



CODEN [USA]: IAJPBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://zenodo.org/records/10303938>Available online at: <http://www.iajps.com>

Review Article

A REVIEW ON EYES CONJUNCTIVITIS**Mr. Gundala Aswin¹, Mr. V. S. Chandrasekaran^{2*}, Dr. M. Kishore Babu³**¹Final year B Pharmacy, Krishna Teja Pharmacy College, Tirupati – 517 506.²Associate Professor, Department of Pharmaceutical Biotechnology, Krishna Teja Pharmacy College, Tirupati – 517 506.³Professor and Principal, Krishna Teja Pharmacy College, Tirupati – 517 506.**Abstract:**

Conjunctivitis is a common pediatric problem and is broadly divided into infectious and non-infectious etiologies. Bacterial conjunctivitis makes up the majority of cases in children and often presents with purulent discharge and matting of the eyelids. Viral conjunctivitis is the other infectious cause and is primarily caused by adenovirus, with a burning, gritty feeling and watery discharge. Allergic conjunctivitis is largely seasonal and presents with bilateral itching and watery discharge(1). Contact lens wearers should always be treated for bacterial conjunctivitis and referred to evaluate for corneal ulcers. Allergic conjunctivitis is an increasingly frequent condition with a higher prevalence in children and it is considered to be controlled when the ocular symptoms are not uncomfortable or are present, at most, on 2 days a week; the visual analog scale score is below 5, and the degree of conjunctival hyperemia is graded 0 or 1 on the Efron scale.

Keywords: *Conjunctivitis, Adeno virus, Corneal Ulcers, Hyperemia, Efron scale***Corresponding author:****Gundala Aswin,**

Final year B Pharmacy,

Krishna Teja Pharmacy College, Tirupati – 517 506.

QR code



Please cite this article in Gundala Aswin et al, *A Review On Eyes Conjunctivitis*, Indo Am. J. P. Sci, 2023; 10 (11).

INTRODUCTION:

Conjunctivitis, commonly called “pink eye”, refers to inflammation or infection of the conjunctiva. The conjunctiva is the thin mucous membrane that lines the inside of the eyelids and the surface of the globe up to the limbus, where the sclera and cornea meet. It is divided into the following two portions: the bulbar portion, covering the globe, and the tarsal portion, covering the lids. It is usually transparent; however, it can become injected and pink or red when inflamed, leading to the colloquial term “pink eye”. Conjunctivitis can vary in severity, ranging from mild redness associated with tearing to subconjunctival hemorrhage with purulent discharge and edema of the conjunctiva or eyelid.(2) Most cases of pediatric conjunctivitis are infectious, either bacterial or viral. Non-infectious conjunctivitis includes allergic conjunctivitis as well as conjunctivitis due to foreign bodies, environmental causes, or contact lens overwear. There are certainly other, more serious, causes of pink eye such as cellulitis, uveitis, endophthalmitis, and acute glaucoma. The goal of this literature review is to summarize the current evidence on the clinical manifestations, diagnosis, and management of conjunctivitis for primary care providers.

1. TYPES:

- a. Bacterial conjunctivitis.
- b. Viral conjunctivitis.
- c. Allergic conjunctivitis.
- d. Toxic conjunctivitis.
- e. Nonspecific conjunctivitis.

a. Bacterial conjunctivitis:

Acute bacterial conjunctivitis (Figure 1) is common in children, with more than 50% of conjunctivitis cases being bacterial in origin. Common pathogens include *Haemophilus influenzae*, *Streptococcus pneumoniae*, and *Moraxella catarrhalis*. Of those, *H. influenzae*, most commonly non-typeable *H. influenzae*, remains the most common cause of bacterial conjunctivitis, present in up to 70% of cases. Presenting symptoms are commonly eye redness and significant mucopurulent discharge, frequently yellow to green in color. Patients with acute bacterial conjunctivitis often complain of eyes that are matted and adhered in the morning. On examination, patients typically have mucopurulent discharge at the lid margins that reappears quickly after wiping the lids, usually within minutes.(3)



