

The Association Between Etiology and Clinical Symptoms and Signs in Conjunctivitis Patients at Makrayu Primary Health Center, Palembang, in 2024

Anang Tribowo^a, Ratu Prima Puspita^b, and Masayu Syarinta Adenina^{c*}

^a Department of ophthalmology, Faculty of medicine, Universitas Sriwijaya, Palembang, South Sumatra, Indonesia

^b Faculty of Medicine, University of Sriwijaya, Palembang, South Sumatra, Indonesia

^c Department of pharmacology, University of Sriwijaya, Palembang, South Sumatra, Indonesia

*Corresponding Authors: masayusyarintaadenina@fk.unsri.ac.id

Abstract

Conjunctivitis is a common eye disease in Indonesia, with "other" etiologies dominant (72.1%), followed by viral (16.6%), allergic (8.7%), and bacterial (2.6%) in 229 patients at Makrayu Health Center, Palembang, 2024. This cross-sectional analytical observational study evaluated etiology associations with clinical symptoms and signs using chi-square test ($\alpha=0.05$). No significant association found for allergic etiology with clinical manifestations ($p>0.050$). Significant associations existed for bacterial etiology with morning sticky eyes ($p=0.000$) and discharge ($p=0.025$); viral with watery eyes ($p=0.002$) and discharge ($p=0.013$); and other etiologies with discharge ($p=0.014$). Findings support symptom-based clinical diagnosis for appropriate therapy and reducing irrational antibiotic.

Keywords: conjunctivitis, etiology, clinical symptoms, clinical signs, primary health care

Abstrak

Hubungan Etiologi dengan Gejala dan Tanda Klinis pada Pasien Konjungtivitis di Puskesmas Makrayu Palembang tahun 2024. Konjungtivitis merupakan penyakit peradangan pada mata yang umum terjadi di Indonesia, dengan etiologi dominan "lainnya" (72,1%), diikuti virus (16,6%), alergi (8,7%), dan bakteri (2,6%) pada 229 pasien Puskesmas Makrayu Palembang tahun 2024. Penelitian analitik observasional potong lintang ini mengevaluasi hubungan etiologi dengan gejala dan tanda klinis menggunakan uji *chi-square* ($\alpha=0,05$). Hasil menunjukkan tidak ada hubungan signifikan etiologi alergi dengan manifestasi klinis ($p>0,050$). Sebaliknya, terdapat hubungan signifikan etiologi bakteri dengan mata lengket di pagi hari ($p=0,000$) dan sekret ($p=0,025$); virus dengan mata berair ($p=0,002$) dan sekret ($p=0,013$); serta etiologi lainnya dengan sekret ($p=0,014$). Temuan ini mendukung diagnosis klinis berbasis gejala spesifik untuk pemberian terapi tepat dan mengurangi penggunaan antibiotik irasional.

Kata Kunci: konjungtivitis, etiologi, gejala klinis, tanda klinis, Puskesmas

Introduction

Conjunctivitis is one of the most common inflammatory eye diseases worldwide and is frequently encountered in primary health care facilities, including community health centers. Globally, more than 2% of the population is affected by conjunctivitis.^{1, 2} In China (2022), conjunctivitis ranked first among cases of red eye (39%), while in Indonesia (2022) it ranked second among the ten most common eye diseases (9.7%), following refractive errors (25.35%).^{3, 4} At Dr. Mohammad Hoesin General Hospital, Palembang (2022), the incidence of conjunctivitis was reported to be 6.4%.⁵ The high incidence of conjunctivitis indicates that the burden of this disease cannot be overlooked.

