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Refractive error in vernal catarrh at tertiary care hospital: a cross-sectional observational study.

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Abstract

Background:

Vernal keratoconjunctivitis (VKC) is a chronic, recurrent allergic disease of the ocular surface that predominantly affects children and adolescents. Limited literature exists on its association with other refractive errors, such as myopia and hypermetropia. Understanding this association is essential to prevent avoidable visual impairment and amblyopia during the critical period of visual development.

Methods:

This hospital-based cross-sectional observational study included children aged 5–18 years diagnosed clinically with VKC. Detailed demographic data and ocular examination findings were recorded. Visual acuity was assessed, intraocular pressure and central corneal thickness were measured, and slit-lamp examination was performed to evaluate conjunctival and corneal changes. Refractive status was assessed using autorefractometry followed by cycloplegic retinoscopy and subjective acceptance. The results were analysed by SPSS software. Data from 100 patients were analysed and expressed as percentages.

Results:

In this study of 100 children, the majority were aged 16–18 years (36%), and males predominated (71%). Bilateral involvement was seen in 32% of cases. Myopia was the most common refractive error (48%), followed by hypermetropia (24%), while 28% were emmetropic. Among myopes, mild myopia was most frequent (45.8%), with similar prevalence between males and females.

Conclusion:

Vernal keratoconjunctivitis is strongly associated with refractive errors, particularly myopia, in children. Routine refractive evaluation should be an integral part of VKC management to ensure early detection and timely correction, thereby improving visual outcomes and quality of life.

Recommendation

This study highlights the need for early detection and timely correction of refractive errors, which are essential to prevent amblyopia, optimize visual development, and improve academic performance and quality of life.

Keywords: *Vernal Keratoconjunctivitis, Refractive Error, Myopia.*
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Introduction and Methodology

Vernal keratoconjunctivitis (VKC) is a chronic, recurrent, bilateral allergic disorder of the ocular surface that predominantly affects children and young adolescents, especially in tropical and subtropical regions. Owing to its chronic and potentially vision-threatening nature, VKC

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remains a significant cause of ocular morbidity in children [1–3].

Childhood represents a critical period for visual development, during which uninterrupted, clear retinal images are essential for normal emmetropization. Refractive errors, particularly myopia and hypermetropia, are among the most common causes of avoidable visual impairment in children. If undetected or inadequately corrected, they may result in amblyopia, poor academic performance, and reduced quality of life [4]. In children with VKC, persistent ocular inflammation, corneal epithelial involvement, and frequent eye rubbing may interfere with normal ocular growth and refractive development.

Several studies have highlighted an increased prevalence of refractive errors in children with chronic allergic eye disease, with myopia and hypermetropia being reported more frequently than in the general pediatric population [7,8]. While astigmatism has been extensively studied in VKC due to its association with corneal changes, the relationship between VKC and other refractive errors remains relatively underexplored. Understanding this association is crucial, as early identification and correction of refractive errors can prevent long-term visual complications.

This study aims to evaluate the association between vernal keratoconjunctivitis as part of comprehensive management in pediatric VKC patients.

METHODOLOGY

Study Design

This was a hospital-based cross-sectional observational study conducted to evaluate the ocular profile and refractive status of patients with Vernal Keratoconjunctivitis (VKC).

Setting

The study was carried out in the Department of Ophthalmology at a tertiary care medical college hospital. The study population comprised patients attending the Ophthalmology Outpatient Department (OPD) with clinical features suggestive of Vernal Keratoconjunctivitis. Data collection was conducted from January 2024 to October 2025. During this period, eligible patients underwent detailed ophthalmic evaluation, including anterior segment examination and refractive assessment.

Participants

Patients aged between 5 and 18 years presenting to the Ophthalmology OPD with ocular features suggestive of Vernal Keratoconjunctivitis were included in the study. Diagnosis of VKC was made clinically based on symptoms and slit lamp findings. Patients not willing to participate or those with other significant ocular pathologies affecting refractive status or corneal assessment were excluded from the study.

Participants were selected consecutively from patients attending the OPD during the study period who fulfilled the inclusion criteria.

Variables

The primary variables assessed included demographic profile, clinical features of VKC, refractive status, intraocular pressure, central corneal thickness, and axial length.

Data recorded included:

- Age and gender of the participants
- Visual acuity measured using Snellen's visual acuity chart
- Intraocular pressure and central corneal thickness measured using a non-contact tonometer
- Slit lamp examination findings under diffuse and oblique illumination
- Presence of papillae on the upper tarsal and lower palpebral conjunctiva
- Axial length measured using B-scan ultrasonography
- Refractive error assessed using autorefractometry, followed by dilated retinoscopy and subjective acceptance

The diagnosis of Vernal Keratoconjunctivitis was based on characteristic clinical findings such as conjunctival papillae, itching, redness, watering, and limbal or tarsal involvement.

Bias

To minimize observer and measurement bias, all patients underwent a standardized ophthalmic examination protocol using the same instruments and examination techniques. Consecutive sampling was used to reduce selection bias.

