



## CORNEAL TOPOGRAPHIC CHANGES ASSOCIATED WITH VERNAL KERATOCONJUNCTIVITIS IN CHILDREN

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### ABSTRACT

**Aim:** To determine the corneal topographic changes in children with vernal keratoconjunctivitis and to compare them with normal children. **Methods:** This was an observational study done over a period extending from November 2020- October 2021 in Department of Ophthalmology, Government Medical College Jammu. The study comprised of study and control group. Topography was performed with Keratron model of corneal topography system from Optikon 2000 SpA. **RESULTS:** In this study, the mean Sim K Astigmatism (D) was  $1.26 \pm 0.82$  in cases and  $0.73 \pm 0.38$  in controls. In our study eyes,  $> 1.5$  D Astigmatism was seen in 9 (40.91 %) cases whereas none in controls. p value (0.01) was found to be significant. The incidence of keratoconus like pattern (K max  $> 47.2$  D + Sim K astigmatism  $> 1.5$  D) in our study eyes was 13.64 % in cases as compared to none in controls on corneal topography. **Conclusion:** This study concludes that the incidence of astigmatism and keratoconus like topography is higher in patients with VKC and there is a strong association of keratoconus with VKC.

**KEYWORDS :** Astigmatism, corneal topography, keratoconus, VKC

### INTRODUCTION

Vernal keratoconjunctivitis, is a recurrent, bilateral, interstitial inflammation of the conjunctiva showing periodic seasonal incidence. It is characterized by flat-topped papules usually present on the tarsal conjunctiva resembling cobblestones in appearance, a gelatinous hypertrophy of the limbal conjunctiva, and keratitis associated with redness, itching, lacrimation and mucinous or lardaceous discharge (Duke Elder, 1965). It is a self-limited condition.

VKC shows great racial and geographical variation. It is most common and very severe in hot, arid environments such as the Mediterranean basin, the Indian subcontinent (Buckley, 1988). A male predisposition has been seen, especially in patients under 20 years of age, among whom the male:female ratio is 4:1 (Leonardi et al., 2006). The gender discrepancy and the improvement seen during puberty have suggested a role for hormonal influence on disease burden. The onset of disease is generally before the age of 10, usually in childhood. It lasts for 2 to 10 years and it usually resolves during late puberty (Bonini et al., 2004). Moderate to intense conjunctival injection, chemosis, severe itching, foreign body sensation, blepharospasm, photophobia, pain are typical signs and symptoms of VKC. These may be very intense upon awakening, causing frequently what is called the morning misery. The disease exists in three clinical forms: tarsal, limbal (bulbar) and the mixed form. Tarsal form is characterized by large papillae of different shape and size, usually greater than 1 mm in diameter, on the upper tarsal conjunctiva. The tarsal conjunctiva develops a cobblestone appearance. The predominant findings are gelatinous limbal papillae associated with epithelial infiltrates described as Horner-Trantant dots which are focal collections of degenerated eosinophils and epithelial cells. The mixed form is characterized by the presence of both forms in the same eye. The bulbar and mixed form of VKC are observed more commonly in Africans and Asians, whereas the palpebral form is seen more among the Europeans as well as the Americans.

VKC patients have a characteristic ropy, stringy mucous and/or serous discharge. Fibrin which is enhanced by heat may accumulate on the giant papillae. It is called as Maxwell-Lyons sign (Donshik and Williams, 1994).

VKC is a condition mediated by Th-2 lymphocytes which

differentiates it from seasonal and perennial allergic conjunctivitis. Both type-I IgE-mediated and type-II hypersensitivity reactions are active with cell-mediated Th-2 involvement of mast cells, lymphocytes and eosinophils in VKC (Malu, 2014). Complications such as superficial punctate keratitis with superficial pannus, shield ulcer, pseudogerontoxon, peripheral corneal degeneration and keratoconus are associated with VKC. Corneal topography is at present the most commonly used method in practice for detection of keratoconus-like pattern which can later be confirmed by clinical signs. It is described as a non-invasive technique to study the morphology of the cornea both qualitatively and quantitatively allows its geometric characterization and hence differentiating standard patterns from those potentially devastating for vision disorders caused by pathological ectatic conditions. It is useful in evaluating patients even with minimal visual loss.

