ORIGINAL ARTICLE

EPIDEMIOLOGICAL ASPECTS OF ALLERGIC CONJUNCTIVITIS

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Background: Allergic conjunctivitis is a common ocular disease which not only affects vision but can also compromise the quality of life of patients to a greater extent. If it is not properly managed it can lead to decreased vision due to corneal complications. This study was conducted to evaluate the epidemiological aspects of allergic conjunctivitis. **Methods:** This cross-sectional study was carried out in the Ophthalmology department of Federal General Hospital, from June 2018 to June 2020. We enrolled 236 patients of allergic conjunctivitis. Data collection form consisted of a structured questionnaire, records of ocular findings using slit lamp biomicroscope and skin prick test results. Data analysis was done using SPSS version 23.0. **Results:** The mean age (±SD) of study population was 22.71±13.11 years, 60.2% were females. Most common type of conjunctivitis was vernal keratoconjunctivitis (VKC) 46.2%, followed by perennial (27.1%), seasonal (17.4%) and atopic (9.3%). There was significant association of type of conjunctivitis with the age, *p*-value<0.001. VKC was prevalent in patients of age <20 years. There was a significant association of gender with type of conjunctivitis, *p*-value =0.000. Perennial variety was more prevalent in females while VKC was common in males. Collateral atopy was present in 52.1% patients. Corneal involvement was seen in 17.8% patients. There was a significant association between corneal involvement and interference with daily visual activities, *p*-value 0.034. SPT was positive in 79.7% patients. **Conclusion:** Ocular allergies/ conjunctivitis was more prevalent in female population. VKC is the most common type of allergic conjunctivitis, prevalent in males of age <20 yrs. Allergic rhinitis was the most common co-morbidity followed by dermatitis.

Keywords: Ocular allergy; Allergic conjunctivitis; Vernal keratoconjunctivitis; Epidemiology; Conjunctivitis

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INTRODUCTION

Allergic conjunctivitis is a common ocular disease which can often affect vision and can compromise the quality of life of patients to a greater extent. If it is not properly managed it can lead to decreased vision which is usually due to corneal complications.[1,2]

Prevalence of allergic conjunctivitis is quite variable in the world with a wide range of 6–30%[3]; variation being due to differences in the geographic locations and atmospheric factors. In Pakistan, a prevalence of 19.2% has been reported.[4] An extensive analysis of the disease pattern of allergic conjunctivitis is generally overlooked, subsequently the disease is being underdiagnosed and undertreated leading to complications and decreased vision.[5]

Studies have shown increasing trends of allergic diseases in the world and specifically in Asia.[6,7] Also, different studies have found extensive multi-morbidity including allergic rhinitis, asthma and dermatitis related to allergic conjunctivitis and overlapping risk elements associated with these diseases.[8,9] All these aspects increase the burden on health system of countries located in Asia including Pakistan. This calls for need of multi-disciplinary approach for management of these diseases.[10] In Pakistan there is lack of available data on factors associated with allergic conjunctivitis. The studies available are done on children and they sometimes lack ophthalmological data. Hence the main focus of our study was to assess the epidemiological aspects of allergic conjunctivitis and to determine the prevalence of co-morbidities in patients of allergic conjunctivitis attending Federal General Hospital.

MATERIAL AND METHODS

This cross-sectional study was conducted from June 2018 to June 2020 at ophthalmology department of Federal General Hospital Islamabad after approval by Institutional review board of the hospital. Sample size was calculated by taking the prevalence of allergic conjunctivitis as 19.2%[4], confidence interval 95% and margin of error 5%. Estimated sample size was 236 patients.

A non-probability convenience sampling technique was used. A written informed consent was taken from adult patients and from parents/ guardians of children <16 years of age. The age range for the population was 5–60 years. Patients of allergic conjunctivitis were enrolled from outpatient department of Federal General Hospital. For subjective questions of *proforma*, pilot interviews were conducted to ensure standardization. A detailed ophthalmic history was taken about indoor/ outdoor nature of job, effect of ocular allergies on daily vision related activities and various aspects of the ocular allergy, i.e., disease onset, course and duration of disease, presence or absence of eye redness, itching, lacrimation, photophobia, discomfort, "ropy" eye discharge and related asthma/rhinitis/ dermatitis. All patients underwent complete ophthalmic examination using slit lamp with special emphasis on conjunctival injection, palpebral or limbal changes, limbal vernal masses, palpebral cobblestone papillae and corneal involvement. Intraocular pressure (IOP) was measured using the applanation tonometer. Allergic conjunctivitis was classified as seasonal conjunctivitis, perennial conjunctivitis, vernal keratoconjunctivitis (VKC) and atopic conjunctivitis on the basis of history and examination. The patients were then referred for skin prick test to Allergy Centre of National Institute of Health Islamabad. The skin prick test (SPT) was performed in 192 (81.4%) patients. It was not done in 44 patients, either they did not consent for SPT or were young children who did not cooperate for the procedure. Results of SPT were interpreted as either positive or negative based on local skin reaction.