Figure 1: Bacterial conjunctivitis

B. Viral conjunctivitis:

Viral conjunctivitis (figure 2) makes up a significant portion of acute conjunctivitis cases, and the vast majority are caused by adenoviruses. Presentation often consists of a burning or gritty feeling with watery discharge. This typically has an abrupt onset, starts with one eye, and infects the other eye within 24 to 48 h. This can be accompanied by a viral prodrome with fever, lymphadenopathy (particularly preauricular), pharyngitis, and/or upper respiratory tract infection. A clinical exam typically demonstrates prominent conjunctival injection with watery discharge and a follicular appearance of the tarsal conjunctiva. While adenoviruses cause most of these cases, other viral causes must be considered.(4) Herpes simplex virus (HSV) can present in a similar manner to adenoviral conjunctivitis with watery eye discharge, often co-occurring with characteristic HSV vesicular eruptions on the face. Fluorescein examination will reveal multiple small branching epithelial dendrites on the surface of the cornea. Molluscum contagiosum, a poxvirus known for causing skin colored, umbilicated papules, can present with lesions on the eyelid and lead to follicular conjunctivitis. Picornaviruses such as Enterovirus 70 and Coxsackievirus A24 can cause acute hemorrhagic conjunctivitis and have led to multiple pandemics, particularly in developing countries. Coronaviruses have not been known to cause ocular manifestations in the past; however, the

novel coronavirus disease 2019 (COVID-19) led to viral conjunctivitis. A meta-analysis demonstrated that approximately 1 in 10 cases of COVID-19 had ocular involvement, primarily characterized by dry eye, redness, and tearing. In pediatric patients specifically, conjunctivitis is the most common ocular manifestation of COVID-19. A study of 15 neonates with COVID-19 showed that more than 70% had chemosis (conjunctival edema) and hemorrhagic conjunctivitis (5). Conjunctivitis appears to be more likely associated with a systemic inflammatory reaction rather than a direct viral infection. More serious complications, such as orbital cellulitis, retinal vein occlusion, and optic nerve abnormalities, have been associated with COVID-19; however, these are rare.



Figure 2: Viral conjunctivitis

C.Allergic conjunctivitis:

Allergic conjunctivitis is a type I hypersensitivity reaction, most commonly to airborne allergens such as pollen, dander, dust, or molds. This IgE-mediated reaction causes mast cell degranulation, leading to the release of histamine and other pro-inflammatory mediators. This occurs in approximately 1 in 5 children, with a peak age from late childhood to adolescence. In fact, allergic conjunctivitis is the most common ocular complaint to the pediatric healthcare provider. Its presentation is typically bilateral with watery discharge, chemosis, and crusting on lid margins in the morning. It tends to occur when allergen levels, such as pollen, are at their peak. The key differentiating factor is itching, sometimes occurring with other atopic symptoms such as nasal congestion, cough, or sneezing(6). The clinical exam findings are similar to viral conjunctivitis with watery discharge and a follicular appearance of the tarsal conjunctiva. A clinical algorithm from a 2017 review laid out helpful features to help rule out allergic conjunctivitis. For

example, photophobia, eye pain, and blurry vision are not expected with allergic conjunctivitis and should prompt referral to an eye specialist. Conditions that can serve as mimickers of allergic conjunctivitis include blepharitis and meibomian gland dysfunction.



Figure 3: Allergic conjunctivitis

D.Toxic conjunctivitis:

Toxic conjunctivitis (also called toxic keratoconjunctivitis) implies direct damage to ocular tissues from an offending agent, usually a preservative or medication. The toxic agent can cause a papillary or follicular response in the conjunctiva with chronic use, and the conjunctiva can become chemotic, edematous, and hyperemic. These features also occur in allergic conjunctivitis, with which toxic conjunctivitis is often confused.(7) The most common form of toxic conjunctivitis is Ocular Surface Medicamentosa (OSM). OSM is a chemical toxicity and/or a delayed, cell-mediated hypersensitivity response of the ocular surface and adnexa to active drugs and/or preservatives. Topical preserved eye drops are increasingly used to treat glaucoma and ocular surface disorders, such as dry eye disease (DED). OSM is usually associated with protracted use of topical drops. If not diagnosed and treated in a timely manner, OSM can result in significant ocular surface symptoms and visual dysfunction, affecting quality of life, daily activities, and workplace productivity. Thus, proper diagnosis, differentiation from DED, and correct management are important.

