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Research Article

**A COMPREHENSIVE ANALYSIS OF ACUTE
CONJUNCTIVITIS IN TIRUNELVELI DISTRICT,
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Abstract:

Conjunctivitis, or pink eye, is an inflammation of the conjunctiva, the clear membrane that covers the white of the eye. Conjunctivitis is a major public health problem in Tirunelveli District, Tamil Nadu, affecting an estimated 10% of the population annually. This study aims to investigate the causes, spread, and preventive measures of conjunctivitis in the district. Epidemiological data, laboratory testing, and interviews with patients were used to identify risk factors, potential sources of infection, and treatments. From January to December 2022, case reports for conjunctivitis from 1,000 people in and around Tirunelveli were collected from hospitals. Gender-wise analysis showed that males (53.9%) and females (46.4%) were affected. Age-wise analysis revealed that the majority of cases of conjunctivitis were in the age group of 18-35 years old. Type of conjunctivitis analysis showed that bacterial conjunctivitis was the most common cause of infectious conjunctivitis, while allergic conjunctivitis affected 45.3% of the population. Analysis of the affected eye shown that the majority of cases of conjunctivitis affected one eye, with 0% of blind people and 0.1% of asymptomatic patients affected. Adenovirus was the main cause of viral conjunctivitis, and seasonal allergies were the primary cause of allergic conjunctivitis. The statistics behind the gender, age and affected eye data for conjunctivitis were significant ($p < 0.05$). The results also indicated that 0% of the fully blind people were affected by conjunctivitis, and 0.1% and 0.3% of the asymptomatic and operated patients respectively were affected. Finally, all cases of conjunctivitis were resolved within 7-10 days from the onset of symptoms.

Keywords: Conjunctivitis, Infection, Adenovirus and allergy**Corresponding author:****Azhagu Raj. R,**

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INTRODUCTION:

In several Indian states, conjunctivitis is a common seasonal illness during the monsoon season. Conjunctivitis, commonly known as pink eye, is often the primary culprit behind eye flu during the rainy season. According to Sharma (2023), viral and bacterial conjunctivitis are the main causes of the outbreaks in India, resulting from the country's high population density, excessive humidity, and occasionally inadequate or unsanitary living conditions.

The conjunctiva is a thin, transparent mucous membrane that overlies the sclera (white outer coat of the eye) and lines the inside of the eyelids. It consists of two parts: the bulbar conjunctiva covering the anterior portion of the sclera, and the palpebral conjunctiva lining the eyelids (Dorland, 2011). Conjunctivitis is characterized by inflammation and irritation of the conjunctiva, leading to swelling, redness due to blood vessel dilation, eye discharge, and ocular discomfort (Shekhawat *et al.*, 2017). According to Leibowitz (2000) and Chu *et al.*, (2020), inflammation or infection of the conjunctiva (medically termed conjunctivitis) leads to vasodilation of the conjunctival blood vessels, resulting in hyperemia (increased blood flow causing redness) and edema (swelling due to fluid accumulation). Symptoms include increased tear production, fluid release from the eyes, and eye crusts, especially noticeable in the morning (Sharma, 2023). While water pollution and environmental conditions may contribute to health problems, there is currently no established link between river water levels and the increase in conjunctivitis cases (Sumel Ashique, 2023).

Bacterial conjunctivitis can spread easily from person to person and from one eye to the other, manifesting with redness, foreign body sensation, morning eyelid sticking, purulent discharge, papillae, and occasional lymph node swelling (Leibowitz, 2000; Doron & Gorbach, 2008; bacterial-conjunctivitis-pediatric, 2023). Despite the fact that heat, humidity, and water logging make the monsoon season ideal for viruses and bacteria to multiply, Sharma (2023) explains that the current viral conjunctivitis outbreak is considerably worse than in previous years, potentially due to increased viral contagiousness. Viral conjunctivitis presents with itching, tearing, recent respiratory infection history, palpebral follicles, and tender preauricular lymphadenopathy (Mahmood & Narang, 2008; Puri *et al.*, 2011). Allergic conjunctivitis involves ocular itching/burning, a watery discharge, allergy history, eyelid edema,

papillae, without lymph node involvement (Liesegang *et al.*, 2008).

