

Clinical pattern of vernal keratoconjunctivitis in children – A cross-sectional study



Roopa K¹, Ramalakshmi Badugu², Sree Lakshmi Pallamreddy³, Suhasini J⁴

^{1,4}Resident, ^{2,3}Assistant Professor, Department of Ophthalmology, Sri Venkateshwara Medical College, Tirupati, Andhra Pradesh, India

Submission: 15-05-2024

Revision: 23-05-2024

Publication: 01-07-2024

ABSTRACT

Background: Vernal keratoconjunctivitis (VKC), a chronic and bilateral allergic eye condition, predominantly affects young males and is more prevalent in hot, humid regions 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

Access this article online

Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v15i7.65894

E-ISSN: 2091-0576

P-ISSN: 2467-9100

Copyright (c) 2024 Asian Journal of Medical Sciences



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

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, and elevated concentrations of airborne allergens, such as the Mediterranean, South America, India, and Central Africa.^{1,2} VKC manifests as a perennial form in 23% of cases, with over 60% of cases experiencing recurrence in winter. Approximately 16% progress from the seasonal to a chronic form after approximately 3 years, suggesting that the longer the patients suffer from VKC, the more they develop a persistent form.¹ Predominant ocular symptoms of the disorder include itching, photophobia,

burning, and tearing, while signs involve papillae on the upper palpebral conjunctiva, aggregates of eosinophils and degenerated epithelial cells at the limbus (Trantas' dots), and pronounced conjunctival redness.³ Chronic cases may induce subconjunctival fibrosis, symblepharon, and conjunctival keratinization.¹

VKC presents clinically with papillary hypertrophy, bulbar conjunctival pigmentation, limbal thickening, ropy discharge, and Horner–Trantas dots. Manifestations categorize into three forms: Limbal or bulbar, palpebral, and mixed. Limbal form, featuring gelatinous limbal thickening, limbal papillae, and yellow Horner–Trantas dots indicating severity; palpebral, with cobblestone-like papillae on the upper eyelid, often associated with ptosis

Address for Correspondence:

Dr. Sree Lakshmi Pallamreddy, Assistant Professor, Department of Ophthalmology, Sri Venkateshwara Medical College, Tirupati, Andhra Pradesh, India. **Mobile:** 9491538294. **E-mail:** drpsreelakshmi@gmail.com

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

Table 1: Basic characteristics of study subjects

Characteristics	Number	Percentage
Age		
5–6	17	18.9
7–8	25	27.8
9–10	32	35.6
11–12	16	17.8
Gender		
Male	61	67.8
Female	29	32.2
Social class		
II Upper middle	57	63.3
III Middle	18	20.0
IV Lower middle	15	16.7
Occurrence		
Seasonal	69	77
Perennial	21	23
Personal history		
Respiratory Allergies	6	6.7
Eczema	3	3.3
Family history		
Atopy	4	4.4

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

Table 2: Symptoms of study subjects

Ocular signs	Number	Percentage
Itching	75	83
Redness	66	73
Watering	66	73
Discharge	42	47

Table 3: Ocular signs in vernal keratoconjunctivitis

Ocular signs	Number	Percentage
Papillae on the upper palpebral conjunctiva	82	91.1
Conjunctival congestion	71	78.9
Limbal papillae	38	42.2
Peri-limbal gelatinous thickening	26	28.9
Superficial punctate keratitis	03	3.3
Horner tranta's spots	03	3.3
Vernal shield ulcer	1	1.1

Table 4: Severity of vernal keratoconjunctivitis at presentation according to the grading system of Bonini et al.⁸

Severity	Number	Percentage
0 (Quiescent)	0	0
1 (Mild)	52	57.8
2a (Moderate intermittent)	31	34.4
2b (Moderate persistent)	3	3.3
3 (Severe)	3	3.3
4 (Very severe)	1	1.1
5 (Evolution)	0	0

first two decades of life.¹⁰ 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.⁷ 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.¹¹ Other studies have also reported a small percentage of VKC cases in individuals aged >20 years.^{2,12} The male preponderance observed in the present study aligns with the VKC pattern across the world.^{2,5,13}

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.¹¹ 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.^{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.^{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 punctate 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.^{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%).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.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.

ACKNOWLEDGMENT

The authors are acknowledged to all departmental staff of ophthalmology, who are helped a lot in this research work.