Routine topography is indicated in allergic disorders and VKC since they could be associated with early onset of keratoconus. Severe cases have an increased risk of acute corneal hydrops and may require early keratoplasty. Measures such as control of allergy and eye rubbing helps in preventing corneal ectasias in cases of ocular allergy.

### MATERIAL AND METHODS

This cross-sectional, analytical, observational and hospital based study was conducted in the Department of Ophthalmology, GMC Jammu from November 2020 to October 2021 after approval from Institutional Ethics Committee. Study consisted of two groups viz children diagnosed with vernal keratoconjunctivitis (Study Group) and age and sex matched healthy children (Control Group).

### Sample Size

Sample size was calculated by using OpenEpi Online statistical software version 3.01. The parameters used were – Confidence Interval 95%, power 80%, and ratio of sample size between two groups as 1. After calculation, the sample size was found to be 22 in each of the two groups.

Children diagnosed with vernal keratoconjunctivitis aged between 5-18 years and of either sex were included and children with any corneal pathology (infective, degenerative, dystrophic) or ocular trauma or myopia  $> 3$ D or any previous history of shield's ulcer, corneal scars and contact lens or any

systemic connective tissue disorders were excluded from the study.

Symptoms of the patient were noted. Detailed present and personal history was taken. Complete general physical examination was carried out. Uncorrected and corrected distance visual acuity of each eye was assessed with the Snellen's Chart / objective refraction. Anterior segment examination was done with the help of Slit lamp bio microscopy.

Diagnosis of VKC was made on the basis of the typical clinical history of itching, redness, foreign body sensation with characteristic signs, including giant papillae on the upper palpebral conjunctiva, limbal infiltrates, and eosinophilic concretions (Horner-Trantas' dots). Slit-lamp biomicroscopic signs such as Vogt's striae, Fleischer's ring, stromal thinning, stromal scarring and topographic findings of irregular mires consistent with a diagnosis of keratoconus was recorded for each subject. Topography was performed with Keratron model of corneal topography system from Optikon 2000 SpA.

Statistical analysis was done by using SPSS software for windows version 25.

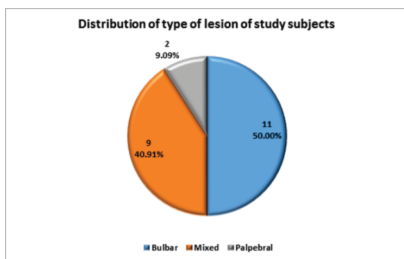
**RESULTS**

**Table 1:- Comparison of demographic characteristics between cases and controls.**

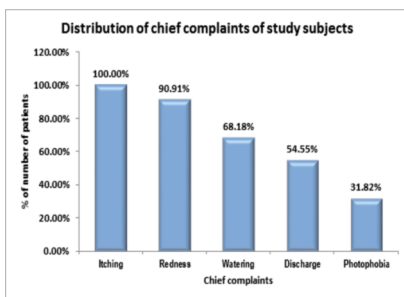
Demographic characteristics	Cases (n=22)	Controls (n=22)	p value
Age (years)			
5-10	11 (50%)	8 (36.36%)	
11-15	8 (36.36%)	7 (31.82%)	
> 15	3 (13.64%)	7 (31.82%)	
Mean ± SD	11 ± 3.44	12.82 ± 3.81	0.104
Gender			
Female	8 (36.36%)	8 (36.36%)	1
Male	14 (63.64%)	14 (63.64%)	

**Table 2:- Distribution of duration of symptoms (months) of Cases.**

Duration of symptoms (months)	No. of patients	Percentage
Upto 6 months	3	13.64%
7 to 12 months	9	40.91%
13 to 24 months	7	31.82%
> 24 months	3	13.64%
Mean ± SD	17.55 ± 14	



**Figure 1:- Distribution of type of lesion of Cases.**



**Figure 2:- Distribution of Chief complaints of Cases.**

The mean Steep K (D) was 44.86 ± 2.43 in cases and 43.07 ± 2.5 in controls. On comparing the mean values of Steep K between the cases and controls, p value (0.02) was found to be significant. p value was calculated by Independent t test.