One of the earliest indications of COVID-19 infection is conjunctivitis, which may indicate a unique illness or be associated with additional symptoms that surface within a week (Valeria Mocanu *et al.*, 2022). Sindhuja *et al.*, (2020) found that mild conjunctivitis presenting as conjunctival redness is a common condition, affecting up to 6.29% of the general population. Their findings indicate conjunctival inflammation may be one of the predominant ocular signs associated with even mild COVID-19 infection. Among SARS-CoV-2 positive patients who develop ocular involvement, infectious conjunctivitis commonly presents regardless of broader systemic disease severity.

Effective treatments exist for various eye conditions that may not necessarily lead to vision impairment, such as dry eye, conjunctivitis, and blepharitis, but can cause discomfort and pain. (WHO; August, 2023).

To better understand the situation, a comprehensive investigation into the causes of conjunctivitis in the Tirunelveli district is necessary. This investigation should gather epidemiological data, interview patients to identify risk factors and potential sources of infection, and focus on implementing preventive measures and treatments to reduce disease spread and improve quality of life for those affected.

MATERIALS AND METHODS:

Study Area

Tirunelveli is located in the southern part of Tamilnadu, South India. The district covers an area of 3,097 square kilometres. It has total population of about 4,061,948 peoples as per the census-2022 where, 1,210,710 are males and 1,062,747 are females. According to Remington *et al* 2022, the epidemiology Data analysis methods mainly include trend based analyses and frequency analyses.

Data Collection

The acute catarrhal conjunctivitis data from January – 2022 to December 2022 were analyzed for this study. The conjunctivitis data was collected from the department of ophthalmology, Tirunelveli Medical College Hospital, Tirunelveli and Dr. Agarwal Eye Hospital, Tirunelveli, Tamilnadu, India.

Statistical Analysis

Data were analyzed using IBM SPSS 22 and OriginPro 8.5. The Kolmogorov-Smirnov test assessed data for normality. For group comparisons, the independent samples t-test or Mann-Whitney U

test were utilized based on normality results. Chi-square analysis determined associations between categorical variables. The Kolmogorov-Smirnov test compared the sample distribution to a normal distribution. The t-test was interpreted using Levene's test for equality of variances. Chi-square tested independence of categorical variables using contingency tables. Graphs including bar charts and scatter plots visualized data and statistical outcomes in OriginPro 8.5. Effect sizes and 95% confidence intervals supplemented inferential statistics. Significance was determined using $p < 0.05$.

Result and Discussion

To investigate the eye complaints registered among visually impaired people and normal populations (N=1000; M=536, F=464), we defined a case as the occurrence of any of the following eye symptoms: redness, watering, discharge, or foreign-body

sensation in either eye among the people of the visually impaired hospitals (Dr. Agarwal Eye Hospital & High Ground Hospital, Tirunelveli) from January to December 2022. We actively searched for cases matching the case definition, line-listed them. We have collected demographic and clinical symptoms data in the line list. Then, patients were divided into six groups: Viral conjunctivitis, Bacterial conjunctivitis, Allergic conjunctivitis, Fungal conjunctivitis, Toxic conjunctivitis, and Nonspecific conjunctivitis.

Gender wise analysis

According to the data, the conjunctivitis spread widely in these two months from November to December 2022. Both males and females were affected by this pandemic. About 536 males (53.9%) and 464 females (46.4%) were affected by conjunctivitis respectively (Figure.1).

