REVIEW ARTICLE

Acute conjunctivitis through a public health lens: a review

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ABSTRACT

Worldwide, conjunctivitis (pink eye) outbreaks are common and affect people of all ages and socioeconomic backgrounds. The data available on Google Scholar, PubMed, World Health Organisation and Centre for Disease Control websites from the year 2014 onwards, showed that outbreaks typically have a seasonal trend in Pakistan. Pink eye outbreaks negatively impact education and productivity because of the lost time at work and school. The cases can be categorised into infectious and non-infectious conjunctivitis depending on the etiology. The most common and most contagious type of infectious conjunctivitis is viral conjunctivitis. The condition is marked by eye pain, redness or swelling of the eye, itching, discharge from the eyes and a gritty feeling. It often has a self-limiting course. The outbreak in Pakistan which started in September 2023, has several contributing factors, including hot, humid weather, a low air quality index, little rainfall, inadequate hand hygiene practices and densely populated areas. Effective management requires a prompt diagnosis and appropriate treatment for the underlying cause. Outbreak control measures include public health initiatives like awareness campaigns, surveillance, notification and epidemiological investigation. Through the public health lens, this article reviews the etiology, epidemiology, clinical presentation, factors associated with outbreaks, surveillance, prevention and control measures.

Keywords: Conjunctivitis, eye infection, outbreak, pink eye, prevention, public health.

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Introduction

Acute conjunctivitis is a public health concern; being highly transmissible requires vigilant mitigation strategies and population-wide measures to control the spread.[1] Conjunctivitis is characterised by the inflammation of conjunctiva and engorgement of the blood vessels of conjunctiva associated with discomfort, pain and discharge.[2,3] Conjunctivitis is a common presentation in hospital emergency rooms, health care centers and primary care clinics. People with acute conjunctivitis come from all sociodemographic and economic backgrounds.[2] Conjunctivitis is a common disease with easy spread, especially in children, teachers and day-care workers because they work in proximity and when exposed to someone infected with conjunctivitis, they catch the disease easily.[1]

Acute conjunctivitis is the cause of up to 2% of outpatient primary care visits and 1% of emergency visits worldwide.[4] Countries like Pakistan experience higher rates of infectious eye illnesses than temperate countries because of factors such as high temperature and humidity, dust, sunlight and rainfall. In addition, environmental antigens and meteorological circumstances also play a role in the higher prevalence of inflammatory eye disorders here. Acute Conjunctivitis is caused by viruses, bacteria, allergies or parasites, but more than 80% of the cases result from viruses.[5] The frequent clinic visits due to this public health issue impart a financial burden on the healthcare system. The annual expenditure of treating bacterial conjunctivitis in the United States alone is around 857 million US dollars.[3]

Although it is a self-limiting disease that resolves on its own, it is crucial to rule out other conditions that could threaten eyesight when evaluating a pink eye for conjunctivitis.

Pakistan faced an outbreak of conjunctivitis (pink eye) which started in September 2023, manifested as profuse tearing, discharge from the eye, swollen and inflamed eyelids, burning or itching and pink or red coloration.[6] Punjab reported the highest number of cases, which led to an alarming situation and many educational institutions

remained closed to contain the epidemic.[6] The alarming surge of conjunctivitis cases substantially impacted people of all age groups. Many cases were reported in school-going children primarily because of non-adherence to precautions at school. The other reason for the rapid spread in Pakistan was densely populated cities.

Methods

A systematic search was conducted across multiple databases including PubMed, Google Scholar, archives on the internet and online websites like the World Health Organisation website and the Centre for Disease Control website. This literature review encompasses published literature related to national and international contexts from the year 2014 onwards. The terms utilised to comprehensively search the scientific literature were 'pink eye', 'conjunctivitis', 'eye infection', 'outbreak', 'prevention' and 'public health'. The selection process involved screening titles and abstracts to include studies pertinent to the research topic. The inclusion criteria comprised original articles, systematic reviews or review articles that provided insights into pink eye or conjunctivitis. Conversely, studies unrelated to pink eye or conjunctivitis, editorials, commentaries or opinion papers were excluded. Finally, data synthesis involved organising extracted information thematically to highlight etiology, epidemiological determinants, factors associated with the outbreak, clinical manifestation, prevention and control measures.