Based on etiology, conjunctivitis is classified into two main categories: infectious (bacterial and viral) and non-infectious (allergic, autoimmune, toxic irritation, or malignancy-related) conjunctivitis.⁶⁻⁸ A study by Yulianti et al. (2022) reported that viral infection was the most common cause of conjunctivitis (45.2%).⁵ The high prevalence of viral conjunctivitis is thought to be related to the highly contagious nature of viruses and their rapid replication. However, these findings differ from studies conducted by Nurul et al. (2023) and Zhao et al. (2022), which reported bacterial (67.5%) and allergic (68%) conjunctivitis as the most common etiologies, respectively.^{3, 4} These discrepancies may be attributed to differences in climate, environmental conditions, population density, and lifestyle factors.^{3, 9}

The most common clinical manifestation of conjunctivitis is red eye (100%), which results from conjunctival vasodilation.^{3, 10} Other clinical signs and symptoms include purulent discharge (23.4%), ocular discomfort or burning sensation (19.5%), tearing (9.1%), eyelid edema (6.5%), ocular itching (2.6%), and others.³ Although these manifestations may appear mild, they can progress to serious complications if not managed appropriately. Therefore, management should be tailored according to the underlying etiology and severity of conjunctivitis.

In primary health care settings, the diagnosis of conjunctivitis is often based on clinical findings due to limited access to laboratory and microbiological diagnostic facilities.^{11, 12} Identifying the relationship between etiology and clinical manifestations may improve the accuracy of clinical diagnosis and reduce inappropriate management. This study aims to evaluate the relationship between etiology and clinical signs and symptoms among patients presenting to Makrayu Community Health Center, Palembang, in 2024, thereby providing a basis for eye health education, strengthening disease identification, supporting accurate diagnosis and appropriate management, and preventing infection transmission and potential complications.

Experimental Section

Study Design and Population

This study employed an observational analytic design with a cross-sectional approach, using secondary data obtained from the medical records of conjunctivitis patients at Makrayu Primary Health Center, Palembang, in 2024. The study population comprised all conjunctivitis patients recorded in the medical records, while the sample consisted of patients who met the inclusion and exclusion criteria. Sampling was conducted using a consecutive sampling technique, resulting in a total of 229 samples. The inclusion criteria were conjunctivitis patients with recorded medical data, while the exclusion criteria were conjunctivitis patients with incomplete medical records.

Variables

The independent variable in this study was the etiology of conjunctivitis, classified as bacterial, viral, allergic, and others. The dependent variables were clinical symptoms, including red eye, sticky eyes in the morning, watery eyes, itchy eyes, foreign body sensation (gritty sensation), and burning sensation, as well as clinical signs, including conjunctival injection, palpebral edema, and ocular discharge.

Statistical Analysis

Data analysis included the use of frequencies and percentages to describe the distribution of etiologies, cross-tabulation to assess the associations between etiology and clinical symptoms as well as between etiology and clinical signs, and the chi-square test to determine the statistical significance of these associations, with a significance level set at $\alpha = 0.05$.

Table 1. Demographic and Etiologic Characteristics

Demographic and Etiologic Characteristics	n	%
Gender		
Male	98	42.8
Female	131	57.2
Age		
0 – 4 years old	27	11.8
5 – 10 years old	35	15.3
11 – 17 years old	31	13.5
18 – 45 years old	72	31.4
46 – 65 years old	52	22.7
> 65 years old	12	5.2
Etiology		
Allergic Etiology	20	8.7
Bacterial Etiology	6	2.6
Viral Etiology	38	16.6
Other Etiologies	165	72.1
Total	229	100.0

Results and Discussion*Demographic and Etiologic Characteristics*

A total of 229 conjunctivitis patients were included, with the majority being female (57.2%). The mean age was 30.0 years, ranging from 0 to 72 years (table 1). The most common etiology of conjunctivitis was classified as “others” (72.1%), referring to conjunctivitis with an unidentified cause or causes not included in bacterial, viral, or allergic etiologies. This finding reflects that the diagnosis of conjunctivitis was predominantly based on clinical presentation without supporting laboratory or microbiological examinations.^{11, 12} This was followed by viral conjunctivitis (16.6%), allergic conjunctivitis (8.7%), and bacterial conjunctivitis (2.6%). Viral conjunctivitis, particularly that caused by adenovirus, is one of the most frequently encountered forms of conjunctivitis and is highly transmissible through both direct and indirect contact. Environmental factors, population density, and community mobility may contribute to the high incidence of viral conjunctivitis cases.^{1, 13-15} These findings are consistent with a study conducted by Vivi et al. (2022), which also reported viral infection as the most common cause of conjunctivitis (45.2%).⁵

