

A Study on an Outbreak of Acute Conjunctivitis in a Tertiary Eye Care Centre of Eastern Odisha

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Abstract

Background: Viral conjunctivitis is an infectious condition that affects the conjunctiva. It is primarily caused by adenoviruses, but other viruses, including enteroviruses, herpes simplex virus (HSV), and varicella-zoster virus (VZV), are also responsible. It is highly contagious and often spreads in settings such as schools, daycare centres, and workplaces. The condition presents with redness, itching, tearing, and discharge, often accompanied by foreign-body sensation in the eye. Diagnosis is largely clinical. Viral conjunctivitis is a self-limiting condition that requires appropriate management to alleviate symptoms and minimise transmission.

Method: This observational hospital-based study included 157 eyes of 100 consecutive patients diagnosed with viral conjunctivitis at a Tertiary Care Hospital, and were evaluated for viral etiologies, severity, and systemic associations.

Results: In our study, the maximum number of patients (27.00%) were 20-30 years of age group with a Mean $\pm$ SD of 34.41 ± 15.4 . There were more male patients, and bilateral cases were more common. Out of 100 patients, 59 (59.00%) had a history of contact. 9 samples did not yield any significant result. Out of the remaining patients, 15/91 patients were positive for both adenovirus and enterovirus, whereas 19/91 patients were also accompanied by other viruses, namely, VZV, HSV, RSV, etc. This study depicts the predominance of multiple viruses as etiological agents in a single patient of viral conjunctivitis. Focussing on the association of systemic features with viruses, fever and diarrhoea were associated mostly with enterovirus and adenovirus, and RTI, being the most common systemic association, was more common with Adenovirus and RSV.

Keywords: Viral conjunctivitis, adenoviral conjunctivitis, contagious, frequent hand washing, polymerase chain reaction.

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Introduction

Viral conjunctivitis is the most common overall cause of infectious conjunctivitis, and it is usually secondary to inoculation of the ocular surface with the adenoviruses.[1] The most frequent manifestation of ocular adenoviral infection is epidemic keratoconjunctivitis, followed by pharyngoconjunctival fever.[2]

Symptoms of viral conjunctivitis include redness, swelling, photophobia, tearing, and irritation,

which often last for one to three weeks.[3] Adenovirus is highly contagious and may occasionally spread in classrooms or offices. This virus is usually spread by the use of contaminated ophthalmic instruments and eye solutions, hand-to-eye contact with infected personnel, swimming pools, or fomites in close-contact situations.[4] Preventative measures, such as frequent handwashing, avoiding touching the eyes, and maintaining proper hygiene, can reduce the risk of

infection. Diagnosis is often based on clinical symptoms. PCR, direct immunofluorescence, and rapid antigen detection immunoassays may be used to diagnose conjunctivitis.[3]

Much evidence has proven that PCR is the best standard method to diagnose viral conjunctivitis.[6] Rapid diagnostic tests are now being used to decrease unnecessary antibiotic use.[3] Most cases of epidemic conjunctivitis resolve independently within a week or two. Treatment for viral conjunctivitis is supportive in general,[4] with artificial tears and cold compresses that can alleviate discomfort.

In severe cases or those caused by bacteria, antibiotics may be prescribed. Detailed evaluation of the patients was done in a pre-formatted proforma, including detailed patients' history and any other associated systemic diseases.

This review underscores the common aetiologies of viral conjunctivitis, the severity of conjunctivitis with viral aetiologies, and to find out the association of systemic features with viral aetiologies.

Aims and Objectives

- Describe the common aetiologies of viral conjunctivitis in this epidemic
- To find out the association of the severity of conjunctivitis with viral aetiologies
- To find out the association of systemic features with viral aetiologies

Materials Methods

This is a cross-sectional, observational hospital-based study that included 157 eyes of 100 patients presenting with symptoms of viral conjunctivitis to the ophthalmology OPD at Tertiary Care Hospital in the months of July and August 2023. The study followed ethical guidelines and patients were included in the study only after informed consent.