E.Non specific conjunctivitis:

It is widely accepted that nonspecific tissue reactivity is a distinct pathophysiological hallmark of allergic diseases, influenced by genetic and environmental factors different from those involved in causing sensitization and allergen response of target organs. This consensus document aims at reviewing procedures currently used for nonspecific

provocation of the bronchi, nose, and eye and for measuring their responsiveness to nonspecific stimuli.

2. EPIDEMIOLOGY:

Allergic conditions affect 30% to 50% of the world population, and ocular symptoms are present in 40% to 60% of affected individuals. The prevalence of allergic conditions is showing consistent increases, probably related to genetic predisposition combined with environmental factors (e.g., food, allergens, and pollution). Brazilian data report a prevalence of rhino conjunctivitis of 15% to 28%. Up to 44% of asthmatic children under 14 years of age report at least one eye symptom, although only a third of them have a medical diagnosis of Allergic Conjunctivitis (AC). Currently, no guidelines have been established for monitoring and treating Ac in children and adolescents in Brazil. This is a frequently underdiagnosed condition that has an impact on quality of life and serves as a trigger for ocular complications. The objective of this document is to guide the monitoring and treatment of AC in children and adolescents in Brazil.⁽⁸⁾ The diagnosis of ocular allergy is based on family and personal history of atopy, symptoms, clinical signs, and, eventually, additional tests. Ocular allergy can be associated with allergic rhinitis in 97% of children, asthma in 56%, and atopic dermatitis in 33%. It is usually bilateral, with itching, accompanied by tearing and a burning sensation, as the most common symptom. Visual disturbance and photophobia can occur in severe cases. A slit-lamp ophthalmological examination may reveal watery or mucoid secretions, eyelid edema, chemosis, papillary hypertrophy in the palpebral conjunctiva, conjunctival hyperemia, limbal nodules, keratitis, and corneal involvement⁽⁹⁾. Complementary tests, such as skin tests, and measurement of IgE-specific levels in serum or tears can be requested. However, skin tests tend to be negative in the absence of an association with rhinitis, and the IgE dosages may not be conclusive, since 24% of patients may be sensitive to multiple allergens. Thus, cytological diagnosis is usually reserved for research purposes.

3. ETIOLOGY:

Patterns of spread for bacterial conjunctivitis include hand-to-eye, eye contact with fomite, and person to person through respiratory droplets. The most common causative organism of bacterial conjunctivitis in children is *Haemophilus influenzae*, followed by *Streptococcus pneumoniae* and *Moraxella catarrhalis*. Bacterial pathogens in adults are more often staphylococcal species with *Haemophilus influenzae* and *Streptococcus*

pneumoniae responsible for a smaller percentage of cases. *Staphylococcus aureus* is more commonly found in adults and the elderly but is also present in pediatric cases of bacterial conjunctivitis⁽¹⁰⁾. There has also been an increase in the frequency of conjunctivitis secondary to methicillin-resistant *Staphylococcus aureus* (MRSA). Contact lens wearers are more susceptible to gram-negative infections. *Pseudomonas aeruginosa* is more likely to be isolated from critically ill, hospitalized patients. Neonates can be affected by the vertical, oculo-genital transmission of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* resulting in acute bacterial conjunctivitis. These organisms can also cause a hyperacute infection in sexually active adolescents and adults.