The most common clinical symptoms and signs were red eye and conjunctival injection (63.8%). Red eye and conjunctival injection are characteristic clinical features in patients with conjunctivitis, both infectious and noninfectious, resulting from dilation of blood vessels due to the inflammatory response in the conjunctiva.^{13, 16} This finding is consistent with the study conducted by Vitaloka et al. (2024).¹⁶

There was no significant association between allergic etiology and clinical symptoms and signs in patients with conjunctivitis ($p > 0.050$). This finding indicates that allergic etiology does not have a meaningful effect on differences in the clinical manifestations observed in conjunctivitis patients. From a pathophysiological perspective, this can be explained by the underlying mechanism of allergic conjunctivitis, which involves an IgE-mediated type I hypersensitivity reaction. Allergen exposure triggers mast cell degranulation and the release of inflammatory mediators such as histamine, leukotrienes, and prostaglandins. This immunological mechanism is relatively nonspecific and not highly dependent on the type of triggering

allergen; therefore, the resulting clinical response tends to be uniform among individuals with different allergic etiologies.^{14, 17, 18}

Table 2. Clinical Symptoms and Signs Distribution

Clinical Manifestation	Yes		No		Total	
	n	%	n	%	n	%
<i>Clinical symptom</i>						
Red eyes	146	63.8	83	36.2	229	100.0
Watery eyes	45	19.7	184	80.3	229	100.0
Itchy eyes	43	18.8	186	81.2	229	100.0
Foreign body sensation	58	25.3	171	74.7	229	100.0
Sticky eyes in the morning	8	3.5	221	96.5	229	100.0
Burning sensation	27	11.8	202	88.2	229	100.0
<i>Clinical sign</i>						
Conjunctival injection	146	63.8	83	36.2	229	100.0
Edema palpebra	57	24.9	172	75.1	229	100.0
Ocular discharge	52	22.7	177	77.3	229	100.0

Table 3. Allergic Etiology-Symptom and Sign Associations

Clinical Manifestation		Allergic Etiology		Non Allergic Etiology		p-value	OR	CI 95%		
		n	%	n	%			Min	Max	
Clinical symptom										
Red eyes	Yes	11	55.0	135	64.6	0.542	0.670	0.266	1.690	
	No	9	45.0	74	35.4					
Watery eyes	Yes	3	15.0	42	20.1	0.419	0.702	0.196	2.506	
	No	17	85.0	167	79.9					
Itchy eyes	Yes	5	25.0	38	18.2	0.313	1.500	0.514	4.379	
	No	15	75.0	171	81.8					
Foreign body sensation	Yes	6	30.0	52	24.9	0.815	1.294	0.473	3.540	
	No	14	70.0	157	75.1					
Sticky eyes in the morning	Yes	0	0.0	8	3.8	0.476	-	-	-	
	No	20	100.0	201	96.2					
Burning sensation	Yes	2	10.0	25	12.0	0.572	0.818	0.179	3.737	
	No	18	90.0	184	88.0					
Clinical sign										
Conjunctival injection	Yes	11	55.0	135	64.6	0.542	0.670	0.266	1.690	
	No	9	45.0	74	35.4					
Palpebral edema	Yes	6	30.0	51	24.4	0.376	1.328	0.485	3.635	
	No	14	70.0	158	75.6					
Ocular discharge	Yes	3	15.0	49	23.4	0.291	0.576	0.162	2.049	
	No	17	85.0	160	76.6					

Furthermore, the lack of a significant association may also be influenced by other factors, including a limited sample size, variability in individual sensitivity to allergens, and differences in environmental exposure levels that could not be fully controlled in this study. Nevertheless, allergic conjunctivitis generally presents with clinical symptoms and signs such as conjunctival hyperemia, itching, tearing, and chemosis.^{14, 17-19}