Detailed information from each patient was collected, which included age, sex, symptoms of conjunctivitis like watering, foreign body sensation, redness, photophobia, contact history, and any kind of systemic symptoms. Visual acuity was assessed by the Snellen's chart.

Detailed examination of the anterior segment was done using a slit lamp. A conjunctival sample was collected and sent for viral culture (PCR) from all consecutive cases of conjunctivitis. In unilateral cases, samples were collected from the same eye, and in bilateral cases, samples were taken from the more severely affected eye. Patients were advised to frequently wash their hands, avoid rubbing their eyes, and avoid sharing towels and linens. Mild cases were observed. Moderate cases were treated with lubricants (carboxymethyl cellulose),

antibacterial eye drops (moxifloxacin), and topical low-strength steroids (loteprednol). In severe cases, along with topical medications, we added systemic medications like NSAIDs and antimicrobials.

Sample Selection: 100 consecutive patients who presented with symptoms of viral conjunctivitis in July and August 2023, to the ophthalmology OPD at Tertiary Care Hospital, Odisha, were included.

Sample Size: 100 patients.

Inclusion Criteria

- Patients who presented with symptoms such as redness, watering, itching, discharge, and irritation of the eyes.
- Patients of age >5 years presenting with symptoms of conjunctivitis
- Patients who agreed to be a part of the disease

Exclusion Criteria

- Patients aged <5 years presenting with symptoms of conjunctivitis
- Patients previously diagnosed with vernal keratoconjunctivitis
- Patients with other ocular diseases mimicking viral conjunctivitis, like episcleritis or scleritis.
- Patients who have undergone any ocular surgery or any recent trauma
- Patients who were unwilling for conjunctival swab collection.

Statistical Analysis: The presentation of the Categorical variables was done in the form of number and percentages (%). On the other hand, the quantitative data were presented as the means $\pm$ SD and as median with 25th and 75th percentiles (interquartile range). The data normality was checked by using the Shapiro-Wilk test. The following statistical tests were applied to the results:

The data entry was done in the Microsoft EXCEL spreadsheet, and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0.

1. The association of the variables, which were quantitative in nature were analysed using an independent t-test.
2. The association of the variables, which were qualitative in nature, were analysed using the Chi-Square test. If any cell had an expected value of less than 5 then Fisher's exact test was used. The data entry was done in the Microsoft EXCEL spreadsheet, and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0. p-value

of less than 0.05 was considered statistically significant.

Results and Observations

The study was conducted in the tertiary eye care centre, Odisha. 100 diagnosed cases of age >5 years with symptoms of conjunctivitis were included in the study. Common aetiologies of viral conjunctivitis were assessed, and the results are as follows. Age distribution (chart 1) of the study

subjects was as follows: 27 (27.00%) cases were aged 21 to 30 years, 18 (18.00%) were aged 41 to 50 years, 17 (17.00%) were aged 31 to 40 years, 16 (16.00%) were aged 11 to 20 years, 10 (10.00%) were aged 51 to 60 years, 8 (8.00%) were aged 61 to 70 years and 4 (4.00%) were aged 6 to 10 years. Mean $\pm$ SD age was 34.41 ± 15.4 years with a median (25th–75th percentile) of 32 (22.75–46) years.

