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Original Research Article

A Hospital-Based Assessment of the Prevalence of Steroid-Induced Glaucoma among Patients Suffering from Vernal Kerato-Conjunctivitis: A Cross Sectional Study

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Abstract

Aim: The present study aimed to assess the prevalence of SIG in VKC patients treated with topical steroids and to determine the association between different types of topical steroids and the presence of SIG.

Methods: This study was conducted as a hospital-based cross sectional study in the Department of ophthalmology, ANMMCH, Gaya, Bihar, India for nine months. The present study was conducted on a total of 200 cases of VKC managed using topical corticosteroids. All the patients belonging to the age range of 8 years to 18 years who were already diagnosed with VKC and were using topical steroids as treatment were included whereas patients with eye trauma, previous ocular surgeries, developmental or congenital glaucoma, or any angle anomalies were excluded.

Results: In the present study, the mean age of the children with VKC was 13.8±3.2 years and the majority i.e. 65% of the patients with VKC on steroids was males. The mean age at onset of VKC was 12.2±3.6 years and the mean duration of use of TCS was 17.23±2.5 months. The majority of children had a history of eczema (20%), whereas asthma and allergic rhinitis were observed in 18% and 12% of the cases respectively.

Conclusion: Steroids are the mainstay of treatment of VKC, and the use of high potency significantly increases the risk of steroid-induced glaucoma in these patients. Steroid-induced glaucoma is one of the common complications of injudicious and long-term use of topical corticosteroids particularly high potency steroids.

Keywords: Steroid-induced glaucoma (SIG),Vernal kerato-conjunctivitis (VKC), Topical corticosteroids, Intra- ocular pressure (IOP), Potency, Duration

Introduction

Vernal keratoconjunctivitis (VKC) is a bilateral chronic inflammation of the conjunctiva that mostly affects children and young adult males. [1] While the term "vernal" suggests a seasonal pattern of disease, VKC is often persistent in warm, tropical climates around Asia, [2,3] up to a quarter of seasonal cases evolving into perennial disease 3 years from the onset of disease.4 These eyes may be at higher risk of permanent visual impairment due to complications including corneal scarring (6%), cataract formation, and corticosteroid-induced glaucoma (2%–7%). [4–6]

The treatment of VKC includes cold compresses, artificial tears, avoidance of specific/nonspecific triggers, and application of topical ophthalmic preparations ranging from anti‑histamines and mast cell stabilizers to periodic use of topical corticosteroids. [7] Up to 85% of subjects require corticosteroids at some point during the course of their illness. [8,9] The more severe the disease process is, the more symptomatically devastating it is and the more potent the treatment must be to alleviate symptoms and achieve disease quiescence. [8] Often mild steroids have to be prescribed for a longer duration due to severe and chronic nature of disease. Due to its potency, high effectiveness and early symptomatic relief, corticosteroids are abused without the knowledge of its vision threatening complications, mainly cataract and glaucoma. [10-12]

The underlying etiology of VKC is multifactorial and is attributed to multiple factors including climate, environmental allergens, and genetic predisposition. [13] The condition is described as an IgE- and T cell-mediated allergic reaction which may be associated with non-specific hypersensitivity reactions. Apart from this, cytologic, immunohistologic, biohumoral, and molecular studies have suggested VKC as Th2 lymphocyte-mediated disease and the role of Th1-type cytokines, mast cells and eosinophils, chemokines, growth factors, and enzymes have also been suggested in the etiopathogenesis of VKC. [14] The management of VKC depends upon the severity of the symptoms. Antihistamines, mast cell stabilizers, and antiallergic eye drops are most commonly prescribed whereas decongestants are added as adjunctive therapy to the antihistaminics/ antiallergics in cases with mild to moderate disease. Topical steroids are indicated in moderate to severe VKC which act by downregulating conjunctival inflammation. [13] Topical steroids are prescribed for a prolonged duration in the management of VKC. Though initially the topical steroids reduce the ocular inflammation and alleviate inflammatory features, injudicious use of topical corticosteroids may lead to sight-threatening complications, of which steroid-induced glaucoma (SIG) is the most serious one which may lead to permanent visual disability. [15,16]

