

Clinical Manifestations of Vernal Keratoconjunctivitis and Its Effects on School Attendance and Access to Medical Care in School Children of Western Uttar Pradesh

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ABSTRACT

Introduction: Vernal Keratoconjunctivitis (VKC) is a chronic ocular condition affecting school-age children, particularly in hot, allergen-rich regions. It presents with symptoms such as intense itching, tearing, foreign body sensation, and sticky discharge, causing discomfort and management challenges in resource-limited settings. VKC impacts public health significantly due to its high prevalence and effect on academic performance and school attendance.

Method: This cross-sectional study included 1521 school children aged 6 to 16 years in Western Uttar Pradesh. Comprehensive eye examinations were conducted, and VKC was diagnosed based on conjunctival and limbal papillae. A structured questionnaire collected data on socio-demographic factors, medical care access, and VKC's impact on daily life and school attendance. Descriptive statistics and Pearson chi-square tests were used for analysis.

Result: Of the participants, 242 (15.9%) had VKC, with a higher prevalence among boys (56.2%). Most cases were mild (66%), with 34% severe. Symptoms included itching, stinging, tearing, photophobia, and discharge. Severe VKC resulted in higher rates of constant eye rubbing and tear production. School absenteeism was significantly higher in severe cases (78%) compared to mild cases (47%) ($P < 0.001$). Severe VKC also led to more frequent medical consultations (52% vs. 22%, $P = 0.01$).

Conclusion: VKC significantly affects school attendance and medical care utilization among children in Western Uttar Pradesh. Improved management practices, better access to medical care, and enhanced support systems are essential for affected children and families.

INTRODUCTION

Vernal Keratoconjunctivitis (VKC) is a chronic and often debilitating ocular condition that predominantly affects school-age children, particularly in regions with high temperatures and allergen exposure.[1] Characterized by

recurrent inflammation of the conjunctiva, VKC manifests through a range of symptoms including intense itching, excessive tearing, a sensation of a foreign body in the eye, and the presence of a thick, sticky discharge. These symptoms not only cause significant discomfort

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but also pose challenges for effective management, particularly in resource-limited settings.[2]

VKC represents a significant public health concern due to its high prevalence among school children and its profound impact on their daily lives.[3,4] Epidemiological studies have shown that VKC primarily affects boys at a rate approximately twice that of girls, with the highest incidence observed in children between the ages of 11 and 13 years. The condition is not only a source of ocular morbidity but also affects the overall quality of life for these children by disrupting their academic performance and school attendance.[4–6]

The clinical presentation of VKC includes hallmark features such as papillary hypertrophy of the conjunctiva, limbal thickening, and the presence of cobblestone-like nodules. Despite these distinct clinical signs, there remains a critical need for a detailed examination of VKC's impact on school attendance, as frequent absenteeism due to severe symptoms can affect educational outcomes and long-term academic success.[7,8]

Furthermore, assessing the accessibility of medical care for VKC in this region is essential for understanding the barriers that prevent timely and effective treatment. Factors such as inadequate healthcare infrastructure, lack of awareness about the disease, and financial constraints may impede the ability of families to seek appropriate medical care for their children.

In light of these considerations, this study aims to explore the clinical presentation of VKC among school children in Western Uttar Pradesh, to evaluate the impact of VKC on school attendance, and to assess the accessibility and utilization of medical care for this condition. The objectives of this study are threefold: (1) to delineate the clinical features and severity of VKC in the target population, (2) to investigate how VKC affects school attendance and academic performance, and (3) to evaluate the barriers to accessing medical care for VKC, identifying potential gaps in the healthcare system and opportunities for intervention.

By addressing these objectives, this research seeks to provide a comprehensive understanding of VKC in this region, offering insights that could inform better management practices, improve access to medical care, and ultimately enhance the well-being of affected children.

By this research, the study will provide valuable insights that can guide the development of effective strategies for managing VKC and improving support systems for children and families in Western Uttar Pradesh.