In patients with bacterial conjunctivitis, there was a significant association between bacterial etiology and the clinical symptom of sticky eyes in the morning ($p = 0.000$) as well as the clinical sign of ocular discharge ($p = 0.025$). These findings indicate that conjunctival infections caused by bacteria are more likely to produce complaints of sticky eyes upon awakening, accompanied by characteristic discharge, compared with conjunctivitis due to other causes such as viral or allergic etiologies. From a pathophysiological perspective,

in bacterial conjunctivitis, pathogenic organisms such as *Staphylococcus aureus*, *Streptococcus pneumoniae*, or *Haemophilus influenzae* infect the conjunctival epithelium and trigger an acute inflammatory response. Neutrophil activation and the release of proteolytic enzymes lead to increased production of thick, mucopurulent discharge with a yellowish to greenish appearance. This discharge tends to dry during sleep, resulting in the sensation of sticky eyes or difficulty opening the eyes in the morning. Clinically, these findings support the important diagnostic value of morning eye stickiness and the presence of discharge as strong indicators of a bacterial etiology.^{8, 14, 15, 17, 20-22}

Table 4. Bacterial Etiology-Symptom and Sign Associations

Clinical Manifestation		Bacterial Etiology		Non Bacterial Etiology		p-value	OR	CI 95%	
		n	%	n	%			Min	Max
Clinical symptom									
Red eyes	Yes	4	66.7	142	63.7	0.623	1.141	0.204	6.366
	No	2	33.3	81	36.3				
Watery eyes	Yes	0	0.0	45	20.2	0.265	-	-	-
	No	6	100.0	178	79.8				
Itchy eyes	Yes	2	33.3	41	18.4	0.314	2.220	0.393	12.530
	No	4	66.7	182	81.6				
Foreign body sensation	Yes	2	33.3	56	25.1	0.475	1.491	0.266	8.362
	No	4	66.7	167	74.9				
Sticky eyes in the morning	Yes	4	66.7	4	1.8	0.000	109.500	15.356	780.851
	No	2	33.3	219	98.2				
Burning sensation	Yes	0	0.0	27	12.1	0.467	-	-	-
	No	6	100.0	196	87.9				
Clinical sign									
Conjunctival injection	Yes	4	66.7	147	63.7	0.623	1.141	0.204	6.366
	No	2	33.3	81	36.3				
Palpebral edema	Yes	2	33.3	55	24.7	0.465	1.527	0.272	8.567
	No	4	66.7	168	75.3				
Ocular discharge	Yes	4	66.7	48	21.5	0.025	7.292	1.296	41.013
	No	2	33.3	175	78.5				

Table 5. Viral Etiology-Symptom and Sign Associations

Clinical Manifestation		Viral Etiology		Non Viral Etiology		p-value	OR	CI 95%	
		n	%	n	%			Min	Max
Clinical symptom									
Red eyes	Yes	23	60.5	123	64.4	0.788	0.848	0.415	1.732
	No	15	39.5	68	35.6				
Watery eyes	Yes	15	39.5	30	15.7	0.002	3.500	1.640	7.471
	No	23	60.5	161	84.3				
Itchy eyes	Yes	6	15.8	37	19.4	0.773	0.780	0.304	2.004
	No	32	84.2	154	80.6				
Foreign body sensation	Yes	7	18.4	51	26.7	0.386	0.620	0.257	1.495
	No	31	81.6	140	73.3				
Sticky eyes in the morning	Yes	0	0.0	8	4.2	0.228	-	-	-
	No	38	100.0	183	95.8				
Burning sensation	Yes	7	18.4	20	10.5	0.134	-	-	-
	No	31	81.6	171	89.5				
Clinical sign									
Conjunctival injection	Yes	23	60.5	123	64.4	0.788	0.848	0.415	1.732
	No	15	39.5	68	35.6				
Palpebral edema	Yes	7	18.4	50	26.2	0.421	0.637	0.264	1.537
	No	31	81.6	141	73.8				
Ocular discharge	Yes	15	39.5	37	19.4	0.013	2.714	1.291	5.706
	No	23	60.5	154	80.6				