The requirement for topical corticosteroids is higher in severe VKC and thus, severe VKC and a higher need for TCS may lead to more symptomatically devastating complications. In our clinical practice, we observed increased intraocular pressure in follow-up cases of VKC, this could be attributed to the injudicious use of topical corticosteroids due to their over-the-counter availability and prescription in wrong doses and for the wrong duration by the pharmacist, general physicians, and quacks. [16]

The present study aimed to assess the prevalence of SIG in VKC patients treated with topical steroids and to determine the association between different types of topical steroids and the presence of SIG.

Methods

This study was conducted as a hospital-based cross sectional study in the Department of ophthalmology, ANMMCH, Gaya, Bihar, India for nine months. The present study was conducted on a total of 200 cases of VKC managed using topical corticosteroids. All the patients belonging to the age range of 8 years to 18 years who were already diagnosed with VKC and were using topical steroids as treatment were included whereas patients with eye trauma, previous ocular surgeries, developmental or congenital glaucoma, or any angle anomalies were excluded. Using a questionnaire, basic demographic data was obtained. Detailed clinical history including the drug name, dosage, frequency, and duration of topical steroids was noted. A detailed ophthalmologic

examination was done which included visual acuity testing using Snellen's chart, and a slit-lamp examination of the anterior segment of the eye to re-confirm the presence of VKC. Intra-ocular pressure (IOP) was measured using Goldman's Applanation tonometer, 3-mirror Gonioscopy was also done to rule out any pre-existing angle anomalies, and visual field analysis using Humphery's field analyzer (24-2), and the findings were documented.

A detailed fundus examination with optic nerve head evaluation using a +90 D Volk lens to look for vertical cupdisc ratio, neuro-retinal rim, and cup-asymmetry was done, and the findings were documented. Depending upon the potency of steroids and their IOP raising potential, patients were categorized in to one of the 4 groups (A,B,C,D).[6]

1. Group A- High potency- Dexamethasone and Betamethasone.
2. Group B- Moderate potency- Prednisolone.
3. Group C- weak potency- Loteprednol and Fluorometholone.
4. Group D- unknown drug group.

Patients with intraocular pressure >21 mmHg in two consecutive follow up were given topical anti-glaucoma medications and were monitored for optic nerve head changes and visual field changes were analyzed using a Humphrey field analyzer. Patients with a low IOP range < 40 mmHg were managed with topical Brimonidine and Timolol combination twice a day. Patients with IOP of more than 40 mmHg were managed with intravenous mannitol and systemic acetazolamide 250 mg thrice a day. Patients were asked to follow up every 3 months for monitoring.

Statistical analysis

Data compilation was done with the help of MsExcel and analysis was done using IBM SPSS software version 20. Categorical variables were expressed as frequency and proportion whereas continuous variables were expressed as mean and standard deviation. Association between different types of topical steroids and the severity of SIG was done using a chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Distribution according to baseline variables

Baseline variables	Frequency (n=200)	Percentage
Age (years)		
8-12	80	40%
13-15	78	39%
16-18	42	21%
Gender		
Male	130	65%
Female	70	35%
Mean age at onset	12.2±3.6 years	
Mean Duration of TCS	17.23±2.5 months	
Past history		
Asthma	36	18%
Eczema	40	20%
Allergic rhinitis	24	12%
Family history of atopy	24	12%
Distribution according to potency of corticosteroids		
High	36	18%
Moderate	64	32%
Weak	72	36%

Unknown	28	14%
Distribution according to IOP levels		
Normal	136	68%
Raised	64	32%

In the present study, the mean age of the children with VKC was 13.8±3.2 years and the majority i.e. 65% of the patients with VKC on steroids was males. The mean age at onset of VKC was 12.2±3.6 years and the mean duration of use of TCS was 17.23±2.5 months. The majority of children had a history of eczema (20%), whereas asthma and allergic rhinitis were observed in 18% and 12% of the cases respectively. The majority of children were taking weak potency of corticosteroids (36%), whereas 32% of patients were using moderate potency corticosteroids. Only 14% of the patients with VKC were using high-potency corticosteroids. IOP levels were raised in 32% of the patients managed with topical corticosteroids.