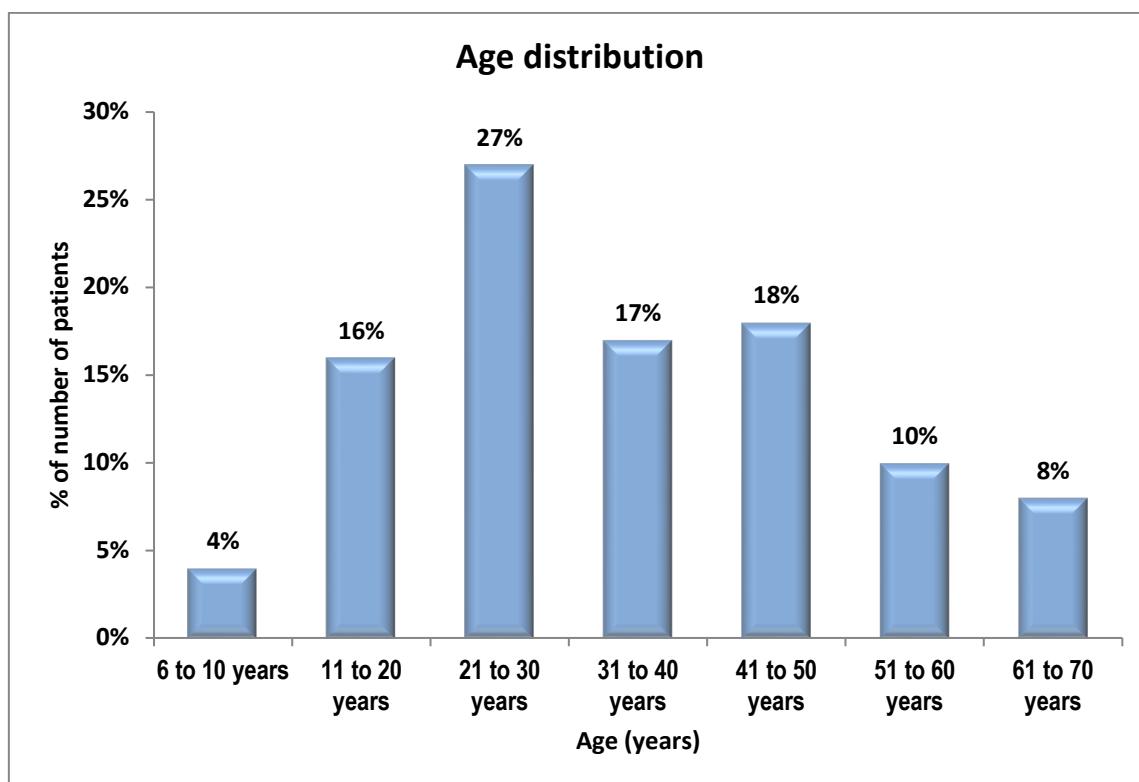


Figure 1: Age distribution.

In this study, 69 (69.00%) patients were males, and 31 (31.00%) patients were females. Laterality distribution of the study subjects was as follows: 57 (57.00%) cases were bilateral, and 43 (43.00%) cases were unilateral. In this study, out of the total eyes involved (157 - including two eyes for bilateral cases and one eye for unilateral cases), 83 (52.87%) were right eyes, and 74 (47.13%) were left eyes. Out of 100 patients, 59 (59.00%) had a history of contact, and 41 (41.00%) had no history of contact. Out of the total 157 eyes examined, 115 (73.25%) eyes had discharge, of which 69 (43.95%) eyes had watery discharge, 36 (22.93%) had mucoid discharge, and 12 (7.64%) had purulent discharge. BCVA distribution of the study subjects was as follows: 63 (40.13%) eyes had 6/6 vision, 60 (38.22%) had 6/9, 24 (15.29%) had 6/12, 6 (3.82%) had 6/18, 3 (1.91%) had 6/24 and 1 (0.64%) had 6/36. Ocular symptoms and signs distribution of the study subjects was as follows:

157 (100%) eyes had conjunctival congestion and papillofollicular reaction each, 146 (93.00%) had foreign body sensation, 129 (82.00%) had chemosis, 126 (80.00%) had itching, 58 (37.00%) had punctate hemorrhage, 55 (35.00%) had pain, 47 (30.00%) had matted lashes, 41 (26.00%) had lid swelling, 33 (21%) had photophobia, 26 (17.00%) had subconjunctival hemorrhage and 1 (0.60%) had corneal involvement. Severity distribution (chart. 2) of the study subjects was as follows: 53 (33.76%) had mild conjunctivitis /grade 1 (conjunctival congestion + papillofollicular reaction), 76 (48.41%) eyes had moderate conjunctivitis/ grade 2 (conjunctival congestion + papillofollicular reaction + chemosis) and 28 (17.83%) had severe conjunctivitis/ grade 3 (conjunctival congestion + papillafollicular reaction + chemosis + lid edema/subconjunctival hemorrhage). Figure 1 shows images with different grades of conjunctivitis.

