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Research Article

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A Prospective Study to Find the Association of Astigmatism in Patients of Vernal Keratoconjunctivitis (VKC) in a Tertiary Health Care Centre in India (Vindhya Region MP)

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ABSTRACT

Introduction: Vernal keratoconjunctivitis (VKC) /Spring catarrh is a chronic, bilateral, although it can occasionally present unilaterally[1] at times asymmetrical, seasonally exacerbated, allergic inflammation of the ocular surface, involving the lids, conjunctiva (tarsal/bulbar), limbus and the cornea with periodic incidence of self-limited character mainly affecting patients in their first or second decade[2]

Aim: To conduct a prospective study to find the association of astigmatism in patients of vernal keratoconjunctivitis (VKC) in tertiary health care Centre.

Material and Method: Hundred patients, age ranging between 5 and 20 years, with Vernal Keratoconjunctivitis (VKC) attending the ophthalmology out-patient department at tertiary health care centre, Rewa, M.P., India from January 2020 to June 2021 were included in the study. Detailed history including a record of age, sex, place of residence, age of onset of symptoms, seasonal variation, associated allergic or atopic history, best corrected visual acuity, refractive status and autorefractometry was noted, and each patient was thoroughly examined with slit lamp.

Result: Vernal Keratoconjunctivitis (VKC) is found to affect young males76 (76%) more than females 24 (24%). Male: female 3:1. 80% patients were below 16 years of age, more in summer in the month of May and June. Itching was the commonest presentation 100 (100%). Palpebral 59 (59%) form of the VKC was predominant type of all three. Myopia 28 (28%) was the commonest refractive error followed by Hypermetropia 9 (9%) and Astigmatism 19 (19%). Amongst astigmatism maximum were having mixed type astigmatism, palpebral form was mostly associated with astigmatism.

Conclusion: We found myopia to be the commonest refractive error in patients of Vernal Keratoconjunctivitis followed by hypermetropia and astigmatism. Chronic VKC was the commonest manifested stage. Palpebral Vernal Keratoconjunctivitis was the commonest clinical type.

Key Words: Vernal Keratoconjunctivitis, Allergy, Palpebral, Limbal, Hypermetropia, Myopia, Astigmatism

INTRODUCTION

Vernal keratoconjunctivitis (VKC) /Spring catarrh is a chronic, bilateral, although it can occasionally present unilaterally[1] at times asymmetrical, seasonally exacerbated, allergic inflammation of the ocular surface, involving the lids, conjunctiva (tarsal/bulbar), limbus and the cornea with periodic incidence of self-limited character Mainly affecting patients in their first or second decade.[2] The disease is more common among males with the male to female ratio reported in the various studies varying from 4:1 to 2:1. It is more common and most severe in hot, arid environment such as temperate zones of Mediterranean areas, Central and West Africa, the Middle East, Japan and the Indian subcontinent.[3] Its onset is most common in the spring and summer in the month of April to August. Patients with VKC have chances of developing refractive errors. Some patients also have family history of atopy, most common atopy being Asthma. On the basis of location VKC is classified as limbal, palpebral or mixed types Most common presenting symptoms of VKC are itching, redness, photophobia, burning sensation, watering, and a mucinous or ropy discharge.[4]

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VKC is known to be clearly associated with keratoconus due to eye rubbing and causes myopic astigmatism and visual disturbance. Refractive errors are also becoming serious public health problem and are major cause of poor quality of life in children. So, each VKC patient should have proper refraction after diagnosis.

In the present study, we have tried to observe if there is an association between astigmatism with types of VKC, and the stages of disease.

MATERIAL AND METHODS

The present study is a prospective observational longitudinal single-Centre study, and was carried out on outdoor patients of vernal keratoconjunctivitis in Department of ophthalmology shyam shah medical college and associated Gandhi Memorial Hospital, Rewa (MP) India, during the period of January 2020 to September 2021.

The study had included 100 cases of vernal keratoconjunctivitis during the period of January 2020 to September 2021

CASE SELECTION

A total of 200 eyes of 100 patients with VKC attending the out-patient department of Ophthalmology Department of S.S. Medical College and associated Gandhi Memorial Hospital, Rewa (M.P.) fulfilling the following criteria were enrolled in the study.