MATERIALS AND METHODS

This study employed a cross-sectional observational design to investigate Vernal Keratoconjunctivitis (VKC) among school children in Western Uttar Pradesh, focusing on its clinical presentation, impact on school attendance, and access to medical care.

The study was conducted among school children aged 6 to 16 years who visited the outpatient department of the ophthalmology clinic. Both government and private schools were included in the study to ensure a representative sample of the school-age population in the region. Informed consent was obtained from the parents or legal guardians of all participating children to ensure their voluntary participation and to comply with ethical standards.

A non-probability consecutive sampling technique was employed to select participants who met the age criteria and presented to the ophthalmology outpatient department during the study period. This approach allowed for the inclusion of all eligible children who attended the clinic, ensuring a comprehensive collection of data related to VKC.

Data collection involved a detailed ocular examination to document VKC-related clinical manifestations. Each child underwent a comprehensive eye examination that included the following procedures:

- Visual Acuity Measurement: Visual acuity was measured in each eye using standard visual acuity charts.
- Keratometry: Keratometry was performed to assess the curvature of the cornea.
- Slit-Lamp Examination: A slit-lamp examination was conducted to evaluate the anterior segment of the eye, including conjunctival signs and corneal involvement.
- Dilated Funds examination was performed to assess the retina and optic nerve.

The presence of VKC was confirmed if there were conjunctival papillae ≥ 1 mm in diameter over the upper tarsal plate and/or limbal papillae. The severity of VKC was classified based on the extent of limbal papillae involvement, with ≥ 6 clock hours of the limbus being categorized as severe VKC. Symptoms and clinical signs were scored according to a system adapted from Akpek et al.[9] to quantify the severity of limbal VKC.

In addition to clinical examinations, a structured questionnaire was used to gather information from parents or guardians. The questionnaire covered socio-demographic factors, access to medical care, and the impact of VKC on daily life and school attendance.

Data collected from the clinical examinations and questionnaires were analyzed to summarize demographic characteristics, clinical presentations, and school attendance patterns. Descriptive statistics, including frequencies and percentages, were used to present the data. Pearson chi-square tests were employed to examine associations between clinical severity, school attendance, and the utilization of medical care. A confidence interval of 95% and a p-value of less than 0.05 were considered significant for statistical tests.

Ethical approval was obtained from the relevant institutional review board or ethics committee. Informed consent was obtained from the parents or legal guardians of all participating children, and participant information was

kept confidential. Data were anonymized and securely stored to protect the privacy of study participants.

RESULTS

The study included a total of 1521 participants aged 6 to 16 years, among them 242 (15.9%) had VKC. As per table-1, the study revealed a slightly higher prevalence of

VKC among boys compared to girls, with 56.2% of the participants being male. The distribution of VKC severity across different age groups and genders showed no statistically significant differences. Specifically, the proportion of children with mild VKC was 66% (159 out of 242), while 34% (83 out of 242) had severe VKC. Age and gender did not significantly influence the severity of VKC, with the p-values for both age and gender being 0.148 and 0.414, respectively.

Table 1: Distribution of VKC Severity by Age and Gender (n=242)

VKC	Mild (159,66%)	Severe (83,44%)	Total	p value
Age (<10 years)	65 (41%)	42 (51%)	107 (44%)	0.148
Male/female	83/41	53/65	136/106	0.414

Table 2: Clinical Symptoms and Signs of VKC in Mild and Severe Cases (n=242)