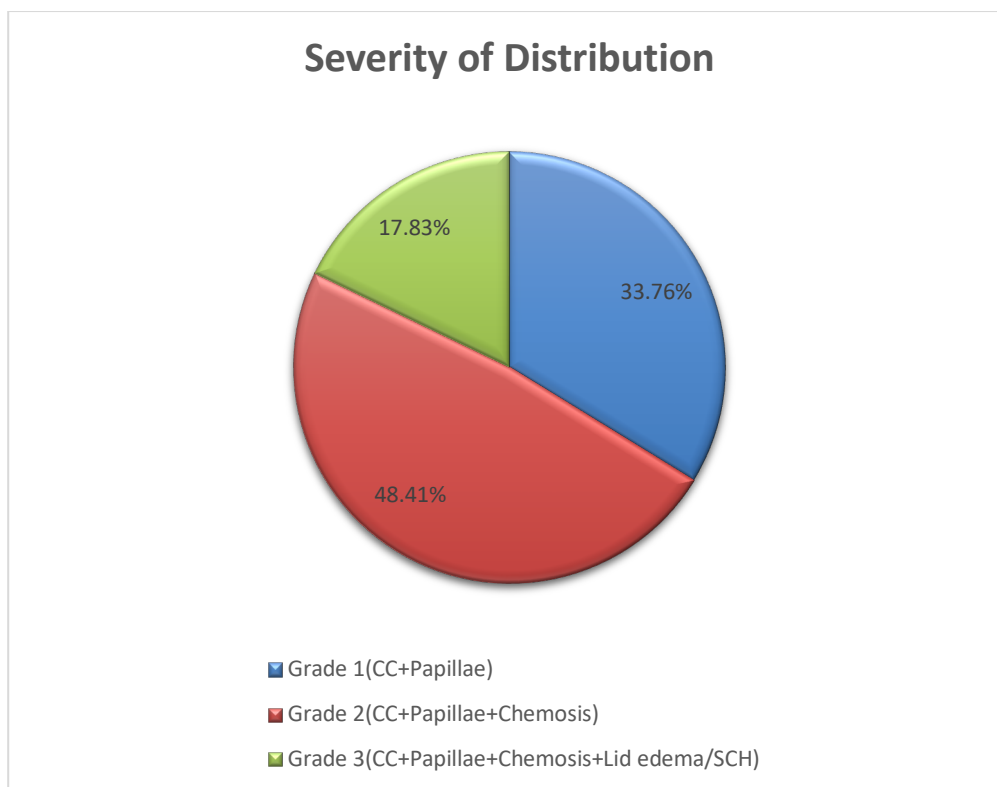


Figure 2: Severity distribution.