Data analysis was done using SPSS version 23.0. Percentages were calculated for qualitative variables, i.e., gender, type of conjunctivitis, comorbidities, ocular symptoms and signs, and mean±SD was calculated for quantitative variable, i.e., age. Chi square test was used to compare demographic and clinical characteristics of all four types of conjunctivitis. Chi square test was also used to compare skin prick test results with type of collateral atopy, type of conjunctivitis, conjunctival reaction, and corneal signs.

RESULTS

The study enrolled 236 patients, amongst them 142 (60.2%) were females. The mean age (±SD) of study population was 22.71±13.11 years and more than half of the participants (54.2%) were younger than 21 years of age. Mean IOP of study participants was 12.49±2.29 mmHg (Range 8–20 mmHg). Type of job/ work was indoor in a significant majority of patients 158 (94.6%). It included 92 (55.1%) students and 57 (34.1%) housewives.

Most common type of conjunctivitis was VKC, present in 109 (46.2%) patients. There was a significant association of gender with type of conjunctivitis, *p*-value =0.000. Vernal kerato-conjunctivitis (VKC) was common in males while perennial variety was more prevalent in female patients. There was no association between type of conjunctivitis and geographical location of patients, *p*-value 0.971.

There was significant association between type of conjunctivitis and age distribution *p*-value <0.001. VKC was prevalent in younger patients of age less than 20 years. In patients 21–40 years of age common type of conjunctivitis was perennial and in patients >41 years of age atopic and perennial conjunctivitis were common. Seasonal conjunctivitis was seen in all age groups. Socio-demographic characteristics of study participants along with distribution of various types of conjunctivitis is shown in Table-1.

Almost half of patients 123 (52.1%) had associated collateral atopic disease. Similarly, half of the patients (n= 123, 52.1%) reported chronic conjunctivitis as disease interfering with their daily life vision related activities. Corneal involvement was seen in 42 (17.8%) patients. There was a strong association between corneal involvement and interference with daily visual activities, *p*-value 0.034. Clinical features of allergic conjunctivitis in our study population are shown in Table-2. A detailed comparison of comorbid conditions, ocular symptoms, corneal and conjunctiva signs amongst all four types of allergic conjunctivitis is shown in Figure-1.

SPT was positive in 153 patients (valid %: 79.7%) and was negative in (20.3%). This study did not find any significant association between results of skin prick test (SPT) and types of allergic conjunctivitis (*p*-value 0.184), location of papillae (*p*-value 0.438), type of collateral atopy (*p*-value 0.308) and presence of corneal involvement (*p*-value 0.470).

Table-1: Socio-demographic characteristics of study participants along with types of conjunctivitis

Variables		VKC* N= 109 (46.2%)	Perennial N= 64 (27.1)	Seasonal N= 41 (17.4%)	Atopic N= 22 (9.3%)	*p*-value
Age Group:	(N= 236)					
5-20	128 (54.4 %)	98 76.6%	10 7.8%	19 14.8%	1 0.8%	**0.000**
21-40	83 (35.2 %)	11 13.3%	43 51.8%	18 21.7%	11 13.3%	
41-60	25 (10.6 %)	- 0	11 44.0%	4 16.0%	10 40.0%	
Gender	(N= 236)					
Male	94 (39.8%)	60 63.8%	14 14.9%	16 17.0%	4 4.3%	**0.000**
Female	142 (60.2%)	49 34.5%	50 35.2%	25 17.6%	18 12.7%	
Work nature	(N= 167)					
Indoor	158 (94.6%)	80 50.6%	31 19.6%	30 19.0 %	17 10.8%	**0.007**
Outdoor	9 (5.4%)	1 11.1%	6 66.7%	2 22.2 %	- 0%	
Province	(N=212)					
Punjab	109 (51.4%)	50 45.9%	27 24.8%	21 19.3%	11 10.1%	0.794
KPK	57 (26.9%)	27 47.4%	14 24.6 %	10 17.5%	6 10 %.	
Federal	28 (13.2%)	16 57.1%	7 25.0%	2 7.1%	3 10.7%	
GB & Kashmir	12(5.7%)	4 33.3%	4 33.3%	2 16.7%	2 16.7%	
Sindh	4 (1.9%)	2 50.0%	- 0%	2 50.0%	- 0 %	
Baluchistan	2 (0.9%)	- 0%	1 50.0%	1 50.0%	- 0 %	
Location	(N= 212)					
Planes	122 (57.5%)	58 47.5%	29 23.8%	22 18.0%	13 10.7%	0.971
Hilly area	90 (42.5%)	41 45.6%	24 26.7%	16 17.8%	9 10.0%	

*Vernal Keratoconjunctivitis

Table-2: Clinical features of chronic allergic conjunctivitis in study population

