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# Prevalence of Keratopathy in Vernal Keratoconjunctivitis

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## ABSTRACT

**Background:** Vernal keratoconjunctivitis is a chronic allergic eye disease that primarily affects young individuals and can lead to significant discomfort and visual impairment. Keratopathy, in the context of Vernal Keratoconjunctivitis (VKC), refers to corneal changes and complications that can occur as a result of this chronic allergic eye condition. VKC primarily affects the conjunctiva and the cornea, and keratopathy is a significant concern due to its potential to cause visual impairment. **Objective:** To determine the frequency of keratopathy in vernal keratoconjunctivitis. **Study Design:** Cross-sectional. **Settings:** Sindh Institute of Ophthalmology and visual sciences at LUMHS Eye Hospital Hyderabad Pakistan. **Duration:** From February 16, to August 15, 2019. **Methods:** All the patients with VKC, aged 5-15 years and both genders were included. History was taken from patient or parent about presenting complains and duration of disease. Clinical (slit lamp) examination was performed to look for corneal lesions. Both eyes of each patient were examined for corneal involvement, including SPEE (positive Florescence staining), corneal epithelial defects, corneal shield ulcer and corneal subepithelial scars. Florescence staining with blue filter was used where indicated. All the data was entered in the proforma and analyzed by SPSS version 20. **Results:** Total 232 patients were studied, most of the patients 84.1%, belonged to age group of 5-10 years, while 15.9% presented with age range of 11-15 years. Males were most common 78.0%. Frequency of keratopathy was 22.0%. Most of the cases 51.3%, had >1 years duration. According to type of keratopathy, superior punctate epithelial erosions was most common type among 35.3% patients out of 51, scarring was among 24.5% patients, shield ulcer was among 9.8% patients and macro erosion was in 2 patients. No significant impact was found of age on Prevalence of keratopathy, (p-0.419). Male gender, duration of VKC and bilateral eyes were significantly associated with Prevalence of keratopathy, (p-0.001). **Conclusion:** It was concluded that frequency of keratopathy in vernal keratoconjunctivitis is 22.0%.

***Keywords:*** *Vernal keratoconjunctivitis, keratopathy, prevalence.*

## INTRODUCTION

Vernal keratoconjunctivitis, an enduring seasonal allergic eye condition affecting both eyes, is a significant contributor to visual impairment and a reduced quality of life in children and young adults in specific regions across the world.[1,2] It is typically identified by the presence of small raised growths called limbal papillae, which can take on various forms.[3] The primary and most persistent symptom of this condition is itching. The symptoms are frequently recurrent, typically persisting throughout the year initially, and eventually developing into a chronic condition over time.[3] It is classified into 3 types: Palpebral vernal keratoconjunctivitis which primarily involves the upper tarsal conjunctiva, Limbal disease with limbal papillae, which typically affects black and Asian patients and Mixed disease which has features of both palpebral and limbal disease.[4] Most patients exhibit a combination of the condition, involving both the palpebral and limbal areas.[5]

The occurrence of vernal keratoconjunctivitis differs by geographical location, with a higher incidence in tropical

and subtropical nations, and it is more widespread in dry and warm regions.[3] In developed countries, vernal keratoconjunctivitis accounts for 0.1–0.5% of ocular conditions and In Europe, the occurrence of VKC varies, with ranging from 1.2 to 10.6 cases per 10,000 people.[6,7]

The higher occurrence in warm regions is thought to be linked to elevated pollen levels and increased allergen pollution.[8] Corneal issues in VKC are frequently encountered,[9] have the potential to be severe, and can result in significant visual impairment.[10] As the severity and duration of disease increases these patients may develop keratopathy which include superior punctate epithelial erosions,[9] epithelial macroerosions, corneal plaques and shield ulcers, subepithelial scars and rarely keratoconus. The term "keratopathy" essentially refers to a corneal disease. Each specific keratopathy is observed in conjunction with distinct clinical situations. Children make a significant proportion of our population. Because VKC is an eye disease of school age children, it can affect the quality of life in these children. Its complications which involve cornea can be potentially blinding in younger population. There is a need to assess the magnitude of corneal involvement in order to develop standardized guidelines in due time to arrest the progression of complications.

A study done on 82 subjects with VKC has shown that twenty-six (31.7%) of 82 subjects had complications with keratopathy.[11] Keratopathy is more frequent in palpebral disease.[12] A study done on 290 eyes with VKC shows corneal scarring in 59 (20.3%) eyes, Keratoconus in 17 (5.9%) eyes, shield ulcer in 09 (3.1%) eyes while 07 (2.4%) eyes had corneal neovascularization.[13] These complications can be potentially sight threatening if not recognized and intervened on time. Due to limited data and lack of local evidence, this study has been done to determine the frequency of corneal complication (Keratopathy) in vernal Keratoconjunctivitis.