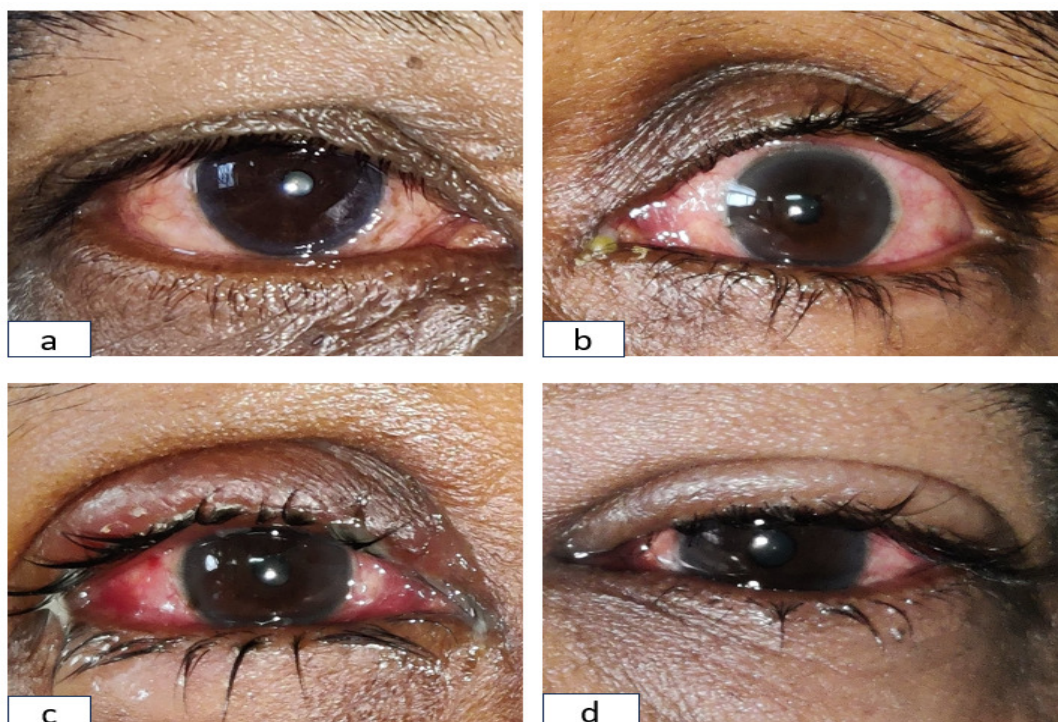


Figure 3. (a) Shows grade 1 conjunctivitis, (b) shows grade 2 conjunctivitis, (c) and (d) show grade 3 conjunctivitis

Viral Aetiologies: Out of the 100 samples tested, 91 samples were found to be positive for viral etiology, whereas 9 samples were found to be negative for viral etiology. Enterovirus was the sole viral etiology identified in 15 out of 91 cases,

whereas adenovirus was the sole etiology noted in 4 out of 91 cases.

Most of the other cases were of mixed etiologies. Adenovirus and enterovirus were the two most common viral etiologies noted, which combinedly were found in 15 samples. Whereas in 19 other

samples, the other viruses were detected along with these two, namely varicella zoster Virus (VZV - 14 cases), Respiratory syncytial virus (RSV - 4 cases), HHV-6 (3 cases), HHV-7 (4 cases), and CMV (3 cases) (Figure 3). Besides this, Enterovirus, along with other viruses (VZV, RSV, HHV-6, HHV-7, CMV), excluding adenovirus, were detected in 15

cases. Similarly, Adenovirus, along with other viruses like VZV, RSV, HHV 6, HHV 7, CMV, excluding Enterovirus, were found in 17 cases. VZV, RSV, and HHV-7 were also depicted as the sole etiological agent in 3, 1, and 1 case, respectively.