Sign/symptoms	Mild VKC (%)	Severe VKC (%)	Total (%)
Ocular Itch			
No desire to rub the eyes	37 (23)	4 (5)	41 (17)
Once a week desire to rub the eyes	38 (24)	15 (18)	53 (22)
Daily desire to rub the eyes	54 (34)	36 (43)	90 (37)
Constant desire to rub the eyes	30 (19)	28 (34)	58 (24)
Tearing			
None	51 (32)	18 (22)	69 (29)
Wet eyes, but no tears on face	81 (51)	36 (43)	117 (48)
Tears on face (intermittently or constant)	27 (17)	29 (35)	56 (23)
Stinging sensation			
None	52 (33)	16 (19)	68 (28)
Once a week	67 (42)	32 (38)	99 (41)
Daily (intermittently)	27 (17)	21 (25)	48 (20)
Daily (constant)	13 (8)	14 (17)	27 (11)
Discharge			
None	102 (64)	42 (51)	144 (60)
Small amount	30 (19)	12 (14)	42 (17)
At least moderate amount upon awakening	27 (17)	29 (35)	56 (23)
Photophobia			
None	63 (40)	21 (25)	84 (35)
Squeezing in bright weather	73 (46)	42 (51)	115 (48)
Squeezing even in dark weather Causing the child to stay indoors	17 (11)	11 (13)	28 (12)
Close the eyes most of the times	6 (4)	9 (11)	15 (6)

As shown in table-2, The most frequently reported symptoms were ocular itching, followed by stinging, tearing, photophobia, and discharge. Almost one-third of children with VKC had a stinging sensation as a daily problem.

In terms of ocular itch, it is evident that children with Severe VKC reported a higher frequency of desire to rub their eyes. Specifically, 43% of those with Severe VKC experienced a constant desire to rub their eyes, compared to only 19% with Mild VKC.

A larger proportion of children with Severe VKC (35%) reported tears on their face, either intermittently or constantly, in contrast to the 'Mild VKC' group where only 17% experienced this symptom. This suggests a higher degree of tear production and potential disruption to daily activities in the severe VKC category.

Regarding stinging sensation, 42% of children with severe VKC reported experiencing it on a daily basis, either intermittently or constantly. In comparison, in the 'Mild VKC' group, only 25% reported daily stinging sensation. This highlights the heightened discomfort experienced by those with severe VKC.

Additionally, the presence of Trantas dots, which are indicative of allergic conjunctivitis, was observed in a considerably higher proportion of children with Severe VKC (23%) compared to the Mild VKC (2%). All children with VKC had perilimbal pigmentation. Keratoconus was only seen in 4 eyes of 3 children, both had severe VKC. 1 eye was blind from cataract.

Children with severe limbal VKC had significantly more Trantas dots ($P < 0.001$) than those less severely affected.

Table 3: Impact of VKC Severity on School Attendance and Medical Care (n=242)

VKC	Mild (159,66%)	Severe (83,44%)	Total	p value
School absenteeism				
Never	32 (20%)	2 (2%)	34 (14%)	<0.001*
<7 days	53 (33%)	16 (19%)	69 (29%)	
>= 7 days	74 (47%)	65 (78%)	139 (57%)	
Repeating the academic year				
Never	231 (100%)	72 (87%)	231 (95%)	<0.01*
Yes	0	11 (13%)	11 (5%)	

Table 4: VKC Severity and access to Medical Care as consultation of eye services (n=242)

VKC	Mild (159,66%)	Severe (83,44%)	Total	p value
Never	83 (52%)	29 (35%)	112 (46%)	0.01*
<=2 time	41 (26%)	11 (13%)	52 (21%)	
>=3 time	35 (22%)	43 (52%)	78 (32%)	

Table 3 illustrates the significant impact of VKC severity on school attendance and medical care. Among children with severe VKC, 78% reported being absent from school for seven days or more, a stark contrast to just 2% of children with mild VKC. This significant difference ($P<0.001$) indicates that severe VKC has a profound effect on school attendance and potentially on academic performance. Similarly, the severity of VKC is significantly associated with repetition of the academic year among children with severe disease compared to mild disease.

Table 4 illustrates the significance of VKC severity with medical care obtain by them. children with severe VKC were more likely to have sought medical eye care three or more times (52%) compared to only 22% of those with mild VKC. Conversely, a higher percentage of children with mild VKC (52%) had never sought medical care for their condition. This difference was also statistically significant ($P=0.01$), underscoring that severe VKC leads to more frequent medical consultations.

DISCUSSION

In present study, we found that VKC significantly affects school attendance and requires frequent medical attention, especially among children with severe forms of the condition. Our findings are consistent with global research but also reveal unique insights into the situation within this specific region.

