The Influence of Corneal Foreign Body on Eye Infection

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Abstract— **Background:** A corneal foreign body is one of the main causes of blindness. The effects can range from mild infections (corneal abration, keratitis) to severe damage (endophthalmitis) depending on the type of material. Late-stage complications can cause permanent blindness. **Objective:** This study aimed to determine the effect of types of corneal foreign body material on the severity of eye infection. **Methods:** This study was a non-experimental research with analytic observational and cross-sectional methods. Subjects were 30 patients. The samples were male and female patients (10-70 years old) who came to the eye clinic with a history of exposure to corneal foreign bodies of less than 8 days. The study was conducted by interviews and visual examination on the anterior segments of the eyes. The analysis used Statistical Package for the Social Sciences (Simple Linear Regression and Spearman tests). **Results:** There were several types of foreign body material that affected the cornea; gram iron (53.3%), plant branches (16.7%), animal wings (13.3%), sand (13.3%) and food (3,4 %). Most of these types of material caused corneal erosion (66.7%) and keratitis infections (33.3%). The incidence of corneal ulcers, endophthalmitis and panophthalmitis was not present in this study. **Conclusion:** There were no significant differences between the types of corneal foreign body material and the severity of eye infections.

Keywords— corneal, foreign body, eye infection

I. INTRODUCTION

The eye is one of the important organs of humans. Disorders of eye function caused either by illness or blindness can interfere with human life. The 2007 World Health Organization (WHO) reported that more than 7 million people suffer blindness every year. Until now there are 180 million people worldwide experiencing visual impairments and 40-45 million suffering from blindness. Indonesia holds the highest position in South East Asia (1.50%) compared to Bangladesh (1%), India (0.70%) and Thailand (0.30%). This number is expected to double by 2020 [1].

The incidence of foreign eye material often occurs in industrial cities and can occur at any age [2]. The most common causes of blindness in Indonesia are cataracts (0.78%), glaucoma (0.20%), refractive abnormalities (0.14%), retinal abnormalities (0.13%) and corneal abnormalities (0.10%). Corneal abnormalities are one of the factors causing blindness [3].

This study aimed to determine the influence of the type of corneal foreign body material on the severity of eye infections. The results of this study are expected to provide information to the public about the impact of corneal foreign bodies on eye health so that public knowledge is improved and people will know what to do if someone is exposed to foreign objects in the eye so that blindness can be prevented.

Corneal foreign bodies are objects that are around our environment that are foreign and enter the cornea. Foreign objects can occur in extraocular or intraocular areas. Extra ocular foreign bodies can occur on the palpebra, sclera, conjunctiva and cornea [2]. The percentage of foreign bodies in the cornea is 35-58% of all cases of ocular trauma, and often occurs in young men. Some complications due to corneal foreign matter can occur ranging from mild stages of infection (such as keratitis) to endophthalmitis. Infection can originate from contaminated conjunctiva or from the foreign body material itself [4].

The types of corneal foreign body material can come from metals (iron, steel, coal, aluminum), inert materials (glass, plastic), materials from plants (wood, leaves, branches, seeds), insect body parts (wings, legs), building materials (dust, sand, stone, brick), chemicals (cement, gamping, battery water) and others [5]. Each type of material can have a different effect on eye infections.

Foreign objects that affect the cornea can cause symptoms of pain, glare, redness, heat, aches, runny tears and sometimes cause blepharospasm. Foreign objects that damage the cornea can cause the corneal surface to become irregular, edema and the cornea can appear to multiply [2,6].

II. METHODOLOGY

This research was a non-experimental study with analytic observational and cross-sectional methods conducted between January and March 2019 and enrolled patients visiting eye clinics in the cities of Kebumen (Central Java) and Yogyakarta. Subjects were 30 patients (10-70 years old), comprised of 23 males and 7 females. Patients came to the eye clinics with a history of exposure to corneal foreign bodies of less than 8 days. The study was conducted by interviews and visual examination on anterior segments of the eyes. Exclusion criteria were history of corneal degeneration, diabetes mellitus, and current conjuctivitis. The analysis used Statistical Package for the Social Sciences with Simple Linear Regression and Spearman tests to know the influence of foreign corneal body on eye infections.