Variables	N= 236, (%)	Chi- Square test P value*
Collateral Atopy		
- Absent	113 (47.9%)	
- Rhinitis	68 (28.8%)	
- Dermatitis	35 (14.8%)	**0.000**
- Asthma	13 (5.5%)	
- Rhinitis & Dermatitis	6 (2.5%)	
- Asthma & Rhinitis	1 (0.4%)	
Symptoms		
Itching	228 (96.6%)	0.415
Eye Redness	181 (76.7%)	**0.001**
Lacrimation	169 (71.6%)	0.489
Photophobia	109 (46.2%)	0.071
Signs		
Conjunctival Hyperemia	190 (80.5%)	**0.006**
Ropy/ Mucoid discharge	34 (14.4%)	0.248
Limbal vascularization	4 (1.7%)	0.597
Location of Papillae		
- Palpebral	156 (66.1%)	
- Limbal	44(18.6%)	0.336
- Mixed	36 (15.3%)	
Corneal signs		
- Nil	194 (82.2%)	0.791
- Pseudogerontoxon	19 (8.1%)	
- Opacity	13 (5.5%)	
- Superior punctate keratitis	9 (3.8%)	
- Shield Ulcer	1 (0.4%)	

*While comparing all four types of allergic conjunctivitis

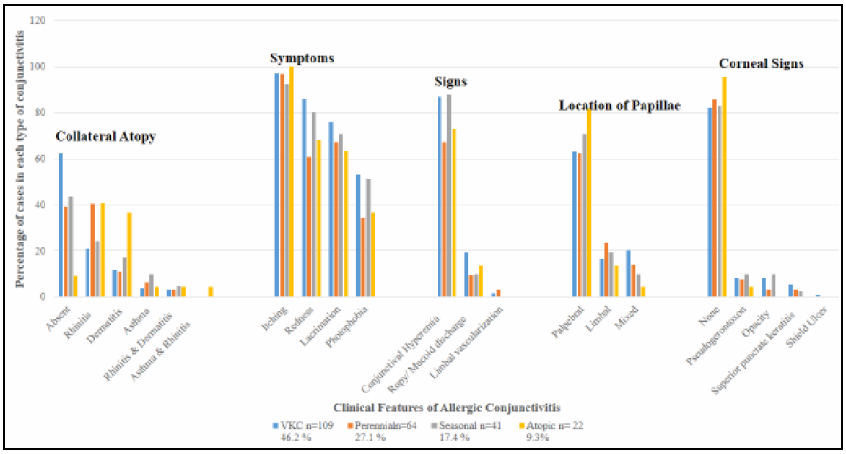

Figure-1: Comparison of clinical features of various types of chronic allergic conjunctivitis

DISCUSSION

Many studies and surveys have been carried out on allergic diseases in Asia and worldwide. However, there is deficiency of available data about epidemiology of allergic conjunctivitis in Pakistan. Moreover, the epidemiological studies often do not include specific ocular examinations. An appreciation of disease pattern of allergic conjunctivitis will provide important statistics that will help in understanding its pharmacoeconomics and hence burden on the nationwide health structure.

We arrived at the conclusion that vernal keratoconjunctivitis (46.2%) is the most common type of allergic conjunctivitis, followed by perennial (27.1%), seasonal (17.4%) and atopic (9.3%) variety in the same sequence. Present findings are comparable to those of an investigation done on Egyptian population. In this study out of 75 patients eight patients (10.7%) had Seasonal allergic conjunctivitis, 19 patients (25.3%) had Perennial, and 48 patients (64%) had VKC.[11.]

While in a review of population-based studies conducted in Italy, seasonal allergic conjunctivitis was found to be the most frequent form.[12] However, usually vernal and atopic keratoconjunctivitis are referred to tertiary care hospital for management by ophthalmologists and hence studied conducted in these hospitals report that this type of conjunctivitis as more prevalent.

Conversely different results were found by an investigation carried out on one hundred and sixty-four children in Thailand.[13] According to this study perennial allergic conjunctivitis was the most common type (61.6%), followed by seasonal (21.3%), vernal (12.2%), and atopic (4.9%) variety. Though they clarified the fact that Thailand is a tropical country and have less seasonal variation, as against the studies conducted in temperate regions like Italy.

We found significant association of type of conjunctivitis with the age distribution *p*-value <0.001, and VKC was found prevalent in younger patients of age less than 20 years. In patients 21–40 years of age common type of conjunctivitis was perennial and in patients >41 years of age both atopic and perennial conjunctivitis were common. Seasonal conjunctivitis was seen in all age groups. These findings are comparable to a cross sectional study conducted in Italy.[14] Mean age of their study population was higher (38±19 years) than our population and they didn't include patients of atopic allergic conjunctivitis in their study.

In our study itching was the most common symptom seen in patients with allergic conjunctivitis followed by redness and lacrimation. Itching and redness were present in 96.6% and 76.7% of patients respectively. This agrees with a local study conducted on school children of Karachi, out of 157 children aged 5–19 year, itching was seen in 97.5%, redness was seen in 92.5% of cases watering in 94.9% of cases.[4] Similar findings were reported in a study conducted in Thailand, as common presentations in ocular allergy are itching 100% of patients and red eye 82.9% of patients.[13] However, in an investigation on Ethiopian children with VKC itching was present in 100% and symptoms of redness in 86% of children.[15]

While in a population-based study in China, itching was present in 97% of the cases and about 7% of the children had all allergic conjunctivitis symptoms being studied including watering, itching, foreign body sensation, and photophobia.[16] Comparable results were reported by an Italian study as itching