In our study the prevalence of VKC was 15.9% which was comparable to Duke et al study where they reported the prevalence of VKC with 18.1%. The ratio of males to females is 1.8: 1. The clinical grading of the 223 children with VKC is as follows: 43 (19.3%) quiescent, 134 (60.1%) mild, 44 (19.7%) moderate, and 2 (0.9%) severe VKC[10]. The severity grade was in not a line with our finding as we found more 44% severe cases of VKC.

Our study found that VKC was more prevalent among males, a finding consistent with Alemayehu et al.'s research, which reported that males had 4.23 times higher odds of developing VKC compared to females (AOR = 4.23, 95% CI, 1.33–13.43). This gender disparity was

also observed in studies conducted in Rwanda and Italy.[4,11]

In our study, children with Severe VKC reported a higher frequency of desire to rub their eyes. Specifically, 43% of those with Severe VKC experienced a constant desire to rub their eyes, compared to only 19% with Mild VKC. Alhanrkan et al. reported that severe VKC often involves significant itching and tearing, which aligns with our observation that children with severe VKC had a higher frequency of these symptoms compared to those with mild VKC.[12]

Similar to our finding, commonly presenting symptoms of VKC were documented by several studies were stringy mucoid discharge, itching swollen eyelid, tearing, burning, red- eye, foreign body sensation, and photophobia. Whereas most common signs of VKC are lid edema, chemosis, tarsal papillae, Horner Trantas-Dots, brownish discoloration of eyeballs, darkened eyelids limbal infiltrates.[13–15]

In our study, the prevalence of VKC among children was found to be 15.9%. This rate is higher compared to several other studies, including a school-based study in Butajira, Southern Ethiopia (5.2%) [16], a community-based study in Gondar, Northwest Ethiopia (5.8%) [3], a school-based study in Rwanda (4%) [4], a school-based study in Egypt (3.3%) [17], a hospital-based study in Japan (3.8%) [29], and a hospital-based study in Italy (6.5%).[18] The higher prevalence observed in our study may be attributed to the hot, dry, and windy climatic conditions of the region, which are known to exacerbate allergic eye conditions such as VKC.[19,20]

In contrast, the prevalence of VKC in this study was lower compared to the findings from Nigeria (18.1%)[10], Mali (37.2%)[21], and India (18%)[22]. This discrepancy may be attributed to variations in environmental, hormonal, and genetic factors that influence the incidence of VKC.[23,24] Additionally, the differences in study populations could be a contributing factor; previous studies focused on younger age groups under 15 years, which aligns with the period of highest VKC risk,[19,25] whereas our study included participants up to 18 years,

a time when VKC is typically on the decline. Furthermore, the lower prevalence observed in our study might also be due to the fact that the other studies, particularly those in Mali and India, were hospital-based, which could have led to a higher concentration of VKC cases.

Our study found a significant association between VKC severity and school absenteeism, with 78% of children with severe VKC missing seven or more days of school. This result is consistent with findings from Ashwini et al, who noted that children with severe VKC often face substantial educational disruptions due to their symptoms.[22] Moreover, Chigbu et al also found that VKC leads to significant school absenteeism among affected children, highlighting the broader implications of this condition for academic performance.[26]

It was found that children with VKC were five times more likely to miss school for eye-related reasons over a three-month period compared to those without VKC.[4] VKC has long been a predominant cause of medical consultations for children, which has had a considerable impact on healthcare services. [12]

Marey et al. reported a VKC prevalence rate of 3.3% with a male-to-female ratio of 2.3:1. The most common symptoms observed were ocular itching, burning sensations, tearing, redness of the eyes, discharge, and photophobia. While the signs of VKC varied between mild and severe forms, all cases were found to negatively affect school attendance and academic performance.[17]

Vernal Keratoconjunctivitis (VKC) represents the most significant cause of eye clinic visits among children in Africa, responsible for 21.0% of general eye clinic appointments and a major factor in school non-attendance.[4,10]

In our study, Trantas dots were significantly more prevalent in children with severe VKC compared to those with mild VKC. In our study, a higher percentage of children with severe VKC sought medical care three or more times compared to those with mild VKC.