**Table 3:- Comparison of K average (Dioptre) between cases and controls.**

K average (Dioptre)	Cases (n=22)	Controls (n=22)	p value
<=47.2 D	19 (86.36%)	22 (100%)	
>47.2 D	3 (13.64%)	0 (0%)	
Mean ± SD	44.24 ± 2.15	42.71 ± 2.51	0.036

**Table 4:- Comparison of Sim K Astigmatism (Dioptre) between cases and controls.**

Sim K Astigmatism (Dioptre)	Cases (n=22)	Controls (n=22)	Total	p value
<=1.5 D	13 (59.09%)	22 (100%)	35 (79.55%)	
>1.5 D	9 (40.91%)	0 (0%)	9 (20.45%)	
Mean ± SD	1.26 ± 0.82	0.73 ± 0.38	0.99 ± 0.69	0.01

**Table 5:- Comparison of keratoconus like topography (Kmax > 47.2 D + Sim K Astigmatism > 1.5 D) between cases and controls.**

Keratoconus like pattern	Cases (n=22)	Controls (n=22)
No	19 (86.36%)	22 (100%)
Yes	3 (13.64%)	0 (0%)
Total	22 (100%)	22 (100%)

**DISCUSSION**

Vernal keratoconjunctivitis is known to be one of the most severe forms of ocular allergy with potential to cause corneal damage and permanent visual loss. Corneal involvement occurs in 50% patients of VKC. Children with VKC have a high incidence of keratoconus and astigmatism and have more abnormal corneal topography patterns compared with normal eyes (Totan et al., 2001 and Kaya et al., 2007). Chronic ocular trauma and rubbing of eyes due to itching could be the environmental factor ('trigger') associated with keratoconus development in genetically predisposed individuals (Cameron et al., 1989). In this study, the mean age was 11 ± 3.44 years for the cases, 12.82 ± 3.81 for the controls. In a study conducted by Totan et al. (2001), majority of the patients were clustered between 8 -22 years of age and the mean age of the patients was 15.04 ± 6.11 years which is comparable to our study. Similarly, Sharma et al. (2016) reported the mean age as 13.88 ± 4.83 years in VKC cases with age range of 6 to 15 years thus indicating that vernal keratoconjunctivitis is common in this age group. Based on topography, the mean Sim K Astigmatism (D) among study eyes was 1.26 ± 0.82 in cases and 0.73 ± 0.38 in controls. In our study eyes, >1.5 D Astigmatism was seen in 9 (40.91 %) cases whereas none in controls; which is higher when compared to controls. p value was found to be significant (p=0.01). In a study done by Gomes et al. (2005), significantly more astigmatism and corneal asymmetry were detected in eyes with VKC. Similarly, the study of Vernal keratoconjunctivitis in school children in Rwanda conducted by De Smedt et al. (2012) reported that children with VKC were > 6 times more likely to have corneal astigmatism (>2D) in worse eye. This indicates that astigmatism is commonly associated with VKC. The two most important indices for detecting keratoconus like topography are Kmax and Sim K astigmatism. The incidence of keratoconus like pattern (K max >47.2 D + Sim K astigmatism > 1.5D) in our study eyes was 13.64 % in cases as compared to none in controls on corneal topography. This correlates with a study conducted by Lapid-Gortzak et al. (2002) where 11.25% keratoconus like pattern was noted in the VKC patients.

**CONCLUSION**

This study concludes that the prevalence of VKC in males was found to be higher than females. Incidence of astigmatism and keratoconus like topography is higher in patients with VKC and there is a strong association of keratoconus with

VKC. Longer duration of disease is associated with more topographic corneal changes in patients of VKC. Corneal topography should be done in all the patients of VKC since it is possible to detect early, mild form of keratoconus by qualitative and quantitative assessment of video keratographic maps, thus allowing early detection and management of keratoconus and related complications.

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