III. RESULTS AND ANALYSIS

The results of this study showed that the most common type of corneal foreign bodies were gram iron (Table 1). This can be caused due to the related work activities of research subjects who are often exposed to iron, namely as construction workers, tailors, welders, and technicians. Foreign materials made from metals are common around metal industry workers such as metal cutting (65%), metal welding (22%) and others (13%). The workplace is a risk factor for the occurrence of corneal foreign bodies [14].

Table 2 shows that the highest percentage of eye infections is corneal abrasion. Corneal abrasion is a defect on the surface of the corneal epithelium which can be caused by the presence of foreign objects. One study explained that more than 10% of cases of eye accidents are corneal abrasions [7] and 8% of cases present in primary care are with cases of corneal abrasion [8].

Another effect of corneal foreign bodies is corneal infection (keratitis), which is an emergency that must be treated immediately because it is the biggest cause of disruption in working-age adults and can end in blindness [9]. Foreign objects can cause secondary infections in the eyes ranging mildly from the presence of keratitis until the onset of endophthalmitis [4].

Association between corneal foreign bodies and eye infection severity was measured with correlation tests to determine the degree of closeness of the relationships between variables. The level of closeness referred to in this test is the relationship between the corneal foreign body and the occurrence of corneal abrasion, keratitis and blefaritis. The basis of decision making in the Spearman correlation test is to compare the significance values with probability values <0.05 [10]. The level of closeness of the relationship between the tested variables can be seen from the value of the correlation coefficient.

The results of this study indicate that corneal foreign bodies can cause eye infections (corneal abration and keratitis) although there were no statistically significant results (Table 4). The results of this study are not statistically significant because the exposure time for foreign bodies was limited to less than 8 days so that treatment took place quickly and precisely so as not to cause more severe complications even though the foreign body involved was different. In addition, various kinds of foreign objects mostly only affect the superficial cornea so that the impact or effect is usually not severe.

The time of handling foreign bodies in the city is particularly important. The faster it is dealt with, the more the complications will be reduced and the effect of foreign bodies will also be milder. Foreign objects that affect the superficial cornea will have a lighter effect than if it hits the entire cornea [6]. Clinical manifestations and travel of foreign bodies to the anterior segment depend on the composition, shape and reaction of foreign bodies. The types of foreign bodies include glass, metal, and cloth or cotton fibers which can cause iridocyclitis and bullous keratopathy [11]. Trauma is the most frequent predisposing factor in patients with keratitis (64%) and the most common foreign bodies causing trauma are dust, mud and soil (35.6%) [12].

The average time patients came to the doctor for handling foreign objects is about 2 days after injury [4]. In some cases of eye trauma patients usually come immediately and seek treatment as early as possible [13].

One study conducted in Turkey reported 52.9% of patients came to the eye clinic within 6 hours after trauma and 34.4% within 24 hours after the incident. With that immediate time the most common of the complications is keratitis [14]. Cataract complications, decreased vision, retinal detachment and hyphemia are rare.

IV. CONCLUSION

There were no significant differences between the types of corneal foreign body material and the severity of eye infections.

TABLE I. TYPES OF FOREIGN CORNEAL BODY

Percentage	Type of Foreign Corneal Body				
	Gram iron	Plant branches	Animal wings	Sand	Food
(%)	53.3	16.7	33.3	33.3	3.4

TABLE II. PERCENTAGE OF EYE INFECTION EVENT

Percentage	Eye Infection	
	Corpal Abration	Keratitis
(%)	66.7	33.7

TABLE III. EFFECT OF CORNEAL FOREIGN BODY ON EYE INFECTION SEVERITY

Significance	Type of Foreign Corneal Body				
	Gram iron	Plant branches	Animal wings	Sand	Food
p	0.108	0.907	0.905	0.905	0.807
b	1.376	0.168	0.166	0.166	0.158

TABLE IV. CORRELATION OF CORNEAL FOREIGN BODY MATERIAL TYPES TO EYE INFECTION SEVERITY

Significance	Type of Foreign Corneal Body				
	Gram iron	Plant branches	Animal wings	Sand	Food
p	0.816	0.274	0.263	0.263	0.259
R	0.037	0.135	0.154	0.154	0.150

Fig. 1. Corneal Foreign Body (Iron Gram) at Central Cornea

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