In patients with viral conjunctivitis, there was a significant association between viral etiology and the clinical symptom of watery eyes ($p = 0.002$) as well as the clinical sign of ocular discharge ($p = 0.013$). This finding indicates that patients with viral conjunctivitis more frequently present with complaints of watery eyes accompanied by characteristic discharge compared with other etiologies. From a pathophysiological perspective, viral conjunctivitis—particularly that caused by adenovirus—is characterized by a nonsuppurative inflammatory response of the conjunctival epithelium. The infection induces hypersecretion of the lacrimal glands due to parasympathetic nerve stimulation and the release of inflammatory mediators such as interferons and proinflammatory cytokines. Consequently, excessive tearing emerges as the predominant clinical symptom. In contrast to bacterial conjunctivitis, the discharge in viral conjunctivitis is typically clear or serous, non-viscous, and varies in volume depending on the severity of inflammation. Clinically, these findings reinforce that watery eyes and clear discharge are hallmark features of viral conjunctivitis, which may aid in differentiating it from bacterial and allergic etiologies.^{1, 13-15, 17}

Table 6. Other Etiologies-Symptom and Sign Associations

Clinical Manifestation		Other Etiologies		Non Other Etiologies		p-value	OR	CI 95%	
		n	%	n	%			Min	Max
<i>Clinical symptom</i>									
Red eyes	Yes	108	65.5	38	59.4	0.480	1.296	0.716	2.346
	No	57	34.5	26	40.6				
Watery eyes	Yes	27	16.4	18	28.1	0.068	0.500	0.252	0.990
	No	138	83.6	46	71.9				
Itchy eyes	Yes	30	18.2	13	20.3	0.854	0.872	0.422	1.802
	No	135	81.8	51	79.7				
Foreign body sensation	Yes	43	26.1	15	23.4	0.810	1.151	0.586	2.261
	No	122	73.9	49	76.6				
Sticky eyes in the morning	Yes	4	2.4	4	6.3	0.311	0.373	0.090	1.538
	No	161	97.6	60	93.8				
Burning sensation	Yes	18	10.9	9	14.1	0.663	0.748	0.317	1.765
	No	147	89.1	55	85.9				
<i>Clinical sign</i>									
Conjunctival injection	Yes	108	65.5	38	59.4	0.480	1.296	0.716	2.346
	No	57	34.5	26	40.6				
Palpebral edema	Yes	42	25.5	15	23.4	0.884	1.115	0.567	2.193
	No	123	74.5	49	76.6				
Ocular discharge	Yes	30	18.2	22	34.4	0.014	0.424	0.221	0.813
	No	135	81.8	42	65.6				

Meanwhile, in the other etiological category, a significant association was found only between this etiology and the clinical sign of ocular discharge ($p = 0.014$). The other etiologies category refers to conjunctivitis with an undetermined cause or causes not classified as allergic, bacterial, or viral. The significant association observed with ocular discharge indicates that discharge represents a common response to various forms of conjunctival irritation or inflammation, although its characteristics and consistency may vary depending on the underlying etiology.^{13, 18}

Conclusions

This study demonstrates a significant association between the etiology of conjunctivitis—bacterial, viral, and other causes—and clinical symptoms and signs ($p < 0.050$). Specifically, bacterial etiology was

associated with sticky eyes in the morning and ocular discharge; viral etiology was associated with watery eyes and ocular discharge; and other etiologies were associated with ocular discharge. These findings support a symptom- and sign-based diagnostic approach to guide appropriate empirical therapy and to reduce the inappropriate use of antibiotics.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgment

The authors would like to express their sincere gratitude to Puskesmas Makrayu Palembang for their support and cooperation in facilitating this research. We also extend our appreciation to all patients who willingly participated in this study. Their contributions were invaluable to the successful completion of this research.