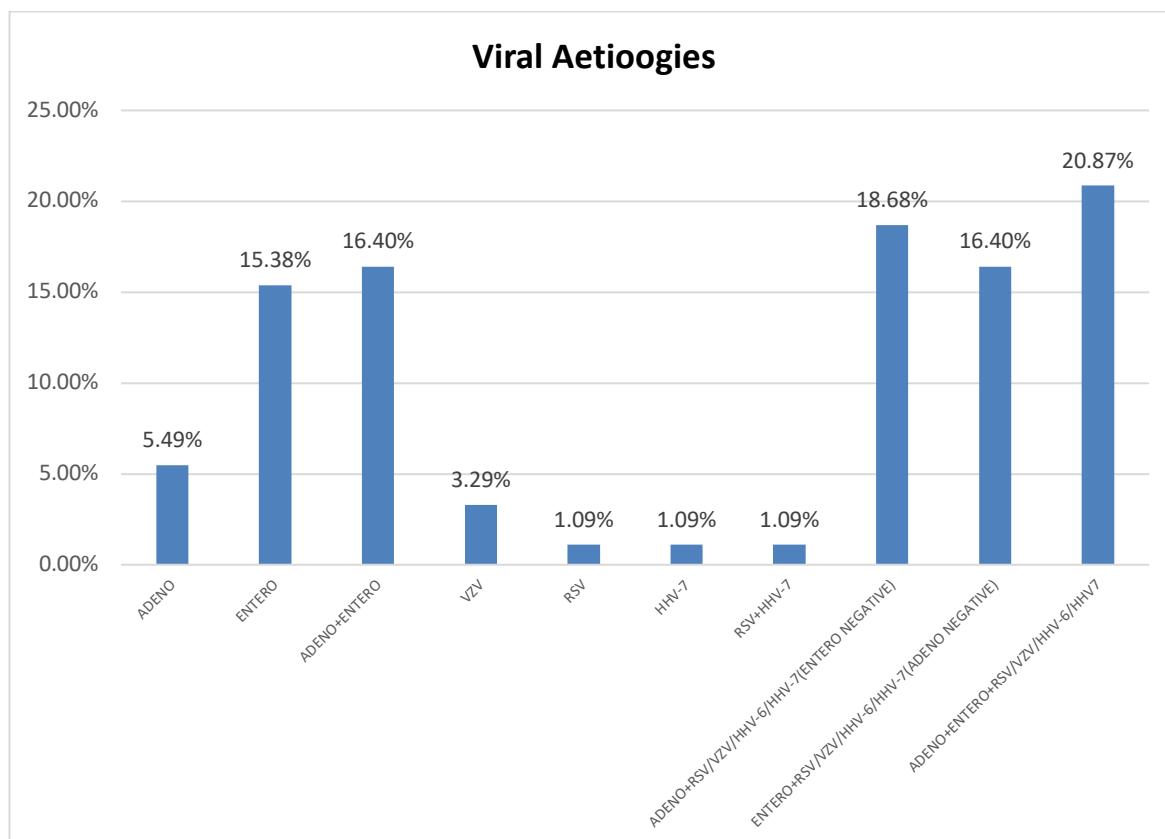


Figure 3. Shows viral aetiologies

Association of severity with viral Aetiologies:

Compared to Adenovirus-negative patients, Adenovirus-positive patients had comparable distribution of severity: Grade 1 (17.86% in positive group vs. 15.91% in negative group), Grade 2 in 51.79% vs. 61.36%, and Grade 3 in 30.36% vs. 22.73% (p value = 0.61).

Compared to Enterovirus-negative patients, Enterovirus-positive patients had comparable distribution of severity: Grade 1 (15.63% in positive group vs. 19.44% in negative group), Grade 2 in 54.69% vs. 58.33%, and Grade 3 in 29.69% vs. 22.22% (p value = 0.695).

Compared to Varicella Zoster Virus-negative patients, Varicella Zoster Virus-positive patients had comparable distribution of severity: Grade 1 (19.51% in positive group vs. 15.25% in negative group), Grade 2 in 51.22% vs. 59.32% and Grade 3 in 29.27% vs. 25.42% (p value = 0.714). Compared to RSV-negative patients, RSV-positive patients had a comparable distribution of severity: Grade 1 (30% in positive group vs. 13.75% in

negative group), Grade 2 in 35% vs. 61.25%, and Grade 3.

Association of systemic features with viral Aetiologies (chart 4):

Considering fever, 28.57% Adenovirus positive samples, 28.13% Enterovirus positive samples, 31.71% VZV positive samples and 20.00% RSV positive samples were found to be associated with patient having fever at the presentation; whereas 31.82% adenovirus negative samples, 33.33% Enterovirus negative samples, 28.81% VZV negative samples and 22.50% RSV negative samples were also found to be associated with patients having fever, demonstrating that a certain percentage of all these viruses contributed to fever as an associating symptom, but as it has been already mentioned, most of the samples had evidence of mixed infection, none had statistically significant correlation with fever. Considering diarrhoea, 21.43% Adenovirus positive samples, 20.31% Enterovirus positive samples, 19.51% VZV positive samples and 10.00% RSV positive samples were found to be associated diarrhoea, but at the same time, 22.73% adenovirus negative samples,

26.05% enterovirus negative samples, 23.73% VZV negative samples and 25.00% RSV negative samples were also associated with diarrhoea. This result does not demonstrate the specific role of any virus in causing diarrhoea. Considering Respiratory Tract Infection (RTI), 56.36% Adenovirus positive samples, 39.06% enterovirus positive samples, 51.22% VZV positive samples and 70.00% RSV

positive samples were found to be associated with patients having RTI, whereas 36.64% adenovirus negative samples, 63.89% Enterovirus samples, 45.76% VZV negative samples and 42.86% RSV negative samples were also associated with RTI, demonstrating clinically significant role of adenovirus and RSV in causing RTI.

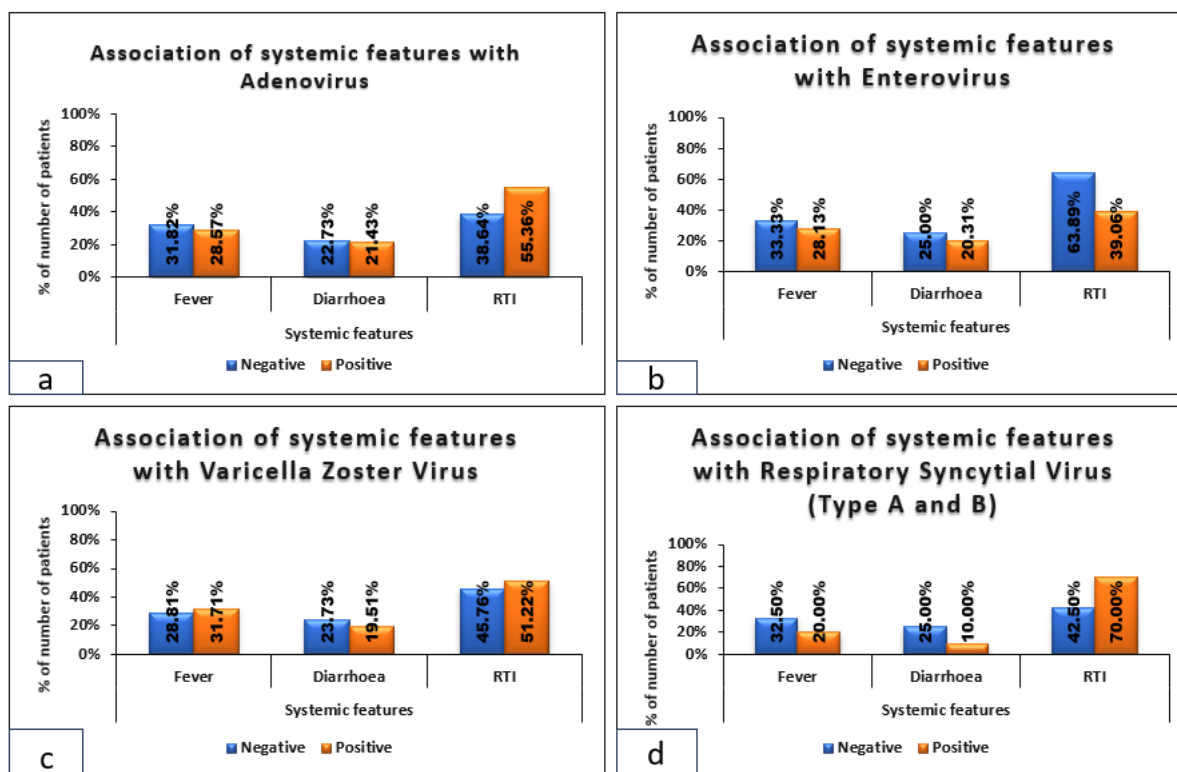


Figure 4: Association of systemic features with viral Aetiologies

Discussion

During July–August 2023, with the onset of the monsoon, an outbreak of conjunctivitis swept across India. [7] In our study, the largest number of patients (27.00%) were in the 20-30-year age group. The Mean $\pm$ SD age was 34.41 ± 15.4 years with a median (25th–75th percentile) of 32 (22.75–46) years. Various studies conducted in India and abroad also mention their mean age group to be between 25 – 30 years of age.[8,9,10,] In this study, there were more male patients than female patients, and bilateral cases were more common than unilateral, which also coincides with the results of studies conducted by Paul TJ et al, Aishwarya A et al [9,10]. In this study, we found that most of the patients were workers or homemakers. The highly contagious nature of these viruses has been known and documented in the literature for a long time. This is because of the ability of the viruses to remain alive on surfaces for longer periods of time, which increases the contagiousness of the disease as well as accentuates the risk of nosocomial infections.[12,13] Increased outdoor temperature also contributes to the rapid

transmission of infection.[14] Out of 100 patients, 59 (59.00%) had a history of contact.

Most of the previous studies on viral conjunctivitis quote Adenovirus as the most common aetiology. [11,17] Consequently, some recent studies document a surge of Coxsackie A24 virus from the collected samples. [8,18] Viral aetiology distribution of the study subjects showed enterovirus was more common, followed by adenovirus, and varicella zoster virus. Additionally, as shown in the results, most cases in our study were of mixed viral origin, indicating a significantly greater number of mixed viral infections than single viral infection cases. In this study, 15/91 cases were positive for both adenovirus and enterovirus, whereas 19/91 cases were also accompanied by other viruses, namely, VZV, HSV, RSV, etc. None of the studies conducted in the past show similar results of such a large number of cases having such a mixed viral aetiology. A majority of the patients in the study were discharged. Along with it most had conjunctival congestion, chemosis, and papillofollicular reactions, revealing grade 2/

moderate conjunctivitis as the more common presentation (76 eyes), followed by grade 1/ mild conjunctivitis (conjunctival congestion and papillae/follicles, 53 eyes). Lid oedema or subconjunctival haemorrhages were observed in grade 3 or severe cases (28 eyes). Grade 2 was more common in Adeno-negative patients, and grades 1 and 3 were more common in the Adeno-positive group. Similar trends were observed in the VZV group, like that of the adenovirus. Similarly, grades 1, and 2 were common in the Enterovirus negative group, and grade 3 was more common in the Enterovirus positive group. The study by Aishwarya et al [10] had shown a significantly larger number of cases having lid oedema and subconjunctival hemorrhages than our study, although both the studies coincide with respect to other signs. Besides, in our study also, only a single case had keratitis, whereas the study by Aishwarya et al depicted none. [10]

Focussing on the association of systemic features with viruses, mostly Adenovirus (12/91) and Enteroviruses (12/91) were found to be associated with fever in our study. While very few studies have depicted the association of systemic illness with conjunctivitis, Huy et al [8] in their study also reported 17%, 21%, and 13 % of cases to be associated with sore throat, running nose, and cough, respectively. Considering diarrhoea, 22 cases were suffering from diarrhoea, which was also associated mostly with enterovirus and adenovirus, whereas Huy et al [8] have reported only a single case (4%) to be suffering from diarrhoea. Surprisingly, 48/91 cases were suffering from RTI, of which Adenovirus and RSV were reported as the most important aetiology (p value<0.05), with RTI being the most common systemic association of the outbreak of conjunctivitis.

Conclusion

Viral conjunctivitis is a highly contagious eye infection typically caused by adenoviruses, although other viruses can also be responsible. The condition is characterized by symptoms such as eye redness, irritation, excessive tearing, and a gritty feeling, often accompanied by a cold or respiratory symptoms. While it is usually self-limiting and resolves within 1–2 weeks.

While previously Adenovirus were depicted as the main etiology in viral conjunctivitis epidemics, now enterovirus and adenovirus, both act as the main etiological factor, along with mixed viral etiologies which also play a very crucial role. Treatment is primarily symptomatic. Supportive measures like cold compresses, artificial tears, and proper hygiene practices are key to managing the condition. This study also emphasizes the correlation of severity of conjunctivitis with viral

etiologies, with adenovirus, enterovirus and RSV being the common ones detected. Systemic features like respiratory tract infection seems to be mostly due to RSV whereas fever and diarrhoea mostly due to adenovirus and enterovirus. Preventing the spread of the virus is crucial. viral conjunctivitis remains a significant public health concern with implications for individual and community health. Continued efforts to improve diagnostic accuracy, optimize treatment strategies, and implement preventive measures are essential in mitigating the burden of this common ocular condition.

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