INTRODUCTION

Vernal keratoconjunctivitis (VKC) is a chronic, bilateral, and recurrent allergic conjunctivitis that exhibits a predilection for young males. It demonstrates a higher prevalence in regions characterized by humid, hot climates, with high allergen exposure. It manifests with itching, light sensitivity, burning sensations, and tearing. The three main clinical forms include limbal or bulbar, palpebral or tarsal, and mixed presentations. Aims and Objectives: This study aimed to describe the clinical patterns of VKC in children at a tertiary care hospital in Andhra Pradesh. Materials and Methods: This cross-sectional observational study was conducted in a hospital setting at the Department of Ophthalmology, SV Medical College in Tirupati, Andhra Pradesh, between January 2021 and January 2022. Ninety children aged 5–12 years with symptoms of allergic conjunctivitis were enrolled in the study. The Bonini grading system was used to grade the severity of the disease based on clinical manifestations at the time of initial presentation. Results: Mean age of disease onset was 8.6 ± 2.3 years, with a male-to-female ratio (M: F) of 2.1:1. The majority of the subjects experienced seasonal occurrence 69 (77.0%), whereas 21 (23%) had perennial occurrence. The commonly reported symptoms included itching (83%), redness (73%), watering (73%), and discharge (47%). A significant number of patients (60, 69%) had a mixed type of disease that affected both the tarsal and bulbar conjunctiva. Conclusion: VKC predominantly affects young males, displaying a seasonal distribution and showing less allergic association, consistent with patterns observed in other tropical regions. Most patients had mild VKC at presentation, and a mixed-form pattern was most frequently observed. Key words: Allergic disease; Itching; Papillae; Vernal keratoconjunctivitis
and pigmentation; and mixed, combining features from both.\(^4\)

VKC can lead to complications including irregular astigmatism, keratoconus, corneal ulcers, and dry eye syndrome. Corneal involvement may be primary or secondary due to the extension of limbal lesions. Vernal keratopathy complications include punctate epithelial keratitis, ulcerative keratitis, vernal corneal plaques, subepithelial scarring, and pseudogerontoxon.\(^5\) Most of the time, VKC follows a benign and self-limiting clinical course, with normal vision. However, 10% of cases involve a subset of patients experiencing very debilitating and vision-threatening corneal complications, especially in severe and persistent cases, with possible iatrogenic side effects that may be evident in adulthood, such as blindness or impaired vision.\(^6,7\) The impact on the quality of life of affected children is substantial, as they find themselves restricted in engaging in preferred activities to prevent exacerbation of their condition.\(^4\)

This study aimed to describe the clinical profile of VKC in children attending the ophthalmology department at SVRRGGH, Tirupati. The objectives of this study were to describe the clinical variant of VKC and its severity to VKC in children.

**Aims and objectives**

To study the clinical profile of VKC in children attending the ophthalmology department at SVRRGGH, Tirupati. To evaluate the clinical variant of VKC and its severity to VKC in children.

**MATERIALS AND METHODS**

The present observational cross-sectional study was conducted on 90 children in the department of ophthalmology at the S.V. Medical College, SVRRGGH, Tirupati, Andhra Pradesh, India, for 1 year between January 2021 and January 2022. The approval was obtained from the Institutional Ethical Review Board of the study institute before the beginning of the study. Informed written consent was obtained from the parents or legally authorized individuals of the included children, provided in their vernacular language, after a comprehensive explanation of the study.

**Inclusion criteria**

Children aged between 5 and 12 years who visited the ophthalmology department of SVRRGG Hospital in Tirupati with symptoms including itching, redness, watering, photophobia, and ropy discharge (indicative of VKC) were included in the study.

**Exclusion criteria**

Contact lens wearers and those with other causes of allergic conjunctivitis were excluded from the study.

The data collection procedure involved recording the relevant details of the patient’s history and clinical examination of a specifically designed pro forma. These details included age, sex, history of allergies, the occurrence of symptoms (seasonal or perennial), age at disease onset, presenting complaints, and ophthalmic examination details such as visual acuity using a snellen’s chart, slit-lamp evaluation for characteristic clinical features, fundus examination, and complications. Fluorescein staining was performed in cases with corneal involvement. Tear film break-up time, Schirmer’s test, keratometry, and measurement of intraocular pressure were conducted in all cooperative children.

Based on clinical presentation, patients were categorized as having palpebral VKC (cobblestone papillae >1 mm on upper eyelid, no limbal changes), limbal VKC (papillae <1 mm on upper eyelid with limbal infiltration), or mixed VKC (combining features of both). VKC severity was initially graded using the Bonini et al., method: Grade 0 (no symptoms), Grade 1 (symptoms but no light sensitivity), Grade 2 (symptoms and light sensitivity), Grade 3 (symptoms and mild-moderate corneal inflammation), and Grade 4 (widespread corneal inflammation and/or ulcers).\(^8\)

**Statistical analysis**

The data of each participant were recorded on a data capture sheet, including consent details. For quantitative data, mean and standard deviation was used whereas for qualitative data, number and percentage were used to present the data. SPSS version 22 software was used for statistical analysis.

**RESULTS**

The mean age of the disease presentation was 8.6±2.3 years, and the male-to-female ratio (M:F) was 2:1.1. Socioeconomic status distribution revealed that 57 out of 90 patients (63.3%) had upper-middle socioeconomic status, followed by 18 out of 90 (20%) in the lower-middle category, based on revised B.G Prasad’s socioeconomic status classifications based on per capita monthly income.\(^9\) The majority of subjects experienced seasonal occurrence 69 (77%), whereas 21 (23%) had perennial occurrence.

