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Outcomes of Microsporidial Keratoconjunctivitis Management During a Seasonal Outbreak at a Tertiary Eye Hospital

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Abstract

Background: Microsporidial keratoconjunctivitis (MKC) is relatively common, frequently misdiagnosed and occasionally persistent to conservative treatment. This paper aimed to report the outcome of treatment regimen in the management of microsporidial keratoconjunctivitis during Monsoon season in a tertiary eye hospital in Nepal.

Methods: The study was a retrospective case series. Twenty-two patients with MKC were studied regarding the clinical response toward the combination of Moxifloxacin 0.5%, Voriconazole 1%, and oral Albendazole 400mg. Corneal epithelial debridement was done selectively in case with confluent and collective MKC lesions. Topical Prednisolone Acetate 1% was added when the MKC lesion resolved. All cases were observed during follow-up regarding the duration from treatment to the resolution of MKC lesions and the resolution of all corneal lesions.

Results: Mean ± SD age of participants was 38.7 ± 13.1 years. Male and female participants accounted for 59.1% and 40.9%, respectively. Gram's stain positive for microsporidial spores was presented in 72.7%. Exposure to topical steroid, rain water and mud were found only in 59.1%, 18.2% and 13.6%, respectively.

Median duration to microsporidial lesions resolution (min to max) and medianduration to total resolution (min to max) were 5.0 (2.0 to 9.0) days and 14.0 (7 to 21) days, respectively. No patient with debridement had persistent epithelial defect or secondary infection. All patients did not have any adverse reaction.

Conclusion: The combination of moxifloxacin, voriconazole, and albendazole is safe and effective in the treatment of MKC. Debridement might be effective in early removal of MKC lesion. However, its benefit does not outweigh the painful experience and the risk of secondary infection.

Introduction

Microsporidia are obligate intracellular parasites which have been recognized for many decades[1, 2]. Only 17 known species among the 8 genera were identified to be associated with human[1, 3]. Various infections including respiratory tract, gastrointestinal tract, kidney, muscle, and central nervous system were reported[4]. Ocular microsporidiosis is one of the rare but devastating ocular infection which is usually associated with poor outcomes[2]. The stromal form of microsporidiosis is typically refractory to medical treatment and anterior lamellar keratoplasty which requires therapeutic keratoplasty for optimal eradication of the organism[5, 6].

A less severe form of ocular infection, microsporidial keratoconjunctivitis (MKC), is limited to the epithelial level and rarely progresses to the stromal infection[7]. Due to the mild presentation of symptoms, MKC is usually overlooked and considered as viral keratoconjunctivitis[8]. Despite being a self-limiting disease in nature, patients usually presented with persistent symptoms, sometimes for

weeks, which could be due to the local immunosuppressing steroid eyedrop given during the initial visits[9, 10].

Various regimens in MKC management were reported in the literature, but with contrasting results[11–15]. As a self-limiting condition, aggressive treatment could potentially cause unnecessary complications[16]. However, choosing observation without any treatment would pose a concern for prolong symptoms and clinical worsening[11]. To the authors' observation, many patients presented with persistent MKC lesions despite being treated conservatively or with topical antibiotic. Following this trend, a medical regimen is utilized as the treatment protocol for the study center. This paper aimed to propose and demonstrate the effectiveness and safety of a medical regimen with or without debridement in twenty-two patients with MKC.

Materials and Methods

This study complied to the ethical standards of the Declaration of Helsinki and its amendments. The retrospective case series was conducted at the Tilganga Institute of Ophthalmology, Nepal, using hospital records from August 2025 to December 2025. Data were retrieved and analyzed retrospectively in 2026. All MKC patients were reviewed and managed in the cornea department.

Investigation

Upon recognition of suspect microsporidial lesions, such as "stuck-on lesions or target-like lesions", patients were sent for corneal scraping (Fig. 1). Topical 0.5% Proparacaine Hydrochloride was instilled and, under a surgical microscope, Kimura spatula was used for obtaining the specimen. Only Gram's staining procedure was performed in order to detect microsporidial spores.