Study Size

A total of 100 patients fulfilling the inclusion criteria were enrolled during the study period. The sample size was based on the number of eligible patients presenting to the Ophthalmology OPD during the defined study duration.

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Statistical Methods

Data collected from all participants were entered into a database and analyzed using descriptive statistical methods. The findings were presented in the form of percentages and proportions. Quantitative variables were summarized using mean and standard deviation wherever appropriate, and categorical variables were expressed as frequencies and percentages.

Ethical consideration

Ethical approval was not required in the above study.

Results

During the study period from January 2024 to October 2025, all patients aged 5–18 years attending the Ophthalmology Outpatient Department with ocular features suggestive of Vernal Keratoconjunctivitis (VKC) were screened for eligibility. Patients fulfilling the clinical diagnostic criteria for VKC and consenting to participate were included in the study. A total of 100 eligible participants were enrolled and underwent complete ophthalmic evaluation, including visual acuity assessment, slit lamp examination, intraocular pressure measurement, central corneal thickness assessment, axial length evaluation, and refractive error analysis. All enrolled participants completed the required examinations and were included in the final analysis. No participants were excluded after enrolment, and there was no loss to follow-up during the study period.

Table 1. Age and Gender Distribution

Age group	Male (Frequency)	Male (%)	Female (Frequency)	Female (%)	Total (Frequency)	Total (%)
0–5	6	6.0%	2	2.0%	8	8.0%
6–10	22	22.0%	7	7.0%	29	29.0%
11–15	19	19.0%	8	8.0%	27	27.0%
16–18	24	24.0%	12	12.0%	36	36.0%
Total	**71**	**71.0%**	**29**	**29.0%**	**100**	**100%**

Table 2. Laterality

Laterality category	Frequency	% of total
Bilateral	32	32.0%
Unilateral	10	10.0%
Total	**100**	**100%**

Table 3. Refractive Error Categories

Category	Frequency	% of total
Emmetropia	28	28.0%
Myopia	48	48.0%
Hypermetropia	24	24.0%
Total	**100**	**100%**

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Table 4. Myopia Severity

Severity	Frequency	% of myopes
Mild	22	45.8%
Moderate	18	37.5%
Severe	8	16.7%
Total myopes	**48**	**100%**

Table 5. Myopia by Gender

Gender	Myopes (Frequency)	% of that gender
Male	34	47.2%
Female	14	50.0%
Total	**48**	**48.0% of all patients**

Tables

Table 1. Age and Gender Distribution

Among the 100 study participants, males constituted the majority of cases with 71% (n=71), while females accounted for 29% (n=29). The highest number of participants belonged to the 16–18 years age group (36%), followed by the 6–10 years age group (29%) and the 11–15 years age group (27%). The least number of participants were in the 0–5 years age group (8%). Male predominance was observed across all age groups. These findings suggest that VKC with associated refractive errors was more commonly observed in older school-going male children and adolescents in the present study population.

Table 2. Laterality

Among the study participants, bilateral ocular involvement was more common, being observed in 32% of cases, whereas unilateral involvement was seen in 10% of cases. This indicates that VKC and associated refractive changes predominantly affected both eyes rather than a single eye, consistent with the bilateral nature of allergic ocular disease.

Table 3. Refractive Error Categories

Analysis of refractive status showed that myopia was the most common refractive error, present in 48% of participants. Hypermetropia was observed in 24% of patients, while 28% of children were emmetropic. These findings indicate a higher prevalence of myopia among children with VKC compared to other refractive states, suggesting a possible association between chronic allergic ocular disease and myopic refractive changes.

Table 4. Myopia Severity

Among the 48 myopic patients, mild myopia was the most common subtype, accounting for 45.8% of myopic cases. Moderate myopia was seen in 37.5% of patients, while severe myopia constituted 16.7% of cases. This distribution demonstrates that most myopic children with VKC had lower grades of refractive error, although a significant proportion also exhibited moderate to severe myopia requiring regular ophthalmic follow-up and correction.

Table 5. Myopia by Gender

Gender-wise analysis of myopia showed a comparable prevalence between males and females. Myopia was present in 47.2% of male participants and 50% of female participants. Although the overall number of male participants was higher, the proportion of myopia within each gender was nearly similar, suggesting that gender may not significantly influence the occurrence of myopia among children with VKC in this study population.

Discussion.

Age and Gender Distribution

The present study demonstrated a clear male predominance, with males constituting 71% of the study population compared to 29% females. This finding is consistent with previous hospital-based pediatric ophthalmology studies

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conducted in India, where male children are more frequently brought for ophthalmic evaluation. Similar observations were reported by Dandona and Dandona as well as Murthy GVS et al., who attributed this predominance partly to healthcare-seeking patterns and increased healthcare access among male children. In the present study, the largest proportion of participants belonged to the 16–18 years age group (36%), followed by the 6–10 years age group (29%) and the 11–15 years age group (27%). These findings suggest that refractive errors associated with VKC become more noticeable during school-going years and adolescence, when visual demands increase significantly. Similar age-related trends have been observed in pediatric refractive studies across Asia and developing countries.