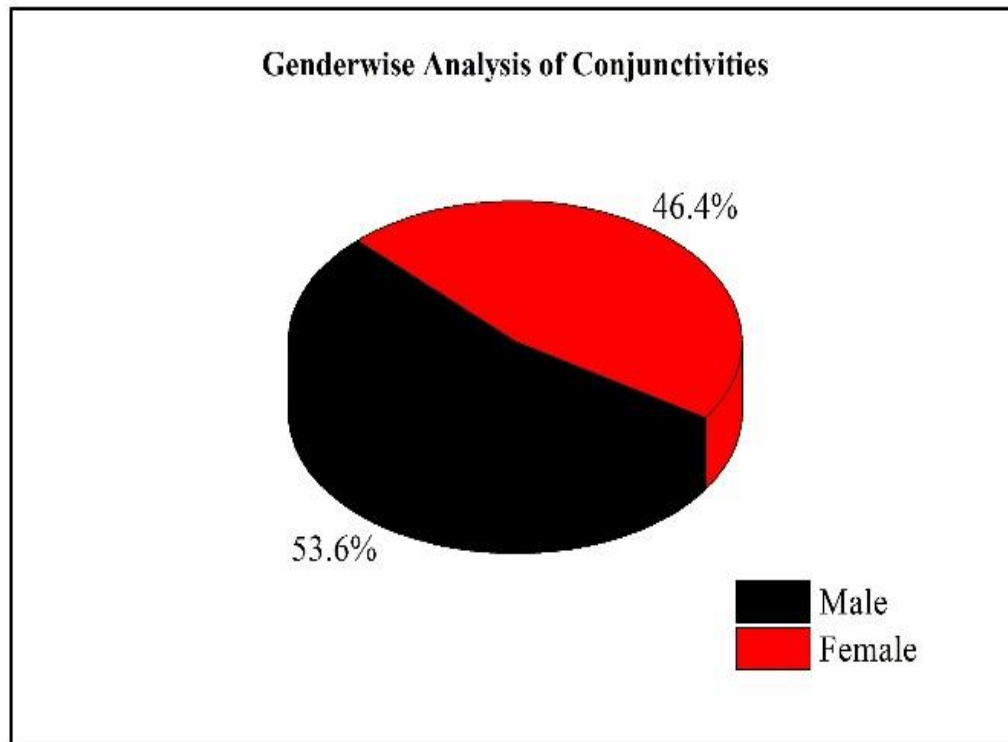


Figure.1 Gender wise analysis of Conjunctivitis in Tirunelveli

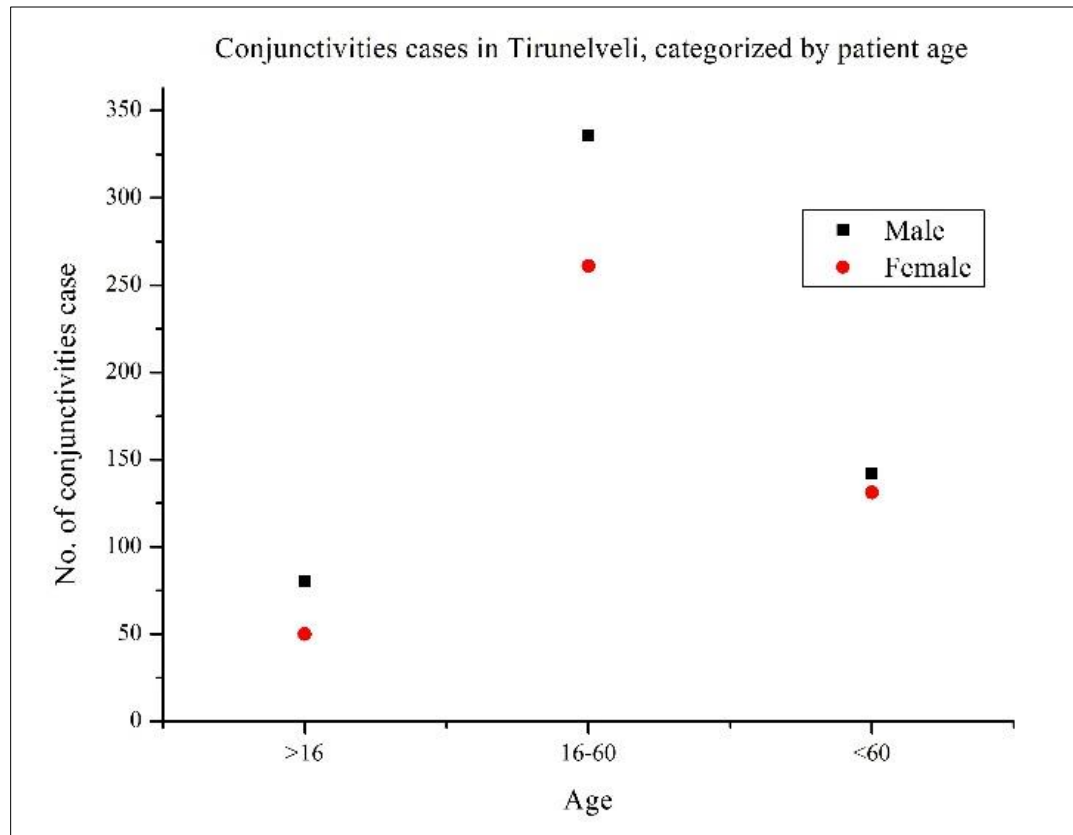
Age wise analysis

Age wise analysis of conjunctivitis spread in Tirunelveli during the year (January 2022 – December 2022), was categorized and represented in (Figure. 2). The data shows that the age group of 16 – 60 was affected by this conjunctivitis disease 59.7% followed <60 age was 27.3%. The chi-square statistic testing for differences between the observed and expected

number of cases across age/gender groups is 3.3779. With degrees of freedom, this yields a p-value of .184717. Since the p-value is greater than .05, we fail to reject the null hypothesis and conclude that there is no statistically significant difference in the distribution of conjunctivitis cases between age groups or genders (Table.1).

Table.1 Conjunctivitis in Tirunelveli: Cases by Age Group

Results		
Age	Male	Female
>16	80 (72.54) [0.77]	50 (57.46) [0.97]
16-60	336 (333.13) [0.02]	261 (263.87) [0.03]
<60	142 (152.33) [0.70]	131 (120.67) [0.89]