Management

After acquiring the specimen for investigation, corneal epithelial debridement was done selectively in patients with laboratory confirmation for MKC. In case of diffuse distribution of MKC lesion on corneal surface, corneal debridement would not be done.

A regimen of combined topical Moxifloxacin 0.5% and Voriconazole 1% four to six times per day, and oral Albendazole 400mg once per day was prescribed for all patients. Once microsporidial lesions and epithelial defect resolved, topical voriconazole and oral albendazole would be discontinued, topical Moxifloxacin was maintained and topical Prednisolone Acetate 1% four times per day was added. Treatment outcome was divided into total resolution of microsporidial lesions and total resolution of all corneal lesions, including epithelial healing line, superficial punctate keratitis and subepithelial haze. Patients were scheduled for evaluation every 2 days until the disappearance of microsporidial lesions and, then, weekly until the total resolution of all lesions.

Data management and analysis

All patient with suspected microsporidial keratoconjunctivitis were documented regarding demographic data, presenting symptoms and signs, type of medicine used and duration from treatment to resolution. In order to minimize bias, any case, which did not have any available laboratory data, was inconclusive of the diagnosis or could not complete the follow-up until the total resolution of corneal lesions, would be excluded. The data were collected using electronic medical record (EMR) and entered in Microsoft Excel. The cleaned data were transported to IBM SPSS V20 for statistical analysis. Mean, median number percentages were calculated for descriptive analysis. Bar diagram was prepared for graphical representation of the data. Normality of the continuous variable was checked using the Kolmogorov-Smirnov test. For the non-normally distributed variables, Mann Whitney U test was used for the association. P value less than 0.05 was considered as statistically significance using two tailed test.

Result

In 25 cases of suspected microsporidial keratoconjunctivitis, one patient was lost to follow-up and two participants were not documented regarding the result of laboratory test. Therefore, the three patients were excluded from the study. Among the 22 remaining patients who were suspected with microsporidial lesions, 16 patients (72.7%) were positive for microsporidial spores on Gram's stain. Mean ± SD age of participants was 38.7 ± 13.1 years. The percentage of male and female patients was 59.1% (n = 13) and 40.9% (n = 9), respectively. All cases except one presented with unilateral corneal lesions in which left eye was the most prevalent (63.6%, n = 14). History of exposure to topical steroid, rain water and mud/soil was found in 59.1% (n = 13), 18.2% (n = 4) and 13.6% (n = 3), respectively. The monthly distribution of incidence was provided in Fig. 2.

Frequency of symptoms and signs are included in Table 1.

Table 1
Frequency of symptoms of microsporidial keratoconjunctivitis.

Symptom and Sign	Frequency	
Redness	100%	(n = 22)
Diminished of vision	59.1%	(n = 13)
Foreign body sensation	54.5%	(n = 12)
Pain	36.4%	(n = 8)
Photophobia	27.3%	(n = 6)
Tearing	27.3%	(n = 6)
Itching	13.6%	(n = 3)
Discharge	9.1%	(n = 2)
Stuck-on lesion	100%	(n = 22)
Target-like lesion	100%	(n = 22)
Superficial punctate keratopathy	100%	(n = 22)
Punctate epithelial erosion	90.9%	(n = 20)
Subepithelial haze	54.5%	(n = 12)
Follicle	36.4%	(n = 8)
Keratic precipitate	27.3%	(n = 6)
Anterior chamber reaction	27.3%	(n = 6)

Analysis of patients who had debridement done and had not had debridement showed faster resolution time in debridement group (Time to MKC lesion disappearance between debridement and non-debridement: 2 vs 7 days; Mann-Whitney U = 14.0, Z = -3.03, P = 0.002) (Time to all corneal lesion resolution: median 14 vs 20.5 days; Mann-Whitney U = 28.5, Z = -2.11, P = 0.035) (Table 2).

Table 2
Comparison in total resolution time between debridement and non-debridement.