## METHODS

A cross-sectional study conducted at Sindh Institute of Ophthalmology and visual sciences at LUMHS Eye Hospital Hyderabad Pakistan. The duration of the study was six months from February 16, to August 15, 2019.

By using WHO sample size calculator. Taking percentage of keratopathy in VKC patients 31.7%,[8] margin of error 6%, with confidence interval 95%; the calculated sample size is 232 eyes. Non-probability consecutive sampling technique was used.

Study was done after taking ethical approval from ethical review board committee of LUMHS/ Jamshoro. All the patients with VKC, aged 5-15 years and both genders were included. All of the cases having history of acute allergic conjunctivitis, patients with corneal lesions due to any other cause (e.g. trauma, infection) and Patients who have received treatment for VKC in/during last one month were exclude. Informed consent was taken from patients or parents/guardians of young patients. History was taken from patient or parent about presenting complains and duration of disease. Clinical (slit lamp) examination was performed to look for corneal lesions. Both eyes of each patient were examined for corneal involvement, including SPEE (positive Florescence staining), corneal epithelial defects, corneal shield ulcer and corneal subepithelial scars. Florescence staining with blue filter was used where indicated.

After taking complete history, initial examination was done by researcher and findings confirmed by consultant having more than 2 years of post-fellowship experience. Vernal keratoconjunctivis was defined as bilateral persistent conjunctival inflammation that presents with photophobia and intense itching and on clinical ophthalmologic examination is characterized by papillae in the upper palpebral conjunctiva (palpebral VKC) or gelatinous nodules adjacent to the corneoscleral limbus (Limbal VKC) or both (mixed VKC). Keratopathy was defined as any of the following corneal lesions in an eye with VKC: Superior punctate epithelial erosions: dot like epithelial erosions seen as green lesions under blue light when stained with florescence. Epithelial macroerosions: epithelial erosions of >2mm as measured on slit lamp, seen as green lesions under blue light when stained with Florescence. Corneal shield ulcers: epithelial defects of >2mm (measured on slit lamp) with mucous deposition and or Corneal opacities: opacities in superficial corneal stroma >2mm (measured on slit lamp) with intact epithelium (negative fluorescence stain). All the information as per study objective including demographic information was collected via study proforma.

## RESULTS

In this study, a total of 232 cases were analyzed. The majority of patients (84.1%) fell within the age group of 5-10 years, while a smaller percentage (15.9%) were between 11-15 years old. Among the cases, 78.0% were male, while 22.0% were female. Regarding the duration of VKC, the majority (51.3%) had a duration of less than 1 year, 19.8% of cases had a duration of 1-3 years, while 22.0% had a duration of 4-6 years and only (6.9%) cases had a disease duration of 7-10 years. Table. 1

The prevalence of keratopathy was found to be 22.0% among all study participants (Figure 1).

When assessing the prevalence of keratopathy based on the laterality of the eye, it was observed that 25 patients had bilateral involvement, while 12 patients had keratopathy in their right eye and 14 patients in their left

eye. In terms of the types of Keratopathies, Spees was the most common, affecting 35.3% of the patients. Scarring was observed in 24.5% of patients, shield ulcers in 9.8%, and macroerosion in 2 patients. Table. 2

**Table 1: Demographic characteristics and VKC duration (n= 232)**

| Variables | | Number | Percentages |
|---|---|---|---|
| **Age** | 5-10 years | 195 | 84.1% |
| | 11-15 years | 37 | 15.9% |
| **Gender** | Male | 181 | 78.0% |
| | Female | 51 | 22.0% |
| **VKC duration** | <1 year | 119 | 51.3% |
| | 1-3 years | 46 | 19.8% |
| | 4-6 years | 51 | 22.0% |
| | 7-10 years | 16 | 6.9% |