INCLUSION CRITERIA

1. All cases of vernal keratoconjunctivitis.
2. Patients willing to sign consent.

EXCLUSION CRITERIA

1. Patients below 5 years of age
2. Patients with previous history of drug instillation
3. Any patient with ocular trauma and surgery
4. Contact lens wearers
5. Other ocular disorders like glaucoma and blepharitis

DATA COLLECTION METHOD

Subjects who satisfy all inclusion criteria and meet no exclusion criteria were included in the study. A written and detailed Informed consent was taken and demographic details of all patients were documented. The purpose of study was explained to the subjects and their parents in cases of minority of subject's age and confidentiality was assured.

This prospective observational longitudinal single- Centre study was initiated in the (January-February) of 2020.

Data collected from all subjects included demographic characteristics like

1. Age
2. Gender of participants
3. Place of residence
4. Occupation
5. Occurrence of symptoms
6. Duration of symptoms
7. Personal or family history of Allergy and other atopy like allergic rhinitis and atopic dermatitis
8. Past history of ocular trauma, surgery and wearing spectacles for vision correction and a detailed clinical history including the chief visual complaint, history of present illness, were recorded on specifically designed proforma.

Ocular Examination

Ocular examination of both eyes of all subjects was started under the following headings including:

VISUAL ACUITY

Assessment of visual acuity with snellen‟s visual acuity chart, Landolt‟s C-Chart in an adequately lighted room.

SLIT LAMP BIO-MICROSCOPY

Slit lamp examination for anterior segment evaluation.

REFRACTION

Cycloplegic refraction and astigmatism were recorded

INTRAOCULAR PRESSURE

Intraocular pressure of each patient was noted with Applanation tonometer.

KERATOMETRY

Keratometry was done by using shin Nippon Autoref-Keratometer to rule out astigmatism and any corneal distortion.

AUTOREFRECTOMETRY

Autorefractometry (ARK) in all patients of VKC was done with Shin Nippon Autorefractometer.

FUNDUS EXAMINATION

Fundus examination was done with 90D Lens and Indirect Ophthalmoscopy.

Diagnosis of VKC was made on the basis of symptoms and signs included:

Symptoms including:

1. Itching
2. Redness
3. Watering
4. Photophobia
5. Ropy discharge
6. Foreign body sensation

Signs Including:

1. Conjunctival injection
2. Upper tarsal giant papillae and Cobble-stone papillae
3. Thickening and opacification of the limbal conjunctiva
4. Perilimbal Horner–Tranta's dots
5. Punctate epithelial erosions or keratitis
6. Shield ulcers
7. A waxing and waning Gray–white lipid deposit (Pseudogerontoxon.)
8. Granuloma formation.

Severity grading of the VKC was done based on the symptoms and signs as recorded by Gokhale NS24. The method of evaluation was done with gradation of symptoms and signs as described below.

(1) **Itching in eyes**
(0) No desire to scratch or rub eyelids
(1) Occasional desire to scratch
(2) Frequent desire
(3) Constant desire
(2) Tearing
(0) Normal tear production
(1) Sensation of tears
(2) Infrequent spilling of tears
(3) Nearly constant spilling of tears
(3) Discharge
(0) No discharge
(1) Ropy discharge
(2) Presence of crust on awakening
(3) Lids matted with discharge
(4) Photophobia
(0) No difficulty
(1) Mild difficulty causing squinting
(2) Dark glass necessary
(3) Difficulty causing to stay indoor
(5) Conjunctival hyperemia
(0) Normal quiet eye
(1) Mild slightly dilated blood vessels
(2) Moderate - more apparent dilated blood vessels; intense Red,
(3) Severe - Numerous dilated blood vessels, deep red.
(6) Conjunctival pigmentation
(7) Limbal Nodule
(0) No evidence
(1) In one quadrant
(2) In two quadrants
(3) In three or more quadrant
(8) Papillary hypertrophy
(0) No Evidence
(1) Mild Papillary hyperemia
(2) Hyperemia with hazy view of tarsal vessels
(3) Papillary hypertrophy and non-visualization of tarsal vessels.
(8) Punctate keratitis
(0) No Evidence
(1) In one quadrant
(2) In two quadrants
(3) In >3 quadrant.