Table 2: Association of baseline characteristics with steroid-induced glaucoma

Baseline variables		**Steroid-induced glaucoma**		**P Value**
		Present n=20	**Absent n=180**	
Age in years	8-12	11 (55%)	72 (40%)	0.12
	13-15	5 (25%)	72 (40%)	
	16-18	4 (20%)	36 (20%)	
Gender	Male	12 (60%)	117 (65%)	0.32
	Female	8 (40%)	63 (35%)	
Mean age at onset (years)		11.9±3.1	12.8±3.8 0.37	0.34
Mean Duration of TCS (months)		22.8±8.9	4.1±0.4 0.001	0.001
Potency of corticosteroids	High	11 (55%)	27 (15%)	0.002
	Moderate	5 (20%)	54 (30%)	
	Weak	3 (15%)	72 (40%)	
	Unknown	1 (5%)	27 (15%)	

Steroid-induced glaucoma was significantly associated with prolonged duration of corticosteroids and high potency corticosteroid use ($p<0.05$).

Table 3: Assessment of various glaucomatous parameters with relation to potency of topical corticosteroids

Parameters		**The potency of topical Corticosteroids**				**P-value**
		High n=11	**Moderate n=5**	**Weak n=3**	**Unknown n=1**	
Best corrected Visual Acuity	>20/40	5	1	2	0	0.21
	20/40-20/200	3	2	1	1	
	<20/200	3	1	0	0	
Intraocular Pressure	<30 mmHg	3	0	2	1	0.02
	30-40 mmHg	5	2	1	0	
	> 40 mmHg	3	2	0	0	
Optic nerve head changes	<0.5 cupping	4	1	2	0	0.02
	0.5- 0.7 cupping	4	2	0	1	
	>0.7 cupping	3	1	0	0	
Visual Field changes	Early	7	2	3	1	0.32
	Advanced	4	2	0	0	

The majority of patients had intraocular pressure in the range of 30-40 mmHg. The mean IOP was 35.5±7.1 mmHg. The majority of patients were having cupping in the range of 0.5 to 0.7 with mean cupping of 0.56±0.13. On gonioscopy, all patients had open angles in all four quadrants in both eyes.

Discussion

Vernal keratoconjunctivitis (VKC) is a bilateral, chronic, external ocular inflammatory disorder; mainly affecting subjects in their first or second decade mostly in temperate climate. [17,18] It is a type 1 IgE mediated hypersensitivity reaction. [19,20] It causes intense ocular itching, tearing, mucous stringy discharge, photophobia, blepharospasm and foreign body sensation. [7,21]

Corticosteroids are the mainstay of management of moderate to severe VKC in children, but these should be used judiciously and long-term use is not recommended as they have the potential to develop ocular complications such as raised intra-ocular pressure, steroid-induced glaucoma, exacerbation of glaucoma, steroid-induced cataract, increased susceptibility to infection, and delayed wound healing. Overall, the complications depend upon the dose, duration, potency of the steroid, and severity of VKC. [23] Steroid-induced glaucoma is one of the common complications associated with topical corticosteroids. Literature suggests that continuous administration of topical corticosteroids for 4–6 weeks may make approximately one- third of the patients as high to moderate steroid responders. [22]