Etiology

Infectious and non-infectious conditions can be broadly grouped as the causes of conjunctivitis Table 1. All pathogens, including bacteria, viruses and even fungi, can cause conjunctivitis. Conjunctivitis that is not contagious may arise from exposure to chemicals, allergens or an atypical immunological response.[7]

There is a seasonal trend to allergic conjunctivitis, with a higher frequency of cases in the spring and during seasonal changes. Common allergies include dust, pollen, cosmetics, perfume and medications.[8]

Haemophilus influenzae, *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Moraxella catarrhalis* are frequently responsible for bacterial conjunctivitis. *Staphylococcus aureus* is a frequent pathogen in adults.[9] A substantial body of literature has demonstrated that the most common type of infectious conjunctivitis is viral conjunctivitis. Between 65% and 90% of cases are caused by adenovirus.[10] Herpes simplex and herpes zoster virus are the less common causes. Acute hemorrhagic conjunctivitis is believed to be caused by the picornaviruses, enterovirus 70 and the coxsackievirus A24 variant.[11]

Epidemiological determinants

Worldwide, about 2% of people suffer from conjunctivitis caused by a number of viruses or bacteria.[12] About 80% of cases of acute conjunctivitis are due to viruses.[13] The majority of viral conjunctivitis cases are brought on by adenoviruses. It has a 10%-50% transmission risk and is extremely contagious.[10] Bacterial conjunctivitis is the second most prevalent cause of infectious conjunctivitis, with an estimated frequency of 132 per 10,000 cases.[14] Infectious conjunctivitis is equally common in both sexes and is influenced by a number of variables, such as the patient's age and the time of year.[15] Previous research reported a 15%-20% prevalence of allergic conjunctivitis.[16]

Accumulating evidence has linked hand-to-eye contact, ocular secretions, respiratory droplets and contaminated medical equipment with transmission of acute conjunctivitis. It is possible for viral conjunctivitis to propagate through swimming pools and other reservoirs.[17] A case's contact history has been defined as having lived, worked, studied or been in close contact with another person who had conjunctivitis within the 14 days before the onset of acute conjunctivitis.[18]

Factors associated with the outbreak

Different kinds of conjunctivitis have been found to occur more frequently during certain seasons. Allergy-related conjunctivitis is more prevalent during spring and summer; bacterial conjunctivitis is typically detected between December and April, and viral conjunctivitis peaks during hot weather. [19]

The most populous city in Pakistan, Karachi, has a high conjunctivitis prevalence. According to a study conducted

Table 1. *Etiology of acute conjunctivitis.*[9]

Infectious	Bacterial *Haemophilus influenzae* *Staphylococcus aureus* *Streptococcus pneumoniae* *Moraxella catarrhalis*
	Viral Adenovirus Herpes simplex Herpes zoster Picornaviruses, Enterovirus 70 Coxsackievirus A24 variant
Non-infectious	Allergic Acute Seasonal Perennial
	Non-allergic Toxins Foreign bodies Chemical agents

in Karachi, the current pink eye outbreak is caused by humid weather, a low air quality index, insufficient rainfall, inadequate hand hygiene and densely populated areas.[20] A similar study in Nawab Shah revealed that air pollution was a significant cause of bacterial and allergic conjunctivitis in children.[21] Farmers in the Vehari district experienced conjunctivitis, which was primarily caused by long working hours with exposure to sunlight and prevailing unhygienic conditions.[22]

Clinical manifestations

Watery discharge from the eyes, adherent eyelids, fever, itching and swollen lymph glands are the primary signs and symptoms of viral conjunctivitis.

Bacterial conjunctivitis presents with hyperemia, pus discharge and swelling of the eyes. [23]

Ocular itching is the most typical symptom of allergic conjunctivitis. Eyelid swelling and a feeling of a foreign body are other symptoms. Severe cases may result in photophobia and impaired vision (Figure 1 and Table 2).[24]

Prevention

Infection control measures have been shown to reduce the number of outbreaks and infected persons.

Primary prevention

Infectious conjunctivitis, whether bacterial or viral, is highly contagious. Using a few simple primary preventive strategies can decrease the risk of contracting an infection or passing it on to another person.[26] Some preventive strategies are listed below.