Clinical severity Grading of VKC:

(0). Quiescent: Absence of symptoms
(1). Mild Symptoms but no corneal Involvement
(2). Moderate Symptoms with photophobia but no corneal involvement
(3). Severe Symptoms, Photophobia Mild to moderate SPK.

STATISTICAL ANALYSIS PLAN

1. The collected data was fed in computer in MS Excel sheet and an individual master chart was prepared for each group for analysis.
2. Graph pad instat software was employed for the statistical analysis in which unpaired t-test and Chi square was applied to compare the two groups and thus the probability (p) value was procured. p value indicates how likely it is that a result has occurred by chance alone.
3. Smaller the p value more is the significance of a test and so a p value of < 0.05 or $< 5\%$ is taken as statistically significant.

OBSERVATIONS AND RESULT

A total of 200 eyes of 100 patients who fulfilled the study criteria were enrolled for the study and after examination, following observations were made-

Table 1: Age and gender distribution of the patients:

Age group in years	Male		Female		Total	
	No of cases	%	No of cases	%	No of cases	%
5-10 yr	17	17.0%	12	12.0%	29	29.0%
11-15 yr	28	28.0%	13	13.0%	41	41.0%
16-20 yr	16	16.0%	14	14.0%	30	30.0%
Total	61	61.0%	39	39.0%	100	100.0%

Table 1 depicts the Age and gender distribution of the patients. Age group 11-15 yr was in majority (41%) followed by 16-20 yr (30%) while 29% age group 5-10 yr. The study included 61 males while 39 were females.

Table 1 depicts the Age and gender distribution of the patients. Age group 11-15 yr was in majority (41%) followed by 16-20 yr (30%) while 29% age group 5-10 yr. The study included 61 males while 39 were females

Table 2: Visual acuity at the time of presentation

VA	No. of Eyes	%
6/24 - 6/18	4	2.0
6/12 - 6/9	108	52.0
6/6	88	44.0
Total	200	100.0

Table 2 depicts the visual acuity at the time of presentation in the study, maximum cases had visual acuity between 6/12 – 6/9 (52%). While the cases with VA 6/6 were 44% and cases with VA 6/24-6/18 were 2% only.

Table 3: Type of Vernal Keratoconjunctivitis (VKC) stages

VKC Stages	No. of Cases	%
Acute	39	39.0
Chronic	61	61.0
Total	100	100

Table 3 depicts the type of Vernal keratoconjunctivitis (VKC) stages. In 61 cases, chronic VKC stage was present while in remaining 39% cases, only acute VKC stage was present.

Table 4: Distribution of refractive error in VKC patients

Refraction	No. of Cases	%
Emmetropia	44	44.0
Myopia	28	28.0
Hypermetropia	9	9.0
Astigmatism	19	19.0

Table 4 depicts the distribution of refractive error in VKC patients. Emmetropic 44% cases, Myopic 28%, Hypermetropic 9% and Astigmatism 19% cases. Myopia was the most frequent refractive error while Hypermetropia were present in least proportion.

Table 5: Type of Astigmatism in VKC patients

Astigmatism	No. of Cases	%
None	81	81.0
Simple	03	3.0
Compound	06	6.0
Mixed	10	10.0
Total	100	100.0

Table 5 depicts the types of Astigmatism in VKC patients. No astigmatism in 81% cases. Simple astigmatism in 3%, compound 6% and mixed 10% cases. The most frequent type was mixed while simple was present in least frequency.

Table 6: Association of VKC with astigmatism

Astigmatism	VKC Stage				Total		chi sq	p-value
	Acute		Chronic					
	No.	%	No.	%	No.	%		
None	32	92.3%	49	80.3%	81	81.0%		
Simple	01	2.6%	02	0.0%	03	3.0%		
Compound	02	0.0%	04	4.9%	06	6.0%	0.134	0.987
Mixed	04	5.1%	06	14.8%	10	10.0%		
Total	39	100.0%	61	100.0%	100	100.0%		

Table 6 depicts the Association of VKC with astigmatism. In acute and chronic both type of VKC cases, mixed type was present in highest proportion but there was a remarkable difference between Acute and Chronic cases (5.1% vs 14.8%). However no significant association was found between Astigmatism type and VKC stage. (p=0.987).