According to Smedt et al., children with VKC were five times more likely to miss school for eye-related reasons over the past three months compared to those without VKC (36.4% vs. 10.2%; OR, 5.04; 95% CI, 3.40-7.47; P < 0.001). However, there was no significant difference between VKC and non-VKC children regarding repeating a school year or having dropped out of school. Additionally, 54 children with VKC (44.6%) sought medical eye care, underscoring the need for improved primary eye care and safe topical treatments in the community.[4]

CONCLUSION

Our study provides a comprehensive view of VKC among school children in Western Uttar Pradesh, revealing significant clinical, educational, and healthcare challenges associated with both mild and severe forms of the condition. The observed patterns of symptoms, impacts on

school attendance, and medical care utilization are consistent with global and Indian literature, highlighting the need for improved management strategies and interventions for VKC.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Doan S, Papadopoulos NG, Lee JK, Leonardi S, Manti S, Lau S, et al. Vernal keratoconjunctivitis: Current immunological and clinical evidence and the potential role of omalizumab. *World Allergy Organization Journal* 2023;16. <https://doi.org/10.1016/j.waojou.2023.100788>.
2. Bruschi G, Ghigloni DG, Cozzi L, Osnaghi S, Viola F, Marchisio P. Vernal Keratoconjunctivitis: A Systematic Review. *Clin Rev Allergy Immunol* 2023;65:277–329. <https://doi.org/10.1007/S12016-023-08970-4>.
3. Hayilu D, Legesse K, Lakachew N, Asferaw M. Prevalence and associated factors of vernal keratoconjunctivitis among children in Gondar city, Northwest Ethiopia. *BMC Ophthalmol* 2016;16. <https://doi.org/10.1186/S12886-016-0345-7>.
4. De Smedt SK, Nkurikiye J, Fonteyne YS, Tuft SJ, Gilbert CE, Kestelyn P. Vernal keratoconjunctivitis in school children in Rwanda: clinical presentation, impact on school attendance, and access to medical care. *Ophthalmology* 2012;119:1766–72. <https://doi.org/10.1016/J.OPHTHA.2012.03.041>.
5. Nsiangani Lusambo N, Kilangalanga Ngoy J, Dilu Ahuka A, Munyeku Bazitama Y, Moanda Kapopo A, Ilunga Muleya J, et al. Prevalence and patterns of childhood ocular morbidity in Kinshasa. A population-based study. *Glob Epidemiol* 2021;3. <https://doi.org/10.1016/J.GLOEPI.2021.100054>.
6. Ahmed S, Ahmed KEG, Morsy O El, Soliman S. Epidemiology of Vernal Keratoconjunctivitis (VKC) among children aged (12-15) years - Menofia Governorate, Egypt. *Delta Journal of Ophthalmology* 2019;20:1–1.
7. Mehta JS, Chen WL, Cheng ACK, Cung LX, Dualan IJ, Kekunnaya R, et al. Diagnosis, Management, and Treatment of Vernal Keratoconjunctivitis in Asia: Recommendations From the Management of Vernal Keratoconjunctivitis in Asia Expert Working Group. *Front Med (Lausanne)* 2022; 9:882240. <https://doi.org/10.3389/FMED.2022.882240/BIBTEX>.
8. Dahlmann-Noor A, Bonini S, Bremond-Gignac D, Heegaard S, Leonardi A, Montero J, et al. Novel Insights in the Management of Vernal Keratoconjunctivitis (VKC): European Expert Consensus Using a Modified Nominal Group Technique. *Ophthalmol Ther* 2023;12:1207. <https://doi.org/10.1007/S40123-023-00665-5>.
9. Akpek EK, Dart JK, Watson S, Christen W, Dursun D, Yoo S, et al. A randomized trial of topical cyclosporin 0.05% in topical steroid-resistant atopic keratoconjunctivitis. *Ophthalmology* 2004;111:476–82. <https://doi.org/10.1016/J.OPHTHA.2003.05.035>.
10. Duke RE, Odey F, Smedt S De. 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. Nebbioso M, Zicari AM, Celani C, Lollobrigida V, Grenga R, Duse M. Pathogenesis of Vernal Keratoconjunctivitis and Associated