**Figure.2** Conjunctivitis cases in Tirunelveli, categorized by patient age**Types of Conjunctivitis**

According to the data, the six type of conjunctivitis data, bacterial conjunctivitis is the most common cause for infectious conjunctivitis. (Table.1) shows Allergic conjunctivitis affects nearly 45.3% of the population, but only a small proportion seeks medical care. The majority of viral conjunctivitis cases are due to adenovirus. The majority of cases of allergic conjunctivitis are due to seasonal allergies (Figure.3). A total of 1000 people survey responses were collected for analysis. The full blind people is not affected of conjunctivitis in 0%, The Asymptomatic conjunctivitis is affected in 0.1% of people, The Operated patients is affected of conjunctivitis in 0.3%. All the cases recovered between 7 and 10 days from the date of onset of symptom.

Table.2 Number Affected: Shows the number of people affected by each cause of conjunctivitis

Results						
Conjunctivitis affected	Bacteria	Virus	Allergy	Toxic & Fungi	Non specific	Row Totals
Male	136 (138.29) [0.04]	65 (60.03) [0.41]	252 (252.99) [0.00]	46 (46.63) [0.01]	37 (38.06) [0.03]	536
Female	122 (119.71) [0.04]	47 (51.97) [0.47]	220 (219.01) [0.00]	41 (40.37) [0.01]	34 (32.94) [0.03]	464
Column Totals	258	112	472	87	71	1000 (Grand Total)