4. SIGNS & SYMPTOMS:

They depend on the cause of the inflammation, but may include:

- Redness in the white of the eye or inner eyelid.
- Swollen conjunctiva.
- More tears than usual.
- Thick yellow discharge that crusts over the eyelashes, especially after sleep. It can make your eyelids stick shut when you wake up.
- Green or white discharge from the eye.
- Itchy eyes.
- Burning eyes.
- Blurred vision.
- More sensitive to light.
- Swollen lymph nodes (often from a viral infection).

Symptoms of pink eye vary depending on the type of pink eye you have.

Burning, itchy eyes that discharge a thick, sticky mucus may indicate bacterial pink eye. Tearing, a swollen lymph node under the jaw or in front of the ear, and a light discharge of mucus from one or both eyes are often signs of viral pink eye. People with viral pink eye commonly have symptoms of an upper respiratory infection or cold as well. Redness, intense itching, and tears in both eyes may indicate allergic pink eye. Slight blurring of vision.

5. RISK FACTORS:

- Not washing your hands and then touching your eyes.
- Using infected tissues and towels on your face and eyes.
- Using infected eye makeup.

- Not cleaning contact lenses or wearing ones that do not fit.

6. DIAGNOSIS:

The physical examination should always begin with a vision measurement, testing each eye separately with a Snellen chart. For children too young to participate in a Snellen chart test, near vision can be broadly measured by seeing if patients can focus on a book, toy, or their caregiver. If visual acuity appears to be affected, a referral should be made to a pediatric ophthalmologist for further evaluation. Physical examination should continue with the use of a penlight. When examining the pupils and anterior segment, attention should be given to the size of the pupil and if it is reactive to light. If there is discharge present, it is important to note the consistency, color, and amount of it. In addition, the conjunctiva should be examined to determine if the entire conjunctiva is affected or if there is a specific area that is more erythematous. For clinicians who are comfortable with it, inverting the eyelid can also provide clues to the etiology. A fundoscopic exam is not typically useful in differentiating between the various etiologies. Laboratory testing and imaging are also not typically necessary for cases of uncomplicated conjunctivitis. However, a more recent meta-analysis from 2022 found that bacterial Conjunctivitis may in fact be the more common cause of conjunctivitis in children, with as many as 70% of conjunctivitis cases in children. The same meta-analysis found that adults presenting with acute conjunctivitis had an identified bacterial etiology much less often, only about 16% of the time(11). A multi-center study of adults with bacterial conjunctivitis demonstrated that the symptoms can widely vary. Of those patients with positive bacterial cultures, 65% had burning, 58% had itching, and 35% had serious or no discharge at all. Associated symptoms may give clinical clues to the bacterial, viral, or other causes of conjunctivitis. For example, the presence of mucopurulent discharge or otitis media is suggestive of a bacterial etiology. Concomitant pharyngitis, pre-auricular lymphadenopathy, and known contacts with red eye all suggest viral etiologies.

7. COMPLICATION:

Complications from bacterial conjunctivitis are uncommon; however, severe infections can result in keratitis, corneal ulceration and perforation, and blindness.

Enhancing Healthcare Team Outcomes:

Bacterial conjunctivitis provides a common and challenging clinical scenario for practitioners. The variability of presentations makes differentiating

bacterial conjunctivitis from other etiologies difficult and has led to the over-prescribing of antibiotics. An interprofessional team is highly recommended to improve outcomes. The majority of patients first present to the nurse practitioner or primary care provider, and these clinicians should make appropriate referrals to an ophthalmologist if the diagnosis is in doubt or there is vision loss. At the same time, the primary clinicians should educate patients on hand washing and not sharing personal care items with others during the acute process(12).

Several studies have sought to define characteristics of conjunctivitis that make a bacterial origin more likely and have proposed these findings to improve the management of the condition. Antimicrobial therapy has demonstrated benefits to patients; however, most uncomplicated cases resolve spontaneously without adverse outcomes. Appropriate management strategies can include antibiotic treatment, as well as reassurance and patient education without antimicrobial use.