Our study findings were supported by the findings of Ang et al in which the authors documented the prevalence of steroid-induced glaucoma as 5.5%. [15] Our study findings were also supported by similar findings where corticosteroid responses have been reported to range from 6% to 56% in Chinese children even without the presence of VKC. [24-26] Senthil et al reported the prevalence of steroid-induced glaucoma as 2.24%. [27] Corticosteroid-induced glaucoma is an iatrogenic cause of open-angle glaucoma, which results from decreased trabecular outflow. [28] The majority of patients had Intraocular Pressure in the range of 30-40 mmHg. The majority of patients were having cupping in the range of 0.5 to 0.7. High potency corticosteroids were significantly associated with advanced cupping as well as a high range of IOP. These findings were similar to the study conducted by Saadia Farooq et al. [29] We also aimed to assess the risk factors associated with steroid-induced glaucoma in patients of VKC. In our study, highly potent steroids and prolonged duration of steroids were associated with steroid-induced glaucoma ($p<0.05$). Various risk factors have been suggested in previous literature for steroid-induced glaucoma, these include the type of steroid, the potency of the corticosteroid, and preexistent ocular conditions such as ocular hypertension or primary open glaucoma. [30,31]

Conclusion

Steroids are the mainstay of treatment of VKC, and the use of high potency significantly increases the risk of steroid-induced glaucoma in these patients. Steroid-induced glaucoma is one of the common complications of injudicious and long-term use of topical corticosteroids particularly high potency steroids. Approximately one-third of the patients on treatment for VKC are corticosteroid responders. There should be a provision of periodic screening of vision and intraocular pressure along with counseling of guardians of patients with VKC for early detection, appropriate management and to prevent progression into glaucoma.

References

1. Buckley RJ. Allergic eye disease--a clinical challenge. Clinical and Experimental Allergy: Journal of the British Society for Allergy and Clinical Immunology. 1998 Dec 1; 28:39-43.
2. Choi H, Lee SB. Nonseasonal allergic conjunctivitis in the tropics: experience in a tertiary care institution. Ocul Immunol Inflamm. 2008;16(4):141–145.
3. Kosrirukvongs P, Vichyanond P, Wongsawad W. Vernal keratoconjunct -ivitis Thailand. Asian Pac J Allergy Immunol. 2003;21(1):25 –30.
4. Leonardi A, Busca F, Motterle L, et al. Case series of 406 vernal keratoconjunctivitis patients: a demographic and epidemiological study. Acta Ophthalmol Scand. 2006;8 4(3):406–410.
5. Tabbara KF. Ocular complications of vernal keratoconjunctivitis. Can J Ophthalmol. 1999;34(2):88–92.
6. Bonini S, Bonini S, Lambiase A, et al. Vernal keratoconjunctivitis revisited: a case series of 195 patients with long-term followup. Ophthalmology. 2000; 107(6):1157–1163.
7. Addis H, Jeng BH. Vernal keratoconjunctivitis. Clinical Ophthal - mology (Auckland, NZ). 2018; 12:119.
8. Mithal S, Sood AK, Maini AK. Management of vernal conjunctivitis with steroid induced glaucoma--a comparative study. Indian Journal of Ophthalmology. 1987 Jan 1;35(5-6): 298-301.
9. Ang M, Ti SE, Loh R, Farzavandi S, Zhang R, Tan D, Chan C. Steroid-induced ocular hypertension in Asian children with severe vernal keratocon-junctivitis. Clinical ophthalmology (Auckland, NZ). 2012; 6:12 53.
10. Munjal VP, Dhir SP, Jain IS. Steroid induced glaucoma. Indian journal of ophthalmology. 1982 Jul 1;30(4):379.
11. Farooq S, Malik A. Evaluation and management of steroid induced glaucoma in vernal keratoconjunctivitis patients. Pakistan Journal of Ophthalmology. 2007 Mar 3 1; 23(01).
12. Skuta GL, Morgan RK. Corticosteroid ‐induced glaucoma. In: Ritch R, Shields MB, Krupin T, editors. The Glaucoma. 2nd ed. II. St Louis: Mosby; 1996; 1177‐88.
13. Leonardi A. Management of vernal keratoconjunctivitis. Ophthalmology and therapy. 2013 Dec;2(2):73-88.
14. Leonardi A, Sathe S, Bortolotti M, Beaton A, Sack R. Cytokines, matrix metalloproteases, angiogenic and growth factors in tears of normal subjects and vernal keratoconjunc tivitis patients. Allergy. 2009;64(5): 710–7.
15. Ang M, Ti SE, Loh R, Farzavandi S, Zhang R, Tan D, Chan C. Steroid-induced ocular hypertension in Asian children with severe vernal keratoconjunctivitis. Clinical ophthal - mology (Auckland, NZ). 2012; 6:1253.
16. Sen P, Jain S, Mohan A, Shah C, Sen A, Jain E. Pattern of steroid misuse in vernal keratoconjunctivitis resulting in steroid- induced glaucoma and visual disability in Indian rural population: An important public health problem in pediatric age group. Indian J Ophthalmol. 2019;67(10):1650–5.
17. De Smedt S, Wildner G, Kestelyn P. Vernal keratoconjunctivitis: an update. British Journal of Ophthalmology. 2013 Jan 1;97(1):9-14.
18. Khan MD, Kundi N, Saeed N. A study of 530 cases of vernal conjunctivitis forms the northwestern frontier province of Pakistan.
19. Bangal SV, Bankar MS, Bhandari AJ, Prasad RK. Bilateral steroid induced glaucoma in vernal keratoconju - nctivitis. International Journal of Medical Research & Health Sciences. 2015;4(1):226-8.
20. Bielory L, Frohman LP. Allergic and immunologic disorders of the eye. Journal of allergy and clinical immunology. 1992 Jan 1;89(1):1-5.