Table 7: Association of VKC with Refractive error

	VKC Stage				Total		chi sq	p-value
	Acute		Chronic					
	No.	%	No.	%	No.	%		
Emmetropia	24	25.60%	20	23.00%	44	24.00%	8.44	**0.038**
Myopia	8	46.20%	20	34.40%	28	39.00%		
Hypermetropia	3	10.30%	6	8.20%	9	9.00%		
Astigmatism	4	17.90%	15	36.10%	19	29.00%		

Table 7 depicts the Association of VKC with Refractive error. In acute type of VKC cases, Myopia was present in highest proportion (46.2%) while in chronic cases Astigmatism was present in highest proportion (36.1%). The significant association was found between refractive error types and VKC stage. (p=0.038).

Table 8: Association of VKC type with Astigmatism

Astigmatism	VKC types						Total		chi sq	p-value
	Palpebral		Bulbar		Mixed					
	No.	%	No.	%	No.	%	No.	%		
None	45	84.7%	15	87.5%	20	84.0%	81	85.0%	2.76	0.838
Simple	2	1.7%	0	0.0%	1	0.0%	3	1.0%		
Compound	4	5.1%	0	0.0%	2	0.0%	6	3.0%		
Mixed	7	8.5%	1	12.5%	2	16.0%	10	11.0%		
Total	59	100.0%	16	100.0%	25	100.0%	100	100.0%		

Table 8 depicts the Association of VKC type with Astigmatism. In all type of VKC cases, Mixed type of Astigmatism was present in highest proportion (8.5% in palpebral, 12.5% in Bulbar and 16% in Mixed) However no significant association was found between Astigmatism types and VKC type. (p=0.838).

Table 9: Association of VKC type with Refractive error

Type of Refractive error	VKC types						Total		chi sq	p-value
	Palpebral		Bulbar		Mixed					
	No.	%	No.	%	No.	%	No.	%		
Emmetropia	24	18.6%	9	50.0%	11	20.0%	44	24.0%	3.12	0.475
Myopia	17	42.4%	5	25.0%	6	40.0%	28	39.0%		
Hypermetropia	6	10.2%	0	0.0%	3	12.0%	9	9.0%		
Astigmatism	12	30.5%	2	25.0%	5	28.0%	19	29.0%		
Total	59	100%	16	100%	25	100%	100	100%		

Table 9 depicts the Association of VKC type with refractive error. Emmetropia was present in Bulbar in maximum proportion.

Myopia was present in Palpebral in maximum proportion (p=0.447).

Hypermetropia was present in Mixed in maximum proportion (p=0.376).

Astigmatism was present in Palpebral in maximum proportion.

However no significant association was found between type of refractive error and VKC type. (p=0.475).

DISCUSSION

DEMOGRAPHIC PROFILE

DISTRIBUTION IN ACCORDANCE WITH AGE:

Total 100 patients were enrolled. The age group considered in our study was 5 to 20 years. The mean age of presentation was 12 (mean 10±2.5 years) years with maximum subjects were in the age group of 11-15 years. It is similar to the other studies conducted by Saleh et al.[5] in 2011 at Yemen Saudi Arabia (9±3.0) years, Shaikh et al.[6] in 2001 at Pakistan (mean 10±2.0 years) and in2008 at Nigeria((mean 8±4.0 years), Shailender et al.[7] in 2019 at Tanda(7.1±4.5), Bonini et al.[2] in 2000 at Rome Italy(7.1±4.7), Leonardi et al.[8] in 2006 at Italy(7.0±5.), Al-Akily et al.[9] in 2011 at Yemen Saudi(7.0±5.), Niharika Shetty et al.[10] in 2019 at Tumakuru Karnataka (10±2.) In all these studies mean age of presentation was 6-15 years.