Interprofessional consultation with pharmacists, infectious disease specialists, and ophthalmologists may provide information on local antibiotic resistance patterns and guide clinician therapy. The pharmacist should verify agent selection and dosing/duration, perform medication reconciliation to prevent any drug-drug interactions and deliver patient counseling on the importance of medication compliance, reporting any concerns to the prescribing/order physician. Nurses can evaluate and assist in monitoring patient compliance, treatment progress, and adverse medication reactions on follow-up visits, or in the case of inpatients, as they administer the medications, and communicate to the prescriber any issues they encounter.

Ophthalmology referral is necessary in complicated cases, and communication with specialists may reinforce the physician's decision to start, or not to start, antibiotic therapy in uncomplicated cases. Evaluating the available data on the diagnosis and management of bacterial conjunctivitis, as well as observing evidence-based practices, can improve patient outcomes and support community health through antibiotic stewardship.

Bacterial conjunctivitis requires an interprofessional team approach, including physicians, specialists, specialty-trained nurses, and pharmacists, all collaborating across disciplines to achieve optimal patient results.

Differential Diagnosis:

The differential diagnosis for bacterial conjunctivitis includes viral and allergic conjunctivitis. Clear discharge and itching are more characteristic of allergies and viral infections. Trauma can also present with similar symptoms to conjunctivitis of bacterial origin. Keratitis and iridocyclitis should be ruled out as corneal infections, and iris inflammation can lead to significant morbidity.

8. TREATMENT:

● Bacterial conjunctivitis:

Most cases of bacterial conjunctivitis are self-limiting, lasting 7 to 10 days without treatment. While antibiotics have been shown to decrease the duration of symptoms, no differences in sight-threatening outcomes have been observed between treatment and non-treatment groups. In a meta-analysis consisting of 11 randomized clinical trials and 3673 patients, there was a 10% increase in the rate of clinical improvement for patients who received early antibiotic treatment compared with the placebo group. A recent study from Finland supported this, showing a more rapid clinical cure in patients treated with antibiotic eye drops, from a mean of 4.0 days with a placebo to a mean of 3.8 days with moxifloxacin treatment. Antibiotics are not without risk, with adverse drug reactions reported by 8% of patients using ophthalmic antibiotics. In addition, studies have shown acquired resistance to pathogenic bacteria in the conjunctiva of children prescribed antibiotics. While antibiotics are not required for all cases, contact lens wearers should always be treated with antibiotics due to the increased risk of infection with gram negative organisms and subsequent keratitis. With that in mind, no treatment, a delayed treatment approach, and immediate treatment all are appropriate responses to suspected uncomplicated bacterial conjunctivitis. A study of 20 clinicians in Colorado demonstrated that the main drivers behind choosing to prescribe or withhold antibiotics were the patient's clinical presentation, family expectations, antibiotic stewardship concerns, diagnostic uncertainty, and daycare and school policies. They noted that the most critical features to help clinicians differentiate between viral and bacterial conjunctivitis were the association with other upper respiratory symptoms and laterality (13). Overprescribing of antibiotics is common, particularly in cases where the etiology is uncertain. The COVID-19 pandemic worsened this, likely due to the increase in children being treated over the telephone or virtually without being seen directly by a physician. In many cases, families will assert that treatment with antibiotics is necessary for

their child to return to school or daycare. School-specific policies widely vary from state to state, but the American Academy of Pediatrics specifically notes that antibiotics should not be required for return to care. If treatment is desired, initial treatment would begin with erythromycin ointment or trimethoprim-polymyxin B ophthalmic drops. Symptoms would be expected to improve within one to two days.

● Viral conjunctivitis:

Treatment of viral conjunctivitis, including COVID-19 conjunctivitis, is primarily symptomatic using cool compresses and lubricating artificial tears. Adenoviral conjunctivitis is generally self-limited and highly contagious. A study of 56 adults with adenoviral conjunctivitis who were treated in clinics with a single drop of 5% povidone-iodine demonstrated reduced viral load and a more rapid improvement in symptoms. While not standard practice at this time, this is likely to be an emerging therapy if larger studies in the future can demonstrate similar symptomatic improvement. Patients should be educated on the ways to prevent the spread of viral conjunctivitis, such as avoiding shared towels or bed linens and washing their hands frequently. In fact, a study of 26 adults with conjunctivitis showed that 46% had positive adenovirus cultures grown from swabs of their hands (14). Patients should be encouraged to make every attempt to minimize contact with others for 10 to 14 days from symptom onset.