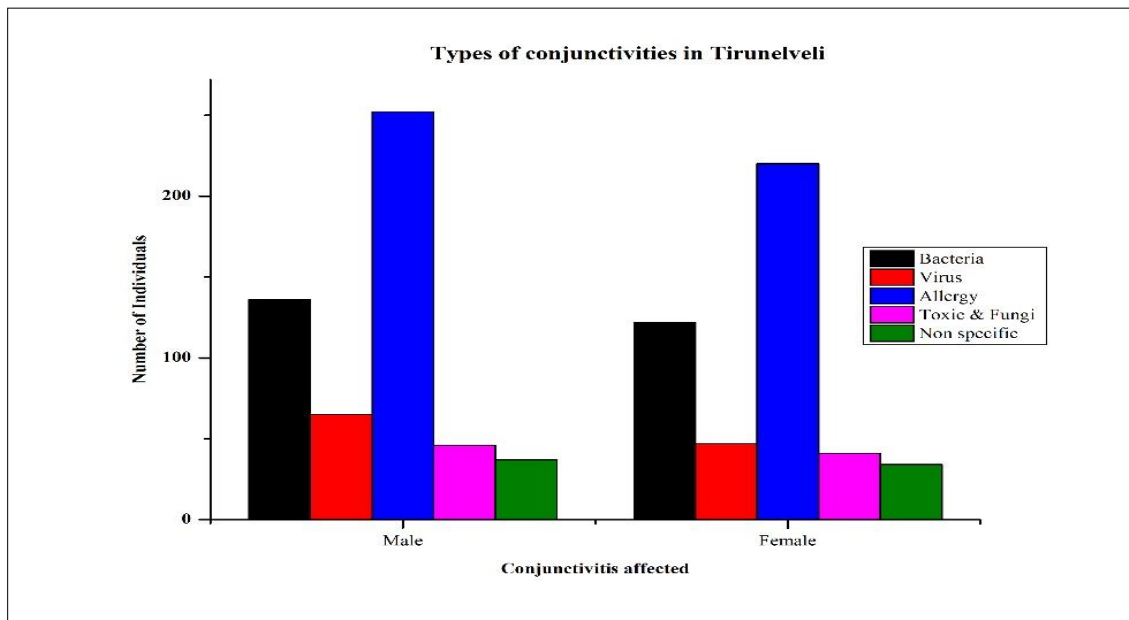


Figure.3 Number Affected: Shows the number of people affected by each cause of conjunctivitis

Chi-square test

The result show that the conjunctivitis chi square statistic value is 1.0576. The *p*-value is .900934. The result is *not* significant at *p* < .05. Both male and female affected by bacterial conjunctivitis, allergy conjunctivitis, viral conjunctivitis, fungal conjunctivitis, toxic conjunctivitis, nonspecific conjunctivitis. The chi-square calculated value of grater then chi-square value rejected null hypothesis A chi-square test of independence showed that there was no significant association between gender and disease $X^2 (2, N = 1000) = 1.0576, p = .900934$. (Table.2; Figure.3).

Table.3 Analyzing Conjunctivitis Cases by Affected Eye and Gender

Results		
Affected eye	Male	Female
Right	321 (314.10) [0.15]	265 (271.90) [0.18]
Left	146 (145.79) [0.00]	126 (126.21) [0.00]
Both	69 (76.11) [0.66]	73 (65.89) [0.77]

A chi-squared test was conducted to determine whether there was a significant difference in the affected eye (left, right, or both eyes) between males and females diagnosed with conjunctivitis. The frequencies of affected left, right, and both eyes categorized by gender are shown in Table 3. The chi-square statistic calculated was 1.7599 ($df = 2$). The associated p -value was 0.414799. As this p -value is greater than the significance level of 0.05, the result is not statistically significant. Therefore, we fail to reject the null hypothesis of no difference in distribution of affected eyes between the genders.

The Kolmogorov-Smirnov Test of Normality

The Kolmogorov – Smirnov Test of Normality was used to the normality & data. The results in shows that the data was not normally distributed. For Male Normality the value of the K-S test statistic (D) is .37732. The p -value is $< .00001$. This provides very good evidence that your data *not* normally distributed whereas. The Female Normality The value of the K-S test statistic (D) is .37732. The p -value is $< .00001$. This provides very good evidence that your data *not* normally distributed.

t - Test for 2 Independent Means

The calculated t -test t -value is 0. The p -value is 1. The result is *not* significant at $p < .05$. There was no significant effect for sex, $t(1000) = 0, p = 1$, despite women ($M = 8.91, SD = 14.2$) ($M = 11.31, SD = 21.2$). Calculated value less than critical value then accepted the null hypothesis.