Laterality

Bilateral involvement was more commonly observed than unilateral involvement in the present study. Bilateral disease was noted in 32% of cases, whereas unilateral involvement was seen in only 10% of participants. This supports the well-established understanding that VKC is predominantly a bilateral allergic ocular disease. Bilateral refractive involvement may be related to symmetrical ocular growth and chronic inflammatory changes affecting both eyes. Previous studies by Mutti et al. have also demonstrated that refractive development in children generally occurs symmetrically in both eyes. Although unilateral cases were fewer, they remain clinically important because unilateral refractive error may predispose children to anisometropic amblyopia if not identified and treated early.

Refractive Error Categories

The present study found myopia to be the most common refractive error among children with VKC, affecting 48% of participants. Hypermetropia was observed in 24% of cases, while 28% of children were emmetropic. The predominance of myopia suggests a possible association between chronic ocular allergy and myopic refractive changes. Chronic inflammation, corneal epithelial disturbances, and habitual eye rubbing in VKC may contribute to altered corneal curvature and axial elongation, thereby increasing the risk of myopia. Similar findings have been reported by Abiose and Mashige KP, who described higher rates of refractive errors among children with chronic allergic conjunctival diseases. The high prevalence of myopia observed in the present study also aligns with global trends reported by the World Health Organization, which recognizes myopia as an increasing public health concern among school-aged children.

Myopia Severity

Among the myopic participants, mild myopia constituted the largest subgroup, accounting for 45.8% of cases. Moderate myopia was observed in 37.5% of myopic children, while severe myopia was present in 16.7% of cases. These findings indicate that although mild myopia was predominant, a substantial proportion of children already had moderate to severe refractive error at presentation. This may reflect the chronicity of VKC and delayed ophthalmic evaluation in some patients. Holden BA et al. similarly reported that mild myopia forms the majority of pediatric myopia cases globally. However, the presence of severe myopia in nearly one-sixth of myopic patients in the present study highlights the importance of regular refractive monitoring, as progressive myopia may increase the future risk of retinal degeneration, myopic maculopathy, and other vision-threatening complications.

Myopia by Gender

Gender-wise analysis showed that the prevalence of myopia was nearly similar among males and females. Myopia was present in 47.2% of male participants and 50% of female participants. Despite the higher overall number of male participants, the comparable proportion of myopia in both genders suggests that refractive changes associated with VKC are not significantly influenced by sex. Similar findings have been reported by He M et al., who concluded that environmental and behavioral factors such as prolonged near work, reduced outdoor activity, and increased screen exposure play a greater role in the development of myopia than gender differences alone. The present findings therefore support the concept that both male and female children with VKC require equal attention regarding refractive assessment and follow-up.

Conclusion

The present study highlights that refractive errors are highly prevalent among children with vernal keratoconjunctivitis (VKC), emphasizing the importance of comprehensive visual assessment in these patients. Myopia emerged as the most common refractive error, followed by hypermetropia, with most myopic cases being mild in severity. The predominance of refractive errors during the school-going years underscores the critical period of visual development,

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during which chronic ocular inflammation, corneal surface changes, and habitual eye rubbing associated with VKC may influence refractive status.

Although a higher proportion of males were observed in the study population, the prevalence of myopia was comparable between genders, suggesting that environmental and behavioral factors play a greater role than biological sex in refractive development. The bilateral nature of refractive errors in most cases further supports the influence of developmental ocular factors rather than isolated pathology. These findings reinforce the need for routine refractive evaluation in children with VKC as part of their standard clinical management.

Given the chronic and recurrent nature of VKC, periodic ophthalmic follow-up is recommended to monitor refractive changes and prevent long-term visual complications. Larger longitudinal studies incorporating corneal topography and environmental risk factor assessment are recommended to further elucidate the relationship between VKC and refractive development.

Overall, integrating refractive screening into VKC management protocols can significantly reduce preventable visual impairment in this vulnerable pediatric population.

Limitations of the study

As this was an observational study, long-term follow-up of patients was not performed, limiting the ability to assess the progression of refractive errors and their temporal relationship with the severity and duration of VKC.

Recommendation

This study highlights the need for early detection and timely correction of refractive errors, which are essential to prevent amblyopia, optimize visual development, and improve academic performance and quality of life.

Acknowledgment

Nil

List of abbreviations.

- **VKC** – Vernal Keratoconjunctivitis
- **OPD** – Outpatient Department
- **CCT** – Central Corneal Thickness
- **IOP** – Intraocular Pressure
- **WHO** – World Health Organization
- **SPSS** – Statistical Package for the Social Sciences
- **B-scan** – Brightness Scan Ultrasonography

Source of funding

The study had no funding.

Availability of data

Data is available upon request from the corresponding author.

Author's contribution.

Dr Manisha Gupta was the Primary investigator.
Dr Shreshtha Sharda supervised the research and writing of the manuscript
Dr Vaishnavi Singh co- supervised the research
Dr Vatsala Vats co-supervised the research

Author's biography

Dr Manisha Gupta is a Professor in the Department of Ophthalmology, Shri Guru Ram Rai Institute of Medical and Health Sciences. She specializes in Cornea and Anterior segment Ophthalmology. She is actively involved in residents' learning as well.

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