● Allergic conjunctivitis:

Treatment of allergic conjunctivitis consists of minimizing exposure to the allergen and controlling symptoms. Topical lubricants such as artificial tears or saline can be used to physically wash out the offending allergens. Mild allergic conjunctivitis can be treated with topical antihistamine agents, preferably second-generation topical H1-receptor antagonists. If persistent, ophthalmic drops that have both antihistamine activity and mast cell stabilizing properties, such as azelastine or olopatadine, can be used. A step-wise approach may be helpful, starting with topical lubricant, then antihistamines, and finally topical steroids. Of note, topical steroids should only be used in a time-limited fashion, limited to 7 days or less. Systemic antihistamines are frequently used to reduce histamine release, improving both allergic conjunctivitis and other systemic symptoms. (15)

DISCUSSION:

AC is an increasingly frequent condition that can be debilitating for the patient and challenging for the ophthalmologist. Genetic predisposition combined

with environmental exposure (food, allergens, viral infections, exposure to bacteria, use of NSAIDs, use of antibiotics, environmental pollution, etc.) may be responsible for the rising number of cases. In most patients, AC is associated with other allergic conditions, especially rhinitis, justifying the term rhino conjunctivitis. In children under 14 years of age, 44.7% of children with atopy had allergic rhinitis and 61% had conjunctivitis, but only 5% presented with conjunctivitis alone. Ocular allergy presents with an obnoxious itching sensation, hyperemia, and tearing and can ultimately lead to corneal scarring and subsequent visual impairment. Approximately 11% of patients with AKC have persistent corneal epithelial defects. The Brazilian epidemiological data on ocular allergy in the general population indicate a prevalence of 17% allergic rhinoconjunctivitis. Concerning the ocular allergy subtypes, a referral center reported that 38.7% of patients had VKC, 38.7% had AKC, 12.6% had PAC, and 10.1% had no definite diagnosis (16). A predominance of chronic and severe forms of ocular allergy was also reported. Among teenagers, the prevalence of rhino conjunctivitis has been reported as ranging between 15% and 28%. Among asthmatic children under 14 years of age, 44% reported at least one eye symptom, although only 16% had a medical diagnosis of AC; this indicates a high rate of underdiagnosis. Brazil is a continental country with a climate ranging from equatorial, in the north, to temperate, in the south. Some particularities may arise from this diversity, such as the type of allergen and the period of the year. Nevertheless, all the AC subtypes are covered in the present document, and, to our knowledge, there are no studies that suggest the need for regional adaptations.

CONCLUSION:

There are many cases of pediatric conjunctivitis that are bacterial in origin, with *H. influenzae* as the overwhelmingly predominant organism. Based on the above data, empirical ophthalmic antibiotic therapy for children presenting with conjunctivitis may be appropriate if used with the guidance of the diagnostic indicators identified in our study. Conjunctivitis is a common complaint in the pediatric primary care office. A clinician can use diagnostic clues from the patient's history and exam to help determine the likely etiology. In general, bacterial conjunctivitis makes up many cases of pediatric conjunctivitis and presents with purulent discharge and matting of eyes. Viral conjunctivitis leads to a gritty feeling with watery discharge and is often associated with other upper respiratory symptoms. Allergic conjunctivitis is usually bilateral and coincides with seasonal allergen levels. Other

causes of conjunctivitis occur groups, including contact lens wearers, those in high pollution environments, and those with symptoms that go beyond conjunctivitis. The treatment of most cases is supportive with topical lubricants; however, antibiotics are indicated on an individual basis for cases of bacterial conjunctivitis, depending on patient and family preference and the clinician's approach to treatment.