REFERENCES

- Bonini S, Bonini S, Lambiase A, Marchi S, Pasqualetti P, Zuccaro O, et al. Vernal keratoconjunctivitis revisited. A case series of 195 patients with long-term followup. *Ophthalmology*. 2000;107(6):1157-1163. [https://doi.org/10.1016/s0161-6420\(00\)00092-0](https://doi.org/10.1016/s0161-6420(00)00092-0)
- Leonardi A, Busca F, Motterle L, Cavarzeran F, Fregona IA, Plebani M, et al. Case series of 406 vernal keratoconjunctivitis patients: A demographic and epidemiological study. *Acta Ophthalmol Scand*. 2006;84(3):406-410. <https://doi.org/10.1111/j.1600-0420.2005.00622.x>
- Bonini S, Bonini S, Schiavone M, Centofanti M, Allansmith MR and Bucci MG. Conjunctival hyperresponsiveness to ocular histamine challenge in patients with vernal conjunctivitis. *J Allergy Clin Immunol*. 1992;89(1 Pt 1):103-107. [https://doi.org/10.1016/s0091-6749\(05\)80046-6](https://doi.org/10.1016/s0091-6749(05)80046-6)
- Sacchetti M, Baiardini I, Lambiase A, Aronni S, Fassio O, Gramiccioni C, et al. Development and testing of the quality of life in children with vernal keratoconjunctivitis questionnaire. *Am J Ophthalmol*. 2007;144(4):557-563. <https://doi.org/10.1016/j.ajo.2007.06.028>
- Tabarra KF. Ocular complications of vernal keratoconjunctivitis. *Can J Ophthalmol*. 1999;34(2):88-92.
- De Smedt S, Wildner G and Kestelyn P. Vernal keratoconjunctivitis: An update. *Br J Ophthalmol*. 2013;97(1):9-14. <https://doi.org/10.1136/bjophthalmol-2011-301376>
- Bonini S, Coassin M, Aronni S and Lambiase A. Vernal keratoconjunctivitis. *Eye (Lond)*. 2004;18(4):345-351. <https://doi.org/10.1038/sj.eye.6700675>
- Bonini S, Sacchetti M, Mantelli F and Lambiase A. Clinical grading of vernal keratoconjunctivitis. *Curr Opin Allergy Clin Immunol*. 2007;7(5):436-441. <https://doi.org/10.1097/ACI.0b013e3282efb726>
- Akram Z, Khairnar MR, Kusumakar A, Kumar JS, Sabharwal H, Priyadarsini SS, et al. Updated B. G. Prasad socioeconomic status classification for the year 2023. *J Indian Assoc Public Health Dent*. 2023;21:204-205. https://doi.org/10.4103/jiaphd.jiaphd_123_23
- Duke RE, Odey F and De Smedt S. Vernal keratoconjunctivitis in public primary school children in Nigeria: Prevalence and nomenclature. *Epidemiol Res Int*. 2016;2016:9854062.

- <https://doi.org/10.1155/2016/9854062>
11. Saboo U, Jain M, Reddy JC and Sangwan VS. Demographic and clinical profile of vernal keratoconjunctivitis at a tertiary eye care centre in India. *Indian J Ophthalmol.* 2013;61(9):486-489. <https://doi.org/10.4103/0301-4738.119431>
 12. Shafiq I and Shaikh ZA. Clinical presentation of vernal keratoconjunctivitis (VKC): A Hospital-based study. *J Liaquat Uni Med Health Sci.* 2009;8:50-54.
 13. Akinsola FB, Sonuga AT, Aribaba OT, Onakoya AO and Adefula-Ositelu AO. Vernal keratoconjunctivitis at Guinness Eye Centre, Luth (A five-year study). *Nig Q J Hosp Med.* 2009;18(1):1-4. <https://doi.org/10.4314/nqjhm.v18i1.44945>
 14. Lambiase A, Minchiotti S, Leonardi A, Secchi AG, Rolando M, Calabria G, et al. Prospective, multicenter demographic and epidemiological study on vernal keratoconjunctivitis: A glimpse of ocular surface in Italian population. *Ophthalmic Epidemiol.* 2009;16(1):38-41. <https://doi.org/10.1080/09286580802573177>
 15. Ukponmwan CU. Vernal keratoconjunctivitis in Nigerians: 109 consecutive cases. *Trop Doct.* 2003;33(4):242-245. <https://doi.org/10.1177/004947550303300419>
 16. Tuft SJ, Cree IA, Woods M and Yorston D. Limbal vernal keratoconjunctivitis in the tropics. *Ophthalmology.* 1998;105(8):1489-1493. [https://doi.org/10.1016/S0161-6420\(98\)98034-4](https://doi.org/10.1016/S0161-6420(98)98034-4)
 17. Smedt SD, Tuft S, Nkurikiye J, Gilbert C, Delanghe J, Fonteyne Y, et al. Vernal keratoconjunctivitis in school children in Rwanda and its association with Socio-economic status: A population-based survey. *Am J Trop Med Hyg.* 2011;85(4):711-717. <https://doi.org/10.4269/ajtmh.2011.11-0291>
 18. Singh A, Rana J, Kataria S, Bhan C and Priya P. Demographic and clinical characteristics of childhood and adult onset Vernal Keratoconjunctivitis in a tertiary care center during COVID pandemic: A prospective study. *Rom J Ophthalmol.* 2022;66(4):344-351. <https://doi.org/10.22336/rjo.2022.61>

Authors Contribution:

RK- Literature survey, implementation of study protocol, and data collection; **RB**- Definition of intellectual content, concept, design, manuscript preparation, editing, and manuscript revision; **SLP**- Design of study, prepared the first draft of manuscript, statistical analysis, submission of article, manuscript revision; **SJ**- Literature survey, coordination and preparation of figures.

Work attributed to:

Sri Venkateshwara Medical College, Tirupati, Andhra Pradesh, India.

Orcid ID:

Dr. Roopa K - <https://orcid.org/0009-0008-7910-8669>
Dr. Ramalakshmi Badugu - <https://orcid.org/0009-0001-6929-8349>
Dr. Sree Lakshmi Pallamreddy - <https://orcid.org/0009-0003-1460-0509>
Dr. Suhasini J - <https://orcid.org/0009-0002-4995-5441>

Source of Funding: Nil, **Conflicts of Interest:** None declared.