DISTRIBUTION IN ACCORDANCE TO GENDER:

Total 100 patients were included in the present study, out of which 76 were male and 24 were female. We found predilection VKC for male. gender with (male: female ratio 3:1)61% male and 39% female. Results were comparable to studies conducted by Shaikh et al.[6] Bonini et al.[2] Leonardi et al.[8] Kanskar et al.[11] in 2011 at Nepal Niharika Shetty et al.[10] where the male and female ratio was 3.3:1, 3:1, 4:1, 4.3:1 and 1.8:1 respectively. Our study has found a male: female ratio which is in line with most other studies

However, Ukponmwan et al.[12] in 2003 at Nigeria reported a female predominance with (male: female 1:1.3).

DISTRIBUTION IN ACCORDANCE WITH VISUAL ACUITY AT PRESENTATION:

Out of 100 patients we had 52% patients (VA) ranging between 6/12-6/9 mild vision loss, 2% moderate vision loss while 44% VA 6/6. Ujwala SS et al.[13]in 2012 at Hyderabad reported slightly higher 88% patients with mild vision loss,8% moderate vision loss and 4% with severe vision loss.

Bonini et al.[2] noted permanent visual loss in 6% patients (out of 100 patients) due to corneal complications and scarring.

DISTRIBUTION OF REFRACTIVE ERROR IN VKC PATIENTS:

In present study myopia was the commonest refractive error (28%) followed by astigmatism (19%) and hypermetropia (9%) associated with VKC. Similar result was also obtained in a study conducted by Mimura T et al in 2009 at China, they found 40% patients were having myopia as associated refractive error followed by hypermetropia and astigmatism.

Contradictory to above study, Niharika KS et al.[10] in 2018 observed hypermetropia (48%) as the commonest associated refractive error, followed by myopia (38%) and astigmatism (14%). While Tahir T et al.[14] in 2013 at Pakistan found astigmatism as the commonest associated refractive error 22 (55%) out of 50 patients, 10 (25%) myopia and 8 (20%) hypermetropia.

DISTRIBUTION ACCORDING TO TYPES OF ASTIGMATISM IN VKC PATIENTS:

In our study astigmatism was present in 19% of the patients. Amongst astigmatism maximum (10%) had mixed type of astigmatism that is hyperopic as well as myopic component co-existed, which is similar to a study conducted by Niharika KS et al.[10]

ASSOCIATION OF VKC STAGES WITH REFRACTIVE ERROR:

It was observed that though in acute type of VKC cases, Myopia was present in highest proportion (46.2%) while in chronic cases Astigmatism was present in highest proportion (36.1%). Significant association was found between refractive error types and VKC stage. (p>0.038)

In a contradictory study conducted by **Niharika KS et al.[10]** in which in acute stage myopia was present in higher percent (41.67) while in chronic stage astigmatism was in highest proportion (50%). No Significant association was found between refractive error types and VKC stages. (p>0.087)

ASSOCIATION OF VKC STAGES WITH ASTIGMATISM:

In our study it was observed that though in acute and chronic both type of VKC cases, mixed type was present in highest proportion 5.1%, and 14.8% respectively but there was a remarkable difference between Acute and Chronic cases (5.1% vs 14.8%). Similar to study conducted by **Niharika KS et al.[10]** in 2018 at India. However, no significant association was found between Astigmatism type and VKC stage. (p=0.117).

ASSOCIATION OF VKC TYPE WITH REFRACTIVE ERROR:

In this study it was observed that Emmetropia was present in bulbar form of VKC in maximum proportion.

Myopia was present in palpebral in maximum proportion (42.4%) (p=0.447).

Myopia was present in mixed in maximum proportion (40.0%)

(p=0.376).

Astigmatism and myopia were in same proportion each 25% in bulbar form.

However, no significant association was found between type of refractive error and VKC type. (p=0.475).

Contradictory to this, study conducted by Niharika KS et al. they found that 42.11% myopes had bulbar VKC and

44.74% of the hyperopes had bulbar VKC. However, in 2018 at India, shown that 34.21% bulbar form does not have any type of astigmatism and another 34.21% patients with bulbar form had mixed astigmatism. Palpebral type showed maximum patients with no astigmatism.