- Frequent washing of the hands for at least 20 seconds with soap and water is recommended, particularly after contacting someone with conjunctivitis or their personal objects.[27]
- Touching eyes with unwashed hands should be avoided.
- It's best to keep things like eye drops, makeup, towels, bedding, containers for contact lenses and eyeglasses to yourself.
- It is advisable to refrain from swimming in pools during outbreaks.

Table 2. *Clinical manifestation related to underlying cause.* [25]

Symptom	Allergic conjunctivitis	Bacterial conjunctivitis	Viral conjunctivitis
Discharge from eyes	White stringy mucoid	Mucopurulent	Watery
Presence of erythema	Mild to moderate	Moderate to severe	Mild to moderate
Itching	Moderate to severe	None to mild	Mild to moderate
Bilateral involvement of eyes	Common	Unilateral initially	Rare
Lymphadenopathy	None	Rare	Common
Presence of other upper respiratory infections	None	Rare	Common

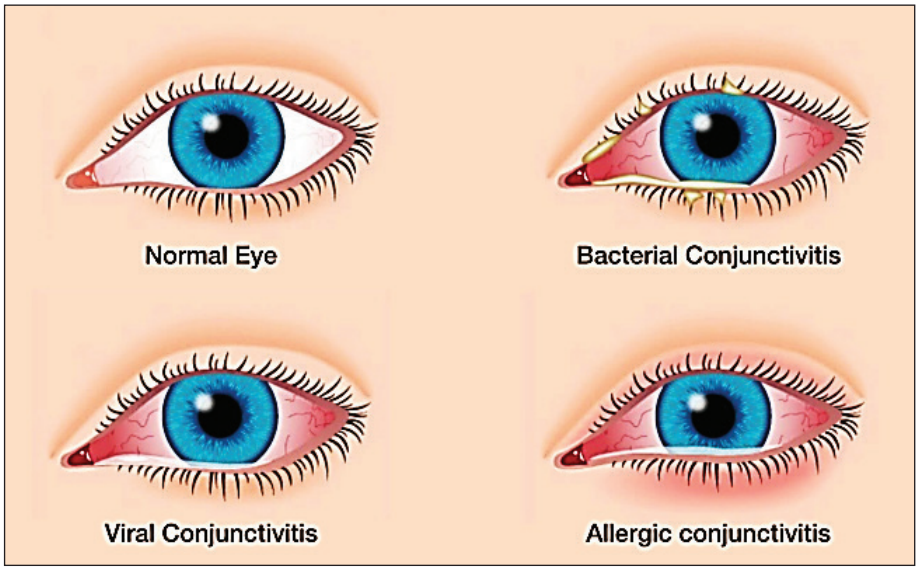

Figure 1. *Clinical manifestations of conjunctivitis.*[25]

- Close contact with someone exhibiting conjunctivitis symptoms should be avoided.
- Health awareness can be enhanced by local health alerts and updates.
- Educating people on how to reduce exposure to common allergens can help prevent allergic conjunctivitis. [4]

There is no vaccine that can be recommended for specific protection of all types of conjunctivitis. Rubella, measles, chickenpox, shingles, pneumococcal and Haemophilus influenzae type B vaccines, among others, offer protection against a few bacterial and viral illnesses linked to conjunctivitis.[20]

Secondary prevention

Diagnosis depends upon the patient's history and examination of the eye. Although not recommended as a routine procedure, discharge from the infected eye can be sent to the lab to find out the underlying pathology and appropriate treatment.

Following general instructions should be given to patients.

Any discharge from the eye(s) should be washed several times daily using a clean, damp cloth or fresh cotton ball.

Use of separate eye drop dispensers/bottles for infected and non-infected eyes is recommended.

It is recommended to refrain from touching or rubbing your eyes. This may make the illness worse or cause the infection to spread to the other eye.

Contact lens wearers should refrain from wearing their lenses for the first 24 hours after treatment or until their eye is no longer red. After discarding the contact lens case, either replace the disposable contacts or disinfect them overnight.[28]

The majority of instances resolve on their own and don't need treatment. Conjunctivitis treatment is based on the underlying cause. The use of a topical antihistamine eye drop is advised to reduce eye discomfort if the cause of conjunctivitis is viral. A cool compress may also be suggested if the itching is bothersome.[3] Before and after cleaning an infected eye or applying eye drops or ointment, hands should be thoroughly cleaned.