References

1. Hashmi MF, Gurnani B, Benson S. Conjunctivitis. StatPearls, Treasure Island (FL): StatPearls Publishing; 2025.
2. Krishna Kumar V, Srivastava AK, Kamble PN, Makhija P. Safety and Efficacy of Ayurvedic Interventions in the Management of Conjunctivitis: A Protocol for a Systematic Review. *Journal of Research in Ayurvedic Sciences* 2019;3:64–7.
3. Nurul AF, Syahrudin FI, Kusumawardhani SI, Aulia N, Polanunu NFA. Karakteristik Konjungtivitis di Klinik Jec Orbita Periode Januari 2022-Juni 2022. *Fakumi Medical Journal: Jurnal Mahasiswa Kedokteran* 2023;3:904–9.
4. Zhao H, Shao Y, Wu S-N, Tang L-Y, Zhang Q, Zhao C, et al. Characteristic of red eye related diseases of Han and Uygur population in Urumchi compared with Shanghai, China. *Int J Ophthalmol* 2022;15:1165–73.
5. Yulianti V. Prevalensi dan Profil Pasien Konjungtivitis di RSUP Dr. Mohammad Hoesin Palembang pada tahun 2019-2021. Sriwijaya, 2022.
6. Chan VF, Yong AC, Blanco AA, Gordon G, Safi S, Lingham, Gareth, et al. A Systematic Review of Clinical Practice Guidelines for Infectious and Non-infectious Conjunctivitis. *Ophthalmic Epidemiology* 2022;29:473–82.
7. Susan Garratt. Conjunctivitis Preferred Practice Pattern. San Francisco: American Academy of Ophthalmology; 2023.
8. Ahmed A, Irfan H, Islam MA. Unraveling the conjunctivitis crisis: understanding the spiking incidence in Karachi and Lahore-Pakistan. *Ann Med Surg (Lond)* 2024;86:920–2.
9. A. Alya Amaliah M. Karakteristik Pasien Konjungtivitis Rumah Sakit Mata Makassar Periode Januari-Desember 2023 2024;8.
10. Tanaya LB. Karakteristik Konjungtivitis Di Puskesmas Besikama Kabupaten Malaka–Nusa Tenggara Timur Maret 2019–Mei 2020. *Jurnal Locus Penelitian Dan Pengabdian* 2023;2:218–23.
11. Ratna Sitompul. Viral Conjunctivitis: Diagnosis and Therapy in Primary Health Care. *eJournal Kedokteran Indonesia* 2017;5:65–71.
12. Aramă V. Topical antibiotic therapy in eye infections - myths and certainties in the era of bacterial resistance to antibiotics. *Rjo* 2020;64:245–60.
13. Rita S Sitorus. Buku Ajar Oftalmologi. Jakarta: Universitas Indonesia Publishing; 2020.
14. Wandini P, Astuti AW, Sayudin S. Konjungtivitis: Kajian Anatomi, Histologi, Dan Etiologi Pada Kesehatan Mata. *Jurnal Locus Penelitian Dan Pengabdian* 2024;3:79–91.
15. Azari AA, Arabi A. Conjunctivitis: A Systematic Review. *J Ophthalmic Vis Res* 2020;15:372–95.
16. Vitaloka NKL, Ningrum RK, Sedani NW. Karakteristik Penderita Penyakit Konjungtivitis pada Poliklinik Mata Rumah Sakit Umum Daerah Sanjiwani Gianyar. *Aesculapius Medical Journal* 2024;4:337–43.
17. Gin C, Crock C, Wells K. Conjunctivitis: A review. *Australian Journal for General Practitioners* 2024;53:847–52.
18. Jonathan C. Horton. *Harrison's Principle of Internal Medicine*. 20th ed. McGraw-Hill Education; 2020.
19. Baab S, Le PH, Gurnani B, Kinzer EE. Allergic Conjunctivitis. StatPearls, Treasure Island (FL): StatPearls Publishing; 2025.
20. Renu Jogi. *Basic Ophthalmology*. 5th ed. New Delhi, India: Jaypee Brothers Medical Publishers; 2016.
21. Eva Mardalena. Sosialisasi Tentang Konjungtivitis Pada Pasien Berobat Jalan Di Poliklinik Mata RSPUR 2021;2.

22. Timothy L Jackson. Moorfields Manual of Ophthalmology. 3rd ed. New Delhi, India: Jaypee Brothers Medical Publishers; 2020.