- Factors. *Semin Ophthalmol* 2015;30:340–4. <https://doi.org/10.3109/08820538.2013.874483>.
12. Alharkan DH. Management of vernal keratoconjunctivitis in children in Saudi Arabia. *Oman J Ophthalmol* 2020;13:3. https://doi.org/10.4103/OJO.OJO_263_2018.
 13. Choleva P, Tole D, Churchill A. Allergic eye disease in children: identifying the signs and symptoms. *International Journal of Ophthalmic Practice* 2014;5:50–2. <https://doi.org/10.12968/IJOP.2014.5.2.50>.
 14. Alemayehu AM, Yibekal BT, Fekadu SA. Prevalence of vernal keratoconjunctivitis and its associated factors among children in Gambella town, southwest Ethiopia, June 2018. *PLoS One* 2019;14. <https://doi.org/10.1371/JOURNAL.PONE.0215528>.
 15. Bonini S, Coassin M, Aronni S, Lambiase A. Vernal keratoconjunctivitis. *Eye (Lond)* 2004;18:345–51. <https://doi.org/10.1038/SJ.EYE.6700675>.
 16. Kassahun F, Development AB-EJ of H, 2012 undefined. Vernal keratoconjunctivitis among primary school students in Butajira Town. *AjollInfoF Kassahun, A BejigaEthiopian Journal of Health Development, 2012•ajollInfo* 2012;26:226–9.
 17. Marey HM, Mandour SS, El Morsy OA, Farahat HG, Shokry SM. Impact of Vernal Keratoconjunctivitis on School Children in Egypt. *Semin Ophthalmol* 2017;32:543–9. <https://doi.org/10.3109/08820538.2015.1123737>.
 18. 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;16:38–41. <https://doi.org/10.1080/09286580802573177>.
 19. 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;107:1157–63. [https://doi.org/10.1016/S0161-6420\(00\)00092-0](https://doi.org/10.1016/S0161-6420(00)00092-0).
 20. Saboo US, Jain M, Reddy JC, Sangwan VS. Demographic and clinical profile of vernal keratoconjunctivitis at a tertiary eye care center in India. *Indian J Ophthalmol* 2013;61:486–9. <https://doi.org/10.4103/0301-4738.119431>.
 21. Pobanou THERA J. Magnitude of vernal kerato conjunctivitis among school children in Koulikoro. *Scholars Journal of Applied Medical Sciences (SJAMS)* 2016;4:180–2. <https://doi.org/10.36347/sjams.2016.v04i01.032>.
 22. Ashwini KV, Dhatri K, Rajeev K. Vernal keratoconjunctivitis in school children in north Bangalore: an epidemiological and clinical evaluation. *J Evol Med Dent Sci* 2015;4:15070–7.
 23. Leonardi A. Vernal keratoconjunctivitis: Pathogenesis and treatment. *Prog Retin Eye Res* 2002;21:319–39. [https://doi.org/10.1016/S1350-9462\(02\)00006-X](https://doi.org/10.1016/S1350-9462(02)00006-X).
 24. Tuft SJ, Dart JKG, Kemeny M. Limbal vernal keratoconjunctivitis: clinical characteristics and immunoglobulin E expression compared with palpebral vernal. *Eye (Lond)* 1989;3 (Pt 4):420–7. <https://doi.org/10.1038/EYE.1989.63>.
 25. Ukponmwan CU. Vernal keratoconjunctivitis in Nigerians: 109 consecutive cases. *Trop Doct* 2003;33:242–5. <https://doi.org/10.1177/004947550303300419>.
 26. Chigbu DI, Labib BA. Immunopharmacology in Vernal Keratoconjunctivitis: Current and Future Perspectives. *Pharmaceuticals* 2021; 14 (7):658. <https://doi.org/10.3390/PH14070658>.