Propagation of allergic or irritant-induced conjunctivitis is not possible unless a secondary bacterial or viral infection develops. Reducing exposure to pollen during allergy season is the best line of action.

Topical antibiotic treatment has been shown to reduce symptoms, speed up return to work or school, enhance resolution times and decrease transmission in bacterial conjunctivitis. In situations, when a doctor has to decide to begin empiric treatment, a broad-spectrum antibiotic that covers both gram-positive and gram-negative bacteria should be used.[29]

This was corroborated by a recent study from Finland that demonstrated a faster clinical cure in individuals receiving antibiotic eye drops, with a mean recovery time of 3.8 days compared to 4.0 days for those receiving a placebo.[30]

When treating suspected cases of conjunctivitis, it is important to take into account red flags for more severe intraocular illnesses, such as significant pain, poor vision and a painful pupillary reaction. Completing a medical and ocular history as well as doing a comprehensive physical examination are essential in individuals with unexpected findings and a chronic course.

Tertiary prevention

However, conjunctivitis frequently causes corneal scarring, dry eyes and infections as adverse effects. If the illness is not treated, it can become chronic and lead to hazardous conditions for eyesight, such as limbal stem cell deficiency and secondary keratoconus.[31] Adherence to medical advice is mandatory to avoid complications.

Outbreak control measures

In order to stop the disease from spreading, the World Health Organisation advises its member nations to increase surveillance and put control measures in place. The advice that follows is relevant to outbreaks of pink eye.[32]

Surveillance and epidemiological investigation

- For early detection of an outbreak surveillance should be strengthened.
- Health authorities should be notified.
- Source of infection must be identified.
- Capacity of the laboratory to confirm diagnoses should be extended.
- Guidance and information to healthcare professionals should be provided.
- Health awareness initiatives should be launched for patients and contacts.
- Chlorination of swimming pools must be carried out.
- Arrangement of diagnostic services and case management should be made.
- Asepsis and antisepsis standards should be followed in healthcare facilities.

Recommendations for health care professionals

Wearing of personal protective equipment, like gowns and gloves by health care providers should be emphasised. Health professionals should practice hand washing after attending suspected or confirmed patient of conjunctivitis. Cleaning of medical equipment and furniture by disinfectants is an effective measure to control outbreak.

A fundamental principle for efficient epidemic control is the early detection of disease outbreaks using proper

surveillance techniques. The practically universal use of mobile phones, which is far higher than that of computers, makes mHealth an effective tool for enhancing medical treatment. Implementing mHealth technologies could be a key facilitator for epidemic monitoring, mitigation and response. The app named as Sick Weather, provides real-time alerts from social media about pink eye. [33] Teleophthalmology-based healthcare services (through mobile telemedicine vans with satellite connectivity and mobile apps) in conjunction with tertiary care eye hospitals are a useful strategy to quickly contain the outbreak by limiting patient mobility in countries where a large portion of the population lives in rural and remote areas.[34]

To quickly stop and contain the infectious disease, capacity building of medical staff and paramedics should be done. This will support effective disease management and resources.

Selecting the right treatment procedures for conjunctivitis can be aided by determining the agents responsible for the condition in a given region. Comprehensive polymerase chain reaction-based DNA sequencing is required to advance public health and epidemiological surveillance.[35]

Limitations of the review

The review is of a narrative nature and hence lacks the systematic analysis of literature and scientific evidence.

Conclusion

Numerous bacterial or viral pathogens can lead to infectious conjunctivitis. Conjunctivitis can also be caused by non-infectious factors such as allergies, irritants or drugs. Viral conjunctivitis can lead to pink eye epidemics and is extremely contagious. The majority of conjunctivitis types resolve on their own, but a few might worsen and result in major complications with the eyes and other tissues. The best ways to halt and manage conjunctivitis epidemics are through public health initiatives like hand washing and awareness campaigns in a rigorous and widespread manner.

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Conflict of interest

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Ethical approval

Not required.

Authors' contributions

SM, HS: Main concept and design of the study, acquisition of data, drafting of manuscript, critical intellectual input.

SD, UN, HM: Drafting of manuscript, critical scientific and technical input, drafting of manuscript.

ALL AUTHORS: Approval and responsibility for the final version of the manuscript to be published.

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