REFERENCE:

1. Kaufman, H.E. Adenovirus Advances: New Diagnostic and Therapeutic Options. *Curr. Opin. Ophthalmol.* 2011, 22, 290–293. [CrossRef]
2. Sebastian, T.; Frost, H.M. A Qualitative Evaluation of Pediatric Conjunctivitis Medical Decision Making and Opportunities to Improve Care. *J. Am. Assoc. Pediatr. Ophthalmol. Strabismus* 2022, 26, 113.e1–113.e6. [CrossRef]
3. Gigliotti, F.; Williams, W.T.; Hayden, F.G.; Hendley, J.O.; Benjamin, J.; Dickens, M.; Ford, R.; Gleason, C.; Perriello, V.A.; Wood, J. Etiology of Acute Conjunctivitis in Children. *J. Pediatr.* 1981, 98, 531–536. [CrossRef]
4. Hu, Y.-L.; Lee, P.-I.; Hsueh, P.-R.; Lu, C.-Y.; Chang, L.-Y.; Huang, L.-M.; Chang, T.-H.; Chen, J.-M. Predominant Role of *Haemophilus Influenzae* in the Association of Conjunctivitis, Acute Otitis Media and Acute Bacterial Paranasal Sinusitis in Children. *Sci. Rep.* 2021, 11, 11. [CrossRef]
5. Upshaw, J.E.; Brenkert, T.E.; Losek, J.D. Ocular Foreign Bodies in Children. *Pediatr. Emerg. Care* 2008, 24, 409–414. [CrossRef] [PubMed]
6. Gigliotti F, Williams WT, Hayden FG, et al. Etiology Of acute conjunctivitis in children. *J Pediatr.* 1981; 9:531–6.
7. Rietveld RP, van Weert HCPM, ter Riet G, Sloos JH, Bindels PJE. Predicting bacterial cause in infectious conjunctivitis: cohort study on informativeness of combinations of signs and symptoms. *BMJ.* 2004;329:206–10.
8. Block SL, Hedrick J, Tyler R, et al. Increasing bacterial resistance in pediatric acute conjunctivitis (1997-1998). *Antimicrob Agents Chemother.* 2000; 44:1650–4.
9. Sheikh A, Hurwitz B. Topical antibiotics for acute bacterial conjunctivitis: Cochrane systematic review and meta-analysis update. *Br J Gen Pract.* 2005; 55:962–4.
10. Coote M. Sticky eye, tricky diagnosis. *Aust Fam Physician.* 2002; 31:225–3
11. Bielory L, Delgado L, Katelaris CH, Leonardi A, Rosario N, Vichyanond P. ICON: diagnosis and management of allergic conjunctivitis. *Ann Allergy Asthma Immunol.* 2020;124(2):118-34.

12. Bonini S. Allergic conjunctivitis: the forgotten disease. *Chem Immunol Allergy*. 2006;91:110-20.
13. Gradman J, Wolthers OD. Allergic conjunctivitis in children with asthma, rhinitis and eczema in a secondary outpatient clinic. *Pediatr Allergy Immunol*. 2006;17(7):524-6.
14. Palmares J, Delgado L, Cidade M, Quadrado MJ, Filipe HP; Season Study Group. Allergic conjunctivitis: a national cross-sectional study of clinical characteristics and quality of life. *Eur J Ophthalmol*. 2010;20(2):257-64.
15. Sánchez-Hernández MC, Montero J, Rondon C, Benitez del Castillo JM, Velázquez E, Herreras JM, et al.; SEAIC 2010 Rhinoconjunctivitis Committee; Spanish Group Ocular Surface-GESOC. Consensus document on allergic conjunctivitis (DECA). *J Investig Allergol Clin Immunol*. 2015;25(2):94-106.
16. Nakagawa Y. [Conjunctival cytology]. *Nippon Ganka Kiyu*. 1988;39:200e1 Japanese.