**Figure 1: Prevalence of keratopathy (n= 232)**

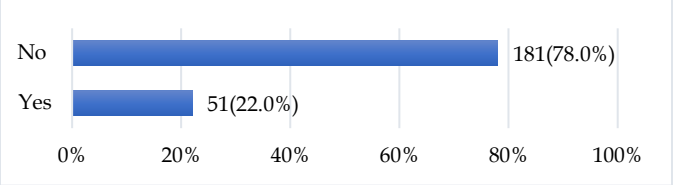



**Table 2: Types of keratopathy and site of eye (n= 51)**

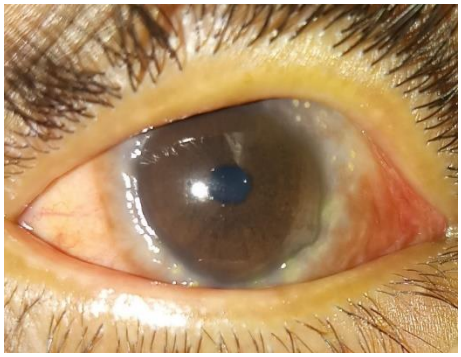
| Variables | | Number | Percentages |
|---|---|---|---|
| **Types of keratopathy** | Spees | 18 | 35.3% |
| | Scarring | 12 | 24.5% |
| | Shield ulcer | 5 | 9.8% |
| | Macroerosion | 2 | 3.9% |
| **Type of eye** | Right | 12 | 23.5% |
| | Left | 14 | 27.5% |
| | Bilateral | 25 | 49.0% |

No significant impact of age on the prevalence of keratopathy was observed (p-value = 0.419). However, there was a significant association between male gender and the prevalence of keratopathy. Out of the 51 cases of keratopathy, 45 were males, and 6 were females (p-value = 0.046). The duration of VKC was also found to have a significant association with the prevalence of keratopathy (p-value = 0.0001). Table. 3

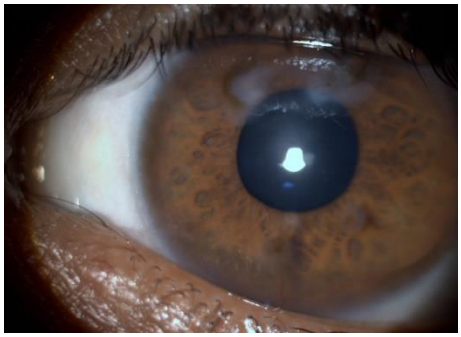
**Table 3: Frequency of keratopathy according to patient's age, gender VKC duration (n= 51)**

| Variables | | Keratopathy | | Total | P-Value |
|---|---|---|---|---|---|
| | | Yes | No | | |
| **Age groups** | 5-10 years | 41 | 154 | 195 | 0.419 |
| | 11-15 years | 10 | 27 | 37 | |
| **Gender** | 45 | 136 | 181 | 45 | 0.046 |
| | 6 | 45 | 51 | 6 | |
| **VKC duration** | <1 year | 22 | 97 | 119 | 0.001 |
| | 1-3 years | 3 | 43 | 46 | |
| | 4-6 years | 18 | 33 | 51 | |
| | 7-10 years | 8 | 8 | 16 | |

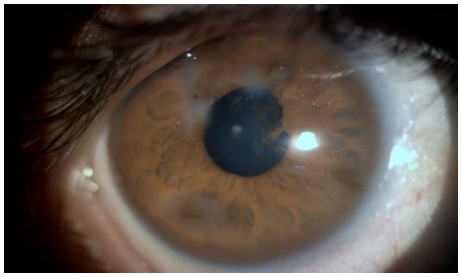
**Pseudogerontoxon with limbal VKC**



**Right eye with VKC shows corneal opacity**



**Left eye with VKC shows corneal opacity**



**Giant papillae on palpebral conjunctiva with palpebral VKC**

**Bilateral melanosis with VKC**

## DISCUSSION

Vernal keratoconjunctivitis can pose a threat to the well-being and academic performance of affected children, consequently affecting their future prospects.[14,15] The symptoms and indicators of VKC can not only be distressing but also the treatment-related complications can be burdensome.[14] Keratopathy, which encompasses corneal changes and complications such as shield ulcers, scarring, and keratitis, represents a pivotal aspect of VKC. These corneal complications can lead to visual impairment and discomfort. Therefore, understanding the frequency of keratopathy is crucial for assessing the overall burden of VKC on patients. It is a chronic external ocular inflammatory condition that affects both eyes, primarily afflicting young boys.

This study was conducted to observe the frequency of keratopathy in vernal keratoconjunctivitis, revealing a male predominance of 78.0%, with females accounting for 22.0%, and the majority of cases, specifically 84.1%, were within the age group of 5-10 years. Consistently, our findings align with those of Sethi *et al*[15] where male predominance was evident, with 129 males and 26 females, resulting in a Male-to-Female ratio of 4.96:1 and overall mean in their study was 10.31+4.05 years. Similarly, Nagrale *et al*[16] also observed a higher prevalence of VKC in males, with 82.5% of affected individuals being male, while the incidence in females was 17.5%. These findings collectively underscore the male predominance in the occurrence of VKC, which is an important epidemiological aspect to consider in the study of this condition.