Discussion

Daniel and Lanxing Fu, 2022 found that sequelae of viral conjunctivitis are rare in the long-term. However, chronic viral conjunctivitis can lead to a decrease in quality of life. Treatment for such cases is primarily meant to reduce symptoms and include the use of lubricating eye drops and the avoidance of irritants. Generally, recovery time is around 1-4 weeks.

In 2021, Muhammad Hashmi and Bharat Gurnani studied complications from bacterial conjunctivitis. While they are uncommon, severe infections may lead to keratitis, corneal ulceration, perforation, and even blindness. For cases involving vision loss, lack of response to treatment, recurrent infections, corneal involvement, or severe pain or discharge, referral to an ophthalmologist is recommended. It was also noted that a number of patients who had not been treated with antibiotics returned to the clinic within one month with persistent symptoms.

Kaur *et al.*, (2021) conducted a survey of 155 experts on the global conjunctivitis outbreak. The results showed that 7% of participants believed in microbial aetiologies which vary around the world. Moreover, 21% reported an increase in the incidence of conjunctivitis epidemics in the last decade. Additionally, there were differences in the peak seasons between the northern and southern hemispheres. Felix Chen *et al.*, (2018) studied patient demographics and microbiology trends in bacterial conjunctivitis in children. The study found that, although bacterial conjunctivitis only accounted for 10% of cases, antibiotics were dispensed to more than half of the patients. Pediatricians prescribed antibiotics more than twice as often as ophthalmologists and less than 5% of patients who didn't receive antibiotics returned to the clinic within one month with persistent symptoms. Amir Azari *et al.*, (2013) conducted a systematic review of diagnosis and treatment of conjunctivitis, including various antibiotics and alternatives to antibiotic use for infectious conjunctivitis, as well as the use of antihistamines and mast cell stabilizers for allergic conjunctivitis.

Nakul Shekhawat *et al.*, (2017) studied antibiotic prescription fills for acute conjunctivitis among enrollees in a large state managed care network. The study found that, compared to whites, blacks and Latinos had lower odds of filling antibiotic prescriptions, although these odds did not differ for persons at risk of developing infections. Remco Rietveld *et al.*, (2007) conducted a study of general practitioners and their results from the second National Survey. This survey showed that 5,213 cases of conjunctivitis were presented to a population of 275,899 resulting in a rate of 13.9 per 1000 person-years. Sheikh and Hurwitz, 2006 studied the efficacy of antibiotics versus placebo for acute bacterial conjunctivitis. They concluded that there were concerns about the clinical benefit of antibiotic therapy for this condition. Their review included five trials involving 1034 participants.

Solano and Fu, 2022 found that sequelae of viral conjunctivitis are rare in the long-term, but chronic cases can lead to decreased quality of life. Hashmi and Gurnani, 2021 noted that severe bacterial infections can cause keratitis, corneal ulceration, perforation, and even blindness. Prajna *et al.*, (2023) conducted a prospective study in November 2022 at the Aravind Eye Clinic in Madurai, India, to identify pathogens associated with the 2022 conjunctivitis outbreak in Tamil Nadu. Their study revealed co-circulation of Coxsackie virus A24v and HAdV-D, with similar clinical findings among affected patients.

CONCLUSION:

This investigation of conjunctivitis cases in Tirunelveli District from January to December 2022 found a high prevalence during November and December. Of the total cases, 53.9% were males and 46.4% were females affected. The most affected age group was 16-60 years at 59.7% of cases. Allergic conjunctivitis was the most common type overall, representing 45.3% of cases. Among infectious causes, bacterial conjunctivitis predominated. Chi-square tests found no significant association between gender and type of conjunctivitis. Additionally, there was no significant difference in the distribution of affected eyes between genders. These findings highlight the prevalence of conjunctivitis within this specific population and environment. Additional research into the causes, risk factors, prevention, and treatment of conjunctivitis is necessary. Consistent surveillance is essential for monitoring trends over time.

Conflict of Interest

The author declares no conflict of interest, financial or otherwise.

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