21. Vichyanond P, Pacharn P, Pleyer U, Leonardi A. Vernal keratoconjuncti - vitis: a severe allergic eye disease with remodeling changes. Pediatric Allergy and Immunology. 2014 Jun;25(4):314-22.
22. Cantrill HL, Palmberg PF, Zink HA, Waltman SR, Podos SM, Becker B. Comparison of in vitro potency of corticosteroids with ability to raise intraocular pressure. Am J Ophthalmol . 1975;79(6):1012–7.
23. Mcghee CN, Dean S, Danesh-Meyer H. Locally administered ocular corticosteroids: benefits and risks. Drug Saf. 2002;25(1):33–55.
24. Fan DS, Ng JS, Lam DS. A prospective study on ocular hypertensive and antiinflammatory response to different dosages of fluorometholone in children. Ophthal - mology. 2001;108(11):1973–7.
25. Ng JS, Fan DS, Young AL. Ocular hypertensive response to topical dexamethasone in children: a dose-dependent phenomenon. Ophthalmology. 2000;107(11):2097–21 00.
26. Kwok AK, Lam DS, Ng JS, Fan DS, Chew SJ, Tso MO. Ocular-hypertensive response to topical steroids in children. Ophthalmology. 1997;104(12):2112–6.
27. Senthil S, Thakur M, Rao HL, Mohamed A, Jonnadula GB, Sangwan V, et al. Steroid-induced glaucoma and blindness in vernal keratoconjunctivitis. Br J Ophthalmol. 2020;104(2):265–9.
28. Clark AF. Basic sciences in clinical glaucoma: steroids, ocular hyperten-sion, and glaucoma. J Glaucoma. 1995 ;4(5):354–69.
29. Farooq S, Malik A. Evaluation and Management of Steroid Induced Glaucoma in Vernal Keratoconjuncti - vitis Patients. Pak J Ophthalmol. 2007;23(1):1–4.
30. Bielory L. Ocular allergy overview. Immunol Allergy Clin North Am. 200 8;28(1):1–23.
31. Villalobos R. J. B., Becerra L. A. R., Silvera Z. M. S., Bonilla J. A. A., Guerrero L. I. P., López D. M. M., Martínez, I. R. G., Guevara, D. A. R., & Caballero R. G. Sars-Cov-2 and its Relationship with the Development of Guillain Barre. Journal of Medical Research and Health Sciences. 2022; 5(4): 1925–1932.