Our observations regarding age were consistent with the research conducted by Kawuma M *et al*[17] which also identified the most frequent occurrence of VKC in the age group ranging from 5 to 9 years. Our results were also supported by the Alemayehu AM etal[6] where it was reported that the average age of the study participants was 9.74 years with a standard deviation of 4.0 years. A significant portion, specifically 44% (250 individuals), fell within the age group of 11-18 years. Additionally, the study by Alemayehu AM also highlighted a male predominance, with males making up more than half (55.6%) of the participants.[6]

In this study we found that 25 patients exhibited keratopathy in both eyes, while 12 patients had it in their right eye, and 14 patients in their left eye. In contrast, Duke RE *et al*[14] reported a slightly different distribution, with 55 patients (24.7%) experiencing keratopathy in their right eye and 60 patients (26.9%) in their left eye.

In our series, we observed that the prevalence of keratopathy was 22.0% among all study participants, among those spees was the most common presentation, affecting 35.3% of the 51 patients, followed by scarring in 24.5% of patients, shield ulcers in 9.8% of patients, and macroerosion in 2 patients. In contrast, Saboo US *et al*[19] reported different rates of VKC-related complications, including corneal scarring (11%), shield ulcers (3%), keratoconus (6%), and limbal stem cell deficiency (1.2%). Additionally, Das S *et al*[20] highlighted that shield ulcers represent a severe form of vernal keratoconjunctivitis, occurring in 3%–11% of VKC patients. Vernal keratoconjunctivitis is a severe allergic inflammatory condition that affects both the cornea and conjunctiva, and shield-shaped corneal ulcers and plaques are serious, vision-threatening manifestations of this condition.[14] Our results found corroboration in the study by Totan Y *et al*,[11] where they reported the distribution of clinical forms of VKC as follows: 46.34% mixed, 43.90% palpebral, and 9.76% limbal types. Moreover, among the 82 subjects in their study, 31.7% experienced complications related to keratopathy, including conditions like, shield ulcers, punctate keratitis, and pseudo-genontoxon.[11] On the other hand, reported that the characteristic indicators of VKC encompass redness in the bulbar conjunctiva, a viscous discharge, and corneal issues such as shield ulcers, superficial punctate keratitis, epithelial erosions, or plaques.[21] According to Duke RE *et al*[14] they observed that prevalent corneal complications included subepithelial scarring in 22 cases (9.9%) and pseudogerontoxon in 7 cases (3.1%). Furthermore, their findings indicated that subepithelial corneal scarring was detected in approximately 9.9% of the children in the study. According to Solomon A *et al*[22] a harmful cycle of inflammation is initiated through a series of interrelated interactions between the conjunctiva and the cornea. This cycle leads to harm to the corneal epithelium and stroma, giving rise to the development of shield ulcers, plaques, infectious keratitis, keratoconus, scarring, and limbal stem cell deficiency. These corneal issues have the potential to result in a permanent reduction or loss of vision in children affected by VKC.[22] Vernal keratoconjunctivitis is a relatively rare condition, and as a result, there are limited large-scale studies or long-term follow-up data available. This lack of data makes it challenging to accurately estimate the frequency of keratopathy. This study possess smaller study sample can lead to skewed or inaccurate estimations of the frequency of keratopathy, making it challenging to generalize findings to the broader population. Future large-scale studies and increasing awareness of vernal keratoconjunctivitis and its potential complications, including keratopathy, can encourage more individuals to seek medical evaluation and treatment. Early diagnosis and intervention can help prevent or manage keratopathy effectively.

## CONCLUSION

In conclusion, the present study provides valuable insights into the frequency of keratopathy in vernal keratoconjunctivitis within our specific population. It is indicated that the frequency of keratopathy in vernal keratoconjunctivitis approximately observed to be the 22.0%. This data contributes to our understanding of the condition and its complications, shedding light on the specific dynamics within our local context. This study is unique to our population, and as such, the results cannot be readily generalized to broader populations due to the lack of comparative data. This underscores the need for caution when interpreting and applying these findings outside our specific demographic.

## LIMITATIONS

The study may have included a limited number of participants and did not account for various atmospheric factors that are known to influence vernal keratoconjunctivitis and the development of keratopathy. This includes factors such as humidity, temperature, allergen levels, and pollution, which can play a significant role in the prevalence and severity of the condition.

## SUGGESTIONS / RECOMMENDATIONS

This study serves as a foundational step in understanding the prevalence of keratopathy in vernal keratoconjunctivitis within our population, but it underscores the necessity for continued research and collaborative initiatives to establish a more comprehensive and universally applicable understanding of this condition.

## CONFLICT OF INTEREST / DISCLOSURE

None.

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