Debridement	Frequency	Median (Range: Max-Min) Lesion Resolution (day)	Median (Range: Max-Min) Total Resolution (day)
	36.4% (n = 8)	**2.0 (2.0–7.0)**	**14.0 (7.0–21.0)**
Non-Debridement	63.6% (n = 14)	7.0 (2.0–9.0)	20.5 (14.0–21.0)
		P = 0.002	P = 0.035

Upon starting the medical treatment, superficial punctate keratopathy (SPK), punctate epithelial erosions (PEEs) and subepithelial haze were noted in 100% (n = 22), 90.9% (n = 20) and 54.5% (n = 12), respectively, on subsequent follow-ups. After the resolution of MKC lesions, topical steroid was added. The mean day of starting steroid after presentation at 6.1 ± 3.1. Mean time from onset of symptoms to presentation was 7.1 ± 2.9 days. Median duration to microsporidial lesions resolution (min to max) and median duration to total resolution (min to max) were 5.0 (2.0 to 9.0) days and 14.0 (7 to 21) days, respectively (Table 2). Summary of all twenty-two participant was provided in Table 3.

Table 3
Summary of all participants' demographic and treatment data.

Case	Laterality	Smear Result	Debridement	MKC Lesion Resolution (Day)	Total Resolution (Day)
1	Left	Spores	Yes	4	14
2	Right	Spores	Yes	2	14
3	Right	Spores	Yes	2	7
4	Right	Spores	No	7	14
5	Left	None	No	7	21
6	Left	None	No	7	21
7	Right	Spores	Yes	2	14
8	Left	Spores	Yes	2	21
9	Left	None	No	7	14
10	Left	Spores	No	5	20
11	Left	Spores	Yes	2	14
12	Left	None	No	5	21
13	Left	None	No	2	14
14	Right	Spores	No	7	14
15	Left	Spores	No	7	21
16	Left	Spores	Yes	7	14
17	Left	Spores	No	7	21
18	Left	None	No	9	21
19	Left	Spores	Yes	2	14
20	Bilateral	Spores	No	4	14
21	Right	Spores	No	7	21
22	Right	Spores	No	4	14

Discussion

Microsporidial keratoconjunctivitis is usually misdiagnosed as viral keratoconjunctivitis due to the similarity in clinical picture[8]. However, certain signs such as stuck-on lesions, target sign, popcorn

lesions could easily raise the suspicion for differential diagnosis[9, 17, 18]. With better recognition, the incidence of MKC would increase significantly and, hence, an increase in the change of management. One study of MKC in South India showed a significant increase in incidence of MKC, starting from 1 case in 2006 to 176 cases in 2015 which accounted for 5% of all conjunctivitis presented[19]. This trend would point of not the increase in incidence of infection, but the awareness of ophthalmologists regarding MKC. In Tilganga Institute of Ophthalmology, MKC had been observed to occur most commonly during the Moonson period from June to December. However, due to the lack of uniform documentation of MKC cases in the previous years, the current study could only present the newly diagnosed MKC cases, starting from August 2025.

The management of microsporidial keratoconjunctivitis is controversial and non-standardized[13]. Some papers reported the benefits of debridement[7, 20]. The mechanism involves the removal of the majority of the lesions to hasten the resolution of the conjunctivitis. However, one randomized controlled trial pointed out the same outcomes, regarding the time of resolution and final visual acuity, whether or not the patients had undergone debridement[21]. The study also concerned the increase risk of stromal involvement after the removal of epithelium. In our study, no case develops microsporidial stromal keratitis throughout the follow-up. In contrast to the previous study, this paper found faster in term of time to resolution of MKC lesion and time to complete resolution in patients who had debridement. The difference could be due to the exposure of our study participants to topical steroid prior to their visit, which could potentially prolong the course of infection. However, even with a few days of faster resolution, debridement causes painful experience for the patients and exposed the cornea to secondary infection[22]. Therefore, risk may outweigh the benefit in debridement.

Regimens also vary among studies. The study of Loh et al showed the clearance of lesions up to 99% with fluoroquinolone monotherapy[14]. However, faster complete resolution of microsporidial keratitis, as soon as 4 days, was seen in one study which utilized the combination of Gatifloxacin 0.5% and Voriconazole 1%[22]. In our report, the combination of Moxifloxacin 0.5%, Voriconazole 1%, and Albendazole 400mg were used as regimen. To our observation, some patients presented with prolong course of infection or symptomatically worsening despite the use of antibiotic prescribed from other centers. This enabled the rational for the current paper to study the effectiveness and safety of the treatment regimen. Moreover, the reason for the aggressive management was the concern over the increase incident of Vittaforma Corneae species in the cases of microsporidial keratoconjunctivitis[11, 20, 23]. Vittaforma Corneae species usually target keratocytes within the stroma, providing the mechanism for microsporidial stromal keratitis[8]. Therefore, the presence of this species would require a more aggressive form of regimen for better coverage and faster resolution. No sign of drug toxicity was noted in all patients of the presenting study.

Topical steroid eyedrop was added when the MKC lesion resolved. This timing provided significant benefit toward the resolution of residual inflammatory reactions such as subepithelial haze, superficial

punctate keratopathy, anterior chamber reaction and keratic precipitate. This finding is in term with other reports which presented similar and excellent responds to corticosteroid eyedrops[20, 22].

However, combining management with steroid in the presence of microsporidial lesions might not be feasible. Case #7 was a 3-month post penetrating keratoplasty and, therefore, topical steroid was continued. The lesions were not only persisted but also increased in quantity and intensity. Similarly, case #20 who presented with bilateral infection was started with full regimen and was continued with topical steroid. There was a significant increase in number of microsporidial lesion on subsequent follow-up despite the use of Voriconazole, Moxifloxacin, and Albendazole (Table 3). Therefore, steroid might be indispensable in MKC but the timing of initiating topical steroid should only be when the microsporidial lesions are under controlled.

Regarding the limitation of the study, as all MKC patients presenting at our center are systematically treated according to the regimen protocol, this study could not provide a control group for comparison to fully demonstrate the effectiveness of the treatment regimen.

As close follow-up was not practical, appointment was on weekly basis. Therefore, the time to total corneal lesion resolution could be overestimated.

The paper was only conducted between August and December which relates to Monsoon season in Nepal, when MKC is observed to be more prevalence. The study did not include the cases beyond this time period as the authors consider those cases to be sporadic, which would not be related to the seasonal outbreak.

Conclusion

Microsporidial keratoconjunctivitis is usually overlook and misdiagnosed as viral infection. Although MKC is self-limiting in nature and some cases could resolve without any intervention, recognition of the disease is essential to avoid mistakenly treating with topical steroid, which potentially prolongs or aggravates the course of infection. To shorten the course of infection, the combination of Moxifloxacin, Voriconazole, and Albendazole proved to be effective and safe in the management of keratoconjunctvitis. Even though debridement might eliminate the MKC lesions faster comparing to medical management alone, the similarity in total resolution time, the painful experience and the risk of secondary infection outweighs its benefit.

Abbreviations

AC	Anterior Chamber
EMR	Electronic Medical Record
KP	Keratic Precipitate
MKC	Microsporidial Keratoconjunctivitis
PEE	Punctate Epithelial Erosion
SPK	Superficial Punctate Keratopathy

Declarations

Ethics approval

The study adhered to the ethical standards of the Declaration of Helsinki and its amendments. This study was approved by the Institutional Review Committee of Tilganga Institute of Ophthalmology (Protocol No: 08/2026). Patients' consent to participate was waived by the Institutional Review Committee of Tilganga Institute of Ophthalmology (IRC-TIO).

Data availability statement

Data with deidentified participant would be provided upon reasonable request.

Consent for publication

Not applicable.

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Competing of interests

There is no competing of interest.

Authors' contributions

Planning, research conceptualization, methodology contributed by all authors. Data acquisition was contributed by T.H., R.S.R., S.R., B.K. Data analysis was contributed by T.H. and M.P.P. Writing the original draft was contributed by T.H. Review, editing and supervision were contributed by R.G. and L. B. Full responsibility for the work and access to all data were supervised by T.H.

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Figures

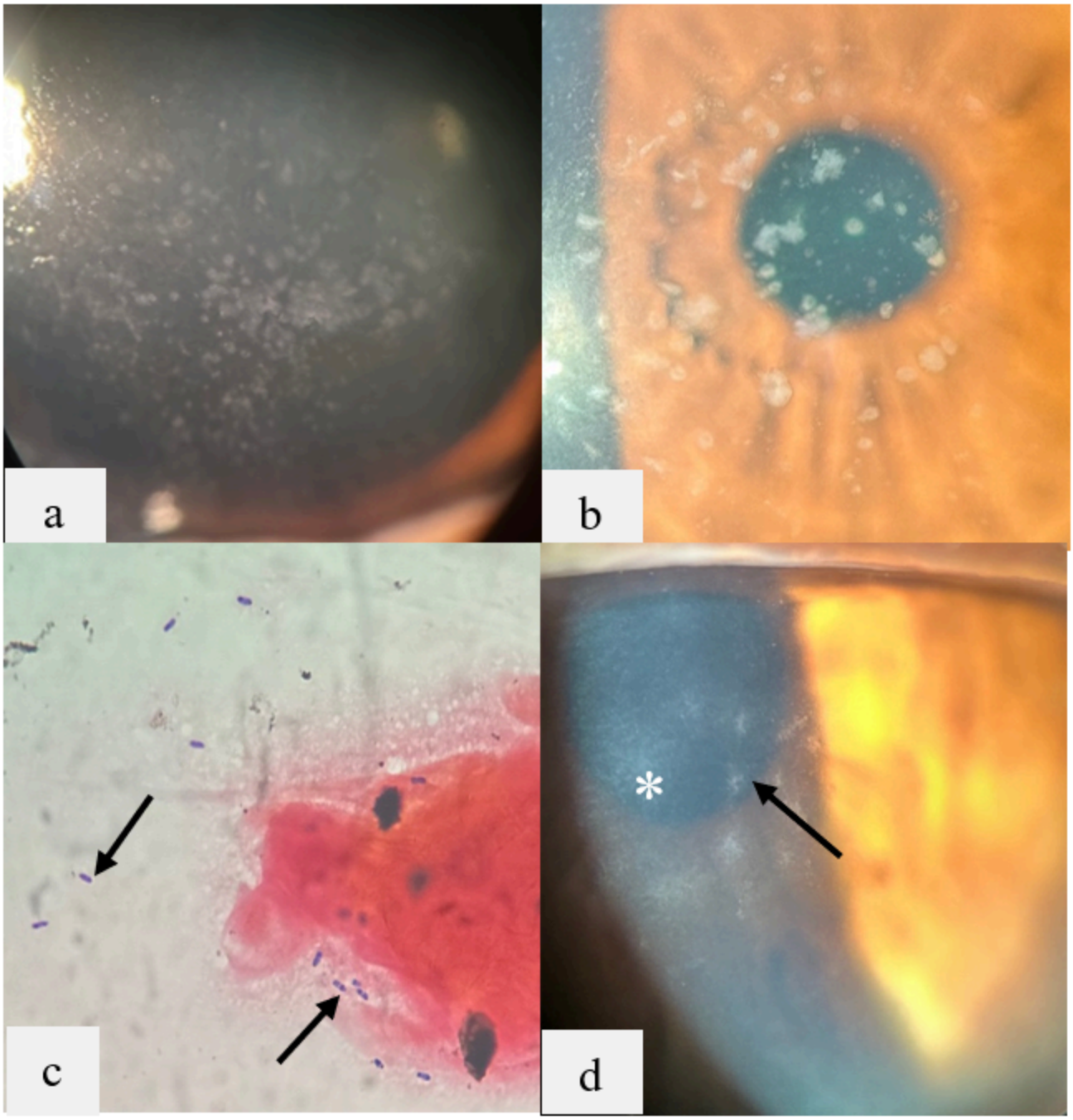


Figure 1

(a) & (b): Diffuse MKC lesions at presentation. Patient was started on full treatment regimen without debridement due to diffusion distribution of MKC lesions; (c): multiple granule Gram positive microsporidial spores (black arrow); (d): Superficial punctate keratopathy (black arrow) and subepithelial haze (white asterisk) presented on the 7th day. Topical steroid was added at this stage of disease.

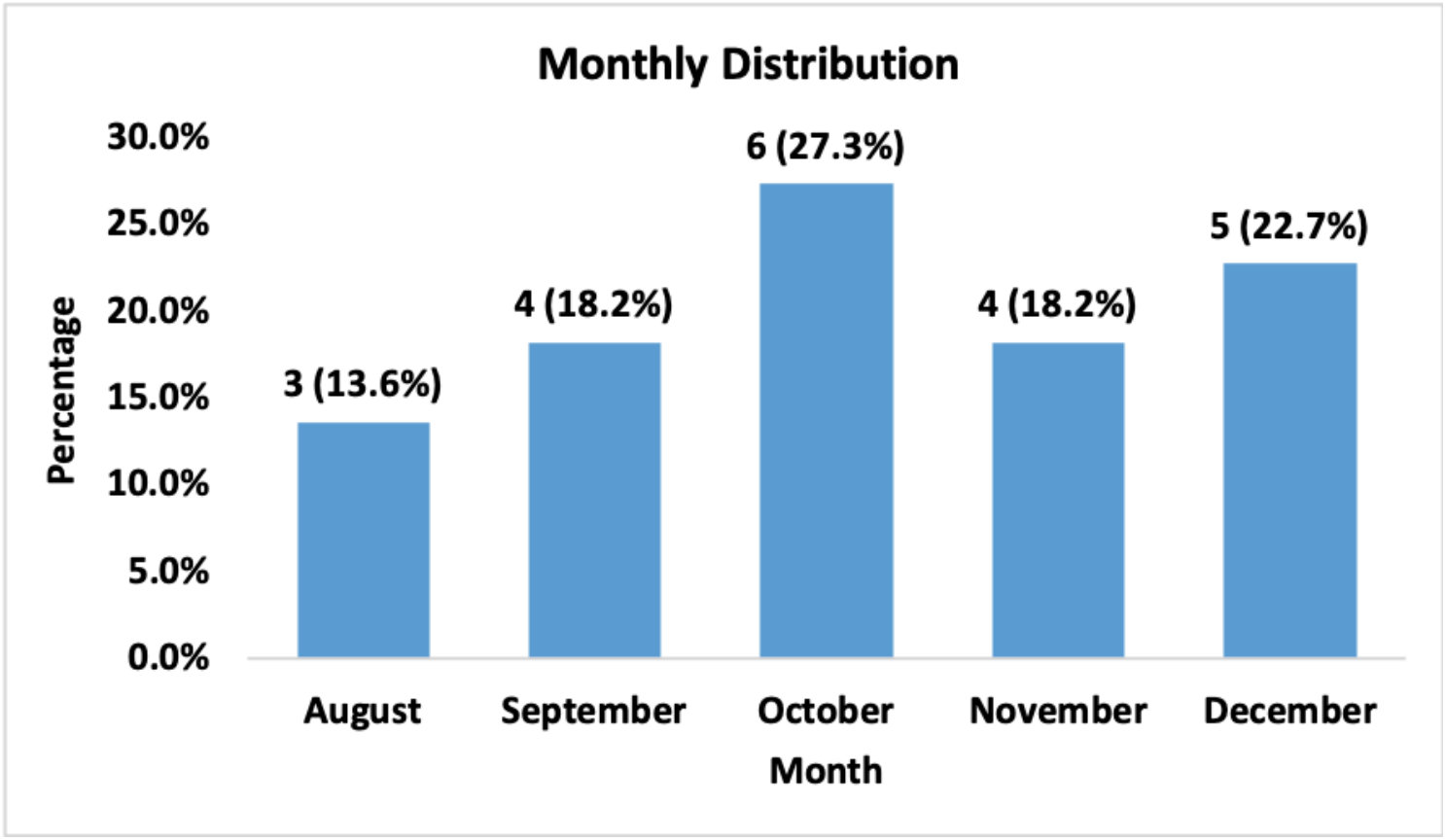


Figure 2

Monthly distribution of microsporidial keratoconjunctivitis incident.