed among male patients, with a notable association with agricultural occupational exposure and a history of surgical interventions.

Despite the scenario observed in several rural areas of Brazil, where fungal keratitis plays a prominent role, the case series in this southern region revealed a predominantly bacterial profile, including cases resulting from trauma involving organic material. Based on these findings, it is recommended that initial empirical therapy in the Midwest region of Santa Catarina primarily target Gram-positive organisms, reserving antifungal agents for secondary

approaches guided by clinical progression or culture results.

Study limitations include the small sample size, single-center design, absence of antibiogram data, and the potential underdiagnosis of viral and parasitic agents. Nevertheless, the findings contribute to the planning of regional ophthalmological services.

Furthermore, the high proportion of cases associated with prior surgical history and agricultural accidents underscores the importance of educational programs focused on ocular health, hygiene, and the use of protective equipment. Continued multicenter studies in southern Brazil are essential to refine an accurate epidemiological profile, with the aim of optimizing time, resources, and visual prognosis for the population.

CRedit author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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