CONCLUSIONS

The following conclusions were drawn from this study:

1. Most of the Vernal Keratoconjunctivitis patients were observed in the age group of 11-15 years, with mean age of presentation was 12 years (Mean 10±2.5 years).
2. There was male predominance (76%) as compared with female (24%) with the M:F ratio of 3:1.
3. Few patients (52%) were having mild visual loss that is visual acuity ranging between 6/12-6/9. None of the patients were showing permanent visual loss.
6. Majority of the patients were having chronic presentation (61%).
7. Palpebral form of the VKC (59%) was the commonest type followed by mixed (25%) and bulbar (16%)
11. Myopia (28%) was the commonest refractive error followed by Astigmatism (19%) and hypermetropia (9%). Myopia was maximally present in palpebral type (42.4%) but the difference was not found to be significant(p=0.029).
12. In acute type of VKC cases, myopia was present in highest proportion (46.2%) while in chronic cases astigmatism was present in highest proportion (36.1%). The significant association was found between refractive error types and VKC stages. (p=0.038).
13. In acute and chronic both type of VKC cases, mixed type was present in highest proportion but there was a remarkable difference between acute and chronic cases (5.1% vs 14.8%). However, no significant association was found between astigmatism type and VKC stages. (p=0.987).
14. It was observed that emmetropia was present in bulbar form of VKC in maximum proportion. Myopia was present in palpebral in maximum proportion (p=0.447). Hypermetropia was present in mixed in maximum proportion Astigmatism was present in palpebral in maximum proportion. However, no significant association was found between type of refractive error and VKC type. (p=0.475).
15. In all type of VKC cases, mixed type of astigmatism was present in highest proportion (8.5% in palpebral, 12.5% in bulbar and 16% in mixed) However no significant association was found between astigmatism types and VKC type. (p=0.838).

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Conflict of Interest

Nil

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REFERENCES

1. Resnikoff S, Cornad G. Limbal vernal keratoconjunctivitis in the tropics 1988;3-4;53-71.
2. BoniniS, Coassin M, AronniS, Llambias. Vernal keratoconjunctivitis. Eye 2004;18;345-51.
3. Pokharel S.vernal keratoconjunctivitis; modes of presentation in Nepalese population. *Kathmandu Univ Med J* .2007;5(4);526-30.
4. Khan MD, Kundi N, Saeed N. Study of vernal keratoconjunctivitis from the north west frontier Province of Pakistan.1986;2;11.
5. Saleh A. Al-Akily, Mahfouth A. Bamashmus. Ocular complications of severe VKC in Yemen. Saudi. J. Ophthalmology 2011 July;25(3):291-4.
6. Shaikh A, Owais SM The morbidity of vernal keratoconjunctivitis. (2001)PJO 3(17):86-89.
7. Minhas S, Tuli R, Sharma G, clinical profile of patients with vernal keratoconjunctivitis 2019; 3(8) :98-101.
8. 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;84:406-10
9. Faisal AK, Shafaq PKN, Salahuddin A; The Clinical Significance of Perilimbal Conjunctival Pigmentation in Vernal Conjunctivitis. *J* Coll Physicians Surg Pak, 2012; 22 (1): 19-22
10. Niharika K. Shetty, Jane AK, Chandana K. A Crosssectional study of Refractive Error in Vernal Keratoconjunctivitis. Ophthalmology and Allied Science 2018;Volume 4 number 2,59-65.
11. Kanskar I. Profile of vernal keratoconjunctivitis in Nepal; a hospitalbased study. *Nepal* Med Coll J: MNCJ.2011Jun;132:92-95. PMID;22364089.
12. Ukponmwan CU. Vernal conjunctivitis in Nigerians: 109consecutive cases. Trop Doct2003;33:242-245.
13. Ujwala S Saboo, jain M, Reddy JC, and Sangwan VS. Demographic and clinical profile of vernal keratoconjunctivitis in tertiary health care centre in India 2013 September61(9);486-489.
14. Tazeentahir, Asad Alam. Proportion of refractive error in patients with Vernal Keratoconjunctivitis. Ophthalmology (Pakistan)2013;03(1):26-29.