In the present study, 13 patients (14%) had a positive history of allergic disorders, out of which a family history of atopy was present in four patients (4.4%), and nine had a positive personal history of allergic diseases, including...
respiratory allergies in six (allergic rhinitis and asthma) (6.7%) and eczema in the three patients (3.3%) (Table 1).

The commonly reported symptoms included itching (83%), redness (73%), watering (73%), and discharge (47%) (Table 2).

In the present study, it was observed that the most prevalent signs were upper tarsal papillae (91.1%), followed by conjunctival congestion 71 (78.9%), limbal papillae 38 (42%), and gelatinous limbal thickening 26 (28.9%). Trantas dots were present in 3.3% of subjects (Table 3). The majority (60; 69%) had a mixed variant of VKC affecting the palpebral and limbal areas, a distinct limbal form in 4 patients (4%), and a palpebral form in 26 patients (31%).

The distribution of subjects with VKC proportional to disease severity is shown in Table 4. The severity grading of VKC revealed that most subjects (52 patients, 57.8%) had Grade 1 features. Grade 2a included 31 patients (34.4%), while Grade 2b and Grade 3 included three patients each (3.3%). Only 3 patients, that is, a total of 3.3% of patients showed positive fluorescence staining. About 25% of the participants (27 of 90) exhibited symptoms of dry eye. In addition, one patient developed a shield ulcer and two patients demonstrated elevated keratometry readings. The latter were recommended to undergo corneal topography; however, these patients did not attend the subsequent visits (Table 4).

**DISCUSSION**

VKC is a common recurrent allergic inflammation that affects both eyes and involves an IgE-mediated mechanism, primarily observed in children and young adults in their first two decades of life. The onset typically occurs after 5 years of age, and the condition tends to resolve around puberty, with persistent cases rarely extending beyond 25 years of age. This study involved 90 children aged 5–12, with a male-to-female ratio of 2.1:1. The age at presentation was 8.6±2.3 years, ranging from the youngest patient at 5 years to the oldest at 12 years. A study by Saboo et al., reported an average age of presentation of 12 years, with 12% of patients being older than 20 years, indicating adult-onset cases.

Other studies have also reported a small percentage of VKC cases in individuals aged >20 years. The male preponderance observed in the present study aligns with the VKC pattern across the world. VKC exhibits seasonal exacerbations; however, a perennial and persistent form has also been described. In our study, the majority of patients experienced seasonal occurrence 69 (77%), while 21 (23%) had perennial symptoms. A positive history of allergy was noted in 14% of the patients. In a retrospective study of VKC by Saboo et al., 36% of patients exhibited chronic perennial disease, and only 4.91% had a history of allergies. It varies from other studies, such as Bonini et al., and Lambiase et al., where associated systemic allergies were reported in 41.5–48.7%
of patients in temperate zones.\textsuperscript{1,14} Tuft et al., also observed distinctions in the clinical characteristics of VKC between tropical and temperate countries. Their findings revealed a higher prevalence of chronic perennial diseases in tropical regions and a reduced association with atopy.\textsuperscript{11,15,16} Regional differences, including climatic conditions, may have contributed to these variations.

Symptomatically, the patients in our study reported classical VKC symptoms, including itching, redness, watering, and foreign body sensation. Ocular itching was predominant in 83% of cases. The clinical features included papillae on the upper palpebral conjunctiva (91.1%), conjunctival congestion (78.9%), and limbal papillae (42.2%). Superficial punctuate keratitis (3.3%) and Horner–Tranta spots (3.3%) were less common. 69% had a mixed form of the disease involving both the limbal and tarsal areas. The prevalence of VKC subtypes exhibits global variability, as indicated in various studies. In temperate zones, palpebral forms are more often observed, whereas in Asia and Africa, mixed and limbal forms tend to be more prevalent, demonstrating geographic diversity.\textsuperscript{4,6,17}

In the present study, mild VKC was the most common presentation (57.8%), followed by moderate VKC (37.7%). Similar findings were reported by Singh et al., 49.6% of the patients presenting with a moderate intermittent form of the disease as the most common form, followed by mild intermittent (25.9%) and moderate persistent (17%).\textsuperscript{18} Severe cases and related complications were infrequent, possibly due to the young age group (5–12 years) of the study population and self-resolution of the disease by puberty. Complications were more likely to occur in persistent cases, as explained by Saboo et al.\textsuperscript{11} Quiescent cases were not reported in the present study, which might be attributed to the improbability of parents to bring their children to the hospital for asymptomatic cases. Consequently, these grades of VKC were not necessarily recorded in hospital data.

**Limitations of the study**

The limitation(s) of the study was its confined focus on a tertiary care center, suggesting that the data could not replicate the attributes of individuals treated in community centers. Conducting a population-based study to estimate the likelihood of children being affected by VKC at a given moment provides valuable insights into the high prevalence of the disease and its implications for health-care services.

**CONCLUSION**

Our study confirms patterns observed in other tropical regions, demonstrating that VKC primarily affects young males and exhibits seasonal variation with a potentially weaker link to allergies. The mixed form was the most prevalent clinical presentation, with most patients displaying mild-grade VKC. Diagnosis relies on clinical examination, including patient history and characteristic signs and symptoms. Utilizing established grading scales is crucial for standardized severity assessment and guiding treatment. Assessing for dry eye and implementing ongoing monitoring are essential for preventing vision-threatening complications in VKC.

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Roopa, et al.: Clinical pattern of vernal keratoconjunctivitis in children

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