

Characteristics of Corneal Ulcer Patients at Bali Mandara Eye Hospital in 2021-2022

Made Wicitra Winansari,¹ Ni Putu Ayu Pande Arista Dewi,²
Ni Made Indah Kencanawati³

¹Intern of Ophthalmology Department, Bali Mandara Eye Hospital

²Intern of Ophthalmology Department, Bali Mandara Eye Hospital

³Ophthalmology Specialist, Ophthalmology Department, Bali Mandara Eye Hospital

Corresponding Author: Made Wicitra Winansari

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ABSTRACT

Background: A corneal ulcer is a pathological discontinuity of corneal epithelium surface. The incidence in developing countries reached 1.5-2 million per year and one of the causes of blindness. Corneal ulcers can occur at any age and gender which is influenced by geographic conditions. The causes of corneal ulcers vary depend on the region, predisposing factors, and microorganisms in the particular community.

Purpose: To know the characteristics of corneal ulcers particularly at the Bali Mandara Eye Hospital and as a basic data for further research.

Methods: A total of 77 selected medical records at Bali Mandara Hospital from January 2021–May 2022 were used in this descriptive study using a retrospective method. Patient characteristics, etiology, clinical characteristics, management, and complications were identified in this study. Descriptive analysis was performed on all data and presented in frequency tabulation.

Results: In this study, 52 cases (67.5%) were male and 25 cases (32.5%) were female. The largest age group was 24-64 years with 34 cases (44.2%). All cases with corneal ulcers (100%) complained of red eye symptoms. Trauma (61.0%) as the most common predisposing factors that was caused by

plants (24.7%). The most common etiologies were bacteria (46.8%) followed by fungi (5.2%), and mixed (28.6%). Most of the cases were managed without treatment (66.2%) with the outcome of improvement (55.8%), without complications (53.2%), perforation (28.6%), and descemetocel (15.6%).

Conclusion: Most patients with corneal ulcers at the Bali Mandara Eye Hospital are male than female with range of 24-64 years and trauma being the most common predisposing factor. This is because it is the range for productive age and the majority of the population in Indonesia, especially Bali, works as farmers. Most microorganisms that cause corneal ulcers are bacteria. Most patients receive non-surgical treatment with more than 50% of patients experiencing improvements in vision and no complications.

Keywords: Corneal Ulcers, keratitis, ocular trauma, visual impairment

INTRODUCTION

Corneal ulcers are a pathological damage or discontinuity of corneal epithelium surface involving stroma and more common occurrence in tropical areas.¹ WHO estimated that corneal opacity including corneal ulcers was the fourth leading cause of blindness in the world² and the first in

developing countries due to the formation of scar tissue.³ In developing countries, it was estimated that the incidence of corneal ulcers annually reached 1.5–2 million. In Nepal, the annual incidence of corneal ulcers was around 799 per 100,000.⁵ While in Indonesia, the incidence of corneal ulcers in 2013 was 5.5%; 11% in Bali, 10.2% in Yogyakarta, 9.4% in South Sulawesi, 3.1% in Jakarta, and the lowest in West Papua around 2%.⁶ This study was conducted at the Bali Mandara Eye Hospital due to the lack of information regarding the features of corneal ulcers, particularly at the Bali Mandara Eye Hospital and provided a basic data for future studies.

METHODS

This is a retrospective descriptive study. The data of corneal ulcer patients was taken from medical records at the Bali Mandara Eye Hospital between January 2021 and May 2022 which comprised the inclusion criteria of being patients diagnosed with a corneal ulcer by an ophthalmologist at the Eye Hospital Bali Mandara and the excluded if the data from the medical records of patients diagnosed with corneal ulcers by an ophthalmologist at the Eye Hospital Bali Mandara was incomplete. Visual acuity was examined using Snellen chart. Sample size is the same as the population size (total sampling). Data that has been collected using Microsoft Excel 2021 will be analyzed univariately using SPSS 26 software. The data that has been collected will be presented in tabular form for the distribution of corneal ulcers based on gender, age, symptoms, predisposing factors, etiology, ulcer location, lateralization, visual acuity before and after treatment, response to therapy, and complications.

RESULTS

Out of 359 cases of corneal ulcer, only 77 cases met the inclusion and exclusion criteria. In this study, 52 cases (67.5%) were male and 25 cases were female (32.5%). Based on the age group, there were 1 case (1.3%) in the 0-14 year age group, 18 cases (23.4%) in the 15-24 year age group, 34 cases

(44.2%) as the majority in the 24-64 year age group, and 4 cases (31.2%) in the ≥ 65 age group years (Table 1). In this study, all patients who came to the Bali Mandara Eye Hospital complained of red eyes (100%). Other complaints in the form of decreased vision by 73 cases (94.8%), pain in the eye area by 68 cases (82.3%), watery eyes by 67 cases (87%), exudate by 36 cases (46.8%), itchy eyes by 25 cases (32.5%), swelling in the eye area by 29 cases (37.7%), headaches by 24 cases (31.2%), and hypopion in 33 cases (42.9%) (Table 1). The majority of ulcer locations in this study were in the central cornea with 49 cases (63.6%), 22 cases in the paracentral region (28.6%), and 15 cases in the periphery (19.5%). Ulcers were found in both eyes in 2 cases (2.6%), right eye (57.1%), and left eye (40.3%) (table 1).

The visual acuity of patients was divided into before treatment and after treatment. The most visual acuity before treatment was $<1/60$ -Light Perception (LP) 38 cases (49.4%), followed by $6/18$ (7.8%), $<6/18-6/60$ (7.8%), $<6/60-3/60$ (2.6%), $<3/60-1/60$ (20.8%), and No Light Perception (NLP) (13.0%). After visual treatment, 11 cases with $\geq 6/18$ (14.35%), $<6/18-6/60$ (15.6%), $<6/60-3/60$ (6.5%), $<3/60-1/60$ (16.9%), $<1/60$ -Light Perception (LP) (28.6%), and No Light Perception (NLP) (8.2%). The predisposing factor for patients with corneal ulcers in the study was trauma in 47 cases (61.0%) with the most causes being grass (24.7%) and accompanied with local abnormalities due to keratitis in 16 cases (20.8%) (Table 1). Patients with history of diabetes mellitus were 1.3%, contact lens 2 cases (2.6%) had and 11 cases (14.3%) with unknown history (Table 2). The results of the scraping examination with gram and KOH staining on the cornea showed that bacteria as the most common in 36 cases (46.8%) and due to fungi in 4 cases (5.2%), beside that mixed causes were also found in 22 cases (28.6%) (Table 3).

In this study, the treatment was divided into two groups such as surgery in 26 cases (33.8%) and no surgery in 51 cases (66.2%)

(Table 4). The results of improving visual acuity after treatment in 43 cases (55.8%), worsening in 12 cases (15.6%), and no change before and after treatment in 22 cases (28.6%) (Table 5). In this study, 44 cases (57.1%) found no complications compared to 22 cases (28.6%). There was corneal perforation and 11 cases (14.3%) had descemetocoele (Table 6).

Table 1. Characteristics of patients with corneal ulcers

Characteristics	Corneal Ulcers n (%)
Gender	
Male	52 (67.5%)
Female	25 (32.5%)
Age	
0-14 years	1 (1.3%)
15-24 years	18 (23.4%)
24-64 years	34 (44.2%)
≥ 65 years	4 (31.2%)
Symptoms	
Red eyes	77 (100%)
Pain	68 (88.3%)
Blurry Vision	73 (94.8%)
Watery eyes	67 (87%)
Exudates	36 (46.8%)
Itchy eyes	25 (32.5%)
Swollen eyes	29 (37.7%)
Headache	24 (31.2%)
Photophobia	27 (35.1%)
Hypopion	33 (42.9%)
Ulcers Location	
Central	49 (63.6%)
Paracentral	22 (28.6%)
Peripheral	15 (19.5%)
Lateralization	
Right Eyes	44 (57.1%)
Left Eyes	31 (40.3%)
Both Eyes	2 (2.6%)
Visual acuity before treatments	
≥ 6/18	6 (7.8%)
< 6/18-6/60	6 (7.8%)
< 6/60-3/60	2 (2.6%)
< 3/60-1/60	16 (20.8%)
<1/60-Light Perception (LP)	38 (49.4%)
No Light Perception (NLP)	10 (13.0%)
Visual acuity after treatments	
≥ 6/18	11 (14.3%)
< 6/18-6/60	12 (15.6%)
< 6/60-3/60	5 (6.5%)
< 3/60-1/60	13 (16.9%)
<1/60-Light Perception (LP)	22 (28.6%)
No Light Perception (NLP)	14 (8.2%)

Table 2. Predisposing factors of patients with corneal ulcers

Predisposing Factors	Corneal Ulcers n (%)
Trauma	47 (61.0%)
Woods	2 (2.6%)
Vegetative	19 (24.7%)
Soil	2 (2.6%)
Dust	14 (18.2%)
Animals	2 (2.6%)
Oils	1 (1.3%)
Foreign body (Gram)	7 (9.1%)
Local Abnormality	
Keratitis	16 (20.8%)
Pterygium	0 (0%)
Endophthalmitis	0 (0%)
Panophthalmitis	0 (0%)
Blepharitis	0 (0%)
Trichiasis	0 (0%)
History of cataract surgery	1 (1.3%)
Systemic disease	1 (1.3%)
Diabetes mellitus	1 (1.3%)
HIV/AIDS	0 (0%)
Autoimmunity	0 (0%)
Contact lenses	2 (2.6%)
Steroid	0 (0%)
Unknown	11 (14.3%)

Table 3. Etiologies of patients with corneal ulcers

Etiology	Corneal Ulcers n (%)
Bacteria	36 (46.8%)
Fungi	4 (5.2%)
Mixed	22 (28.6%)

Table 4. Treatments of patients with corneal ulcers

Treatments	Corneal Ulcers n (%)
Surgery	26 (33.8%)
No Surgery	51 (66.2%)

Table 5. Therapy responses of patients with corneal ulcers

Therapy Responses	Corneal Ulcers n (%)
Improvement	43 (55.8%)
Worsening	12 (15.6%)
No response	22 (28.6%)

Table 6. Complications of patients with corneal ulcers

Complications	Corneal Ulcers n (%)
Without complications	41 (53.2%)
Perforation	22 (28.6%)
Descemetocoele	12 (15.6%)
Endoftalmitis	0 (0%)
Panofthalmitis	0 (0%)

DISCUSSION

Corneal ulcers are still one of the most important causes of morbidity and blindness in the world. In this study, the incidence of corneal ulcers was found in males (67.5%) and females (32.5%). Study conducted by Keshav et al., also got the same results for males (60.83%) and females (35.73%). In another similar study, the incidence of corneal ulcers was higher in men (77.8%) than Study (22.2%).¹⁵ Muhammad Asroruddin et al. conducted the study in Indonesia at a hospital in Pontianak, obtaining a male-to-female incidence of corneal ulcers of 2:1.⁹ Other studies in Indonesia also obtained the same results with the incidence of males (66.7%) and females (33.3%). This could be because males engage in more outdoor activities than females, according to the findings of this study, which found that the most predisposing factors in this study were trauma in 47 cases (61%) with a history of being exposed to grass in 19 cases (24.7%) and being exposed to grass dust in 14 cases (18.2%).^{1,9,15}

According to this study, the age range with the highest incidence of corneal ulcers was 24-64 years old. In the South Indian region, the incidence of ulcers was found to increase at ages greater than 30 and decrease above 60 years.⁴ Study in Portsmouth found the average age of 45 years and more study than males (54.5%).^{7,8} Studies in Oman found more cases of corneal ulcers in males (60.3%) and an average age above 60 year. Asroruddin et al. discovered more in males (67.1%) and 48.6% over the age of 40 at Ciptomangunkusumo Hospital. (52.3%).^{10,11} This age range is the productive age range for working. Other studies also found that the highest age range for corneal ulcers was 30–60 years old (49.6%).¹⁶ The incidence of corneal ulcers was influenced by geographical conditions and differed between several countries and certain regions. Corneal ulcers can occur at any age and in any gender.

In this study, 100% of patients complained red eyes and pain in the eyes (88.3%). While one hospital in Bandung found the most

symptoms was pain in the eyes (70.7%) and followed by red eyes (61.6%).¹ Trauma to the eye (61.0%) was the most predisposing factor for corneal ulcers in this study with the main cause was exposure to plants (24.7%). Other studies conducted in Bandung and in Yemen also found trauma (74.7%) (26.9%) to be a factor most predisposing to corneal ulcers with a history of exposure to plants (26.3%) (36.4%).^{1,15} Different results were obtained in a study by Ibrahim et.al where contact lenses usage was the most common cause (31%) of corneal ulcers. This is probably because in this study there were more females than males and the use of contact lenses is usually more common among females.⁷ In areas where the majority of the population works as farmers, trauma to the cornea is mostly caused by plants.^{10,17}

Most corneal ulcers are caused by infection, and the majority of the causative agents are bacteria, besides that, they can be caused by viruses, fungi, and protozoa. The occurrence of corneal ulcers began with keratitis (inflammation of the cornea), then tears occurred in the corneal epithelium caused by abrasion, trauma to the cornea, and contact lenses usage. Pathogens could enter the layers of the cornea. The causes of corneal ulcers vary depending on the region, predisposing factors, and types of infection in certain communities.⁴ A study in Portsmouth, England, found *Staphylococcus epidermidis* (31.7%) to be the cause of corneal ulcers.⁷ Study at a tertiary facility in Nepal found that 31.1% were caused by *Streptococcus pneumoniae*. Jhyoti, et al. found *Staphylococcus aureus* (47.6%) as the most common cause of corneal ulcers in a hospital in India.¹² Study at Ciptomangunkusumo Hospital found *Pseudomonas sp.* as the pathogen that causes the most corneal ulcers.⁹

A corneal ulcer may be treated with medication or surgery. Before administering medication, a scraping/culture must be performed to identify microorganisms, and a sensitivity test must be performed to detect bacterial resistance.¹² It is possible to undertake surgery if medications are

ineffective especially if the location, depth, and diameter was big. AMT (Amniotic Membrane Transplant), PKP (Penetrating Keratoplasty), and PACK-CXL are surgical techniques (Photoactivated Chromopore for infectious Keratitis-Corneal Collagen Cross-Linking).^{13,14} Studies by Ibrahim, et al., Keshav et al., Putri et al., Yahya et al.^{1,7,8,15} showed that most widely performed treatment was without surgery (drugs) and with surgery (33.8%). Some patients were receiving third-generation fluoroquinolones (levofloxacin), with some of them had started therapy with fourth-generation fluoroquinolones (moxifloxacin). Moxifloxacin was shown to be superior to ciprofloxacin and levofloxacin, especially for treating bacteria that are resistant to fluoroquinolones (*Staphylococcus Sp.*).^{18,19} Research by Wiranata, et al. also got the same results without surgery (79.5%) and surgery (20.5%).¹⁰

It was found that more patients experienced improved vision at 55.8% after the treatment. It was same as the study by Kutsyah, et al. that showed 51.2%. Clinical manifestations such as reduced pain, clearer infiltrate boundaries, decreased infiltrate density in the stroma and endothelium, inflammatory reactions in the anterior chamber, and re-epithelialization could show improvement after therapy in patients with corneal ulcers. Corneal scarring, perforation, secondary glaucoma, cataracts, uneven astigmatism, endophthalmitis, and vision loss may result from improper therapy of corneal ulcers.^{5,9} If not treated immediately, complications in the form of perforation and descemetocele might happen and they were eye emergencies. In this study, there were complications of corneal ulcers, such as perforation (28.6%) and formation of descemetocele (15.5%). Research in India by Chidambaram, et al. and in South Africa by Burton reported that approximately (18.5%) (30%) respectively of the total patients with corneal ulcers had perforations. In conditions like this, treatment is needed with the aim of maintaining eye integrity and tectonic support, either surgically or without surgery.

The choice of treatment is based on clinical characteristics, namely the location, size, and etiology of the corneal ulcer.²⁰⁻²² In this study, the majority of patients with perforation underwent surgery; 2.6% of patients underwent evisceration, Amniotic Membrane Transplantation (AMT) (7.8%), and Periosteal Graft (23.4%).

There were some limitations on this study since this research was using secondary data. The quality of the data was totally depend on the recording process in the medical record. Some of them were incomplete and unspecified so it must be excluded.

CONCLUSION

Corneal ulcers are still one of the most important causes of morbidity and blindness in the world. Corneal ulcers are more common in males. The largest age range was 24-64 years with trauma being the most predisposing factor. This probably because it is the range for productive age and most of the population in Indonesia, especially in Bali, are farmers as a livelihood. Patients received therapy with surgery and no surgery. More than 50% of patients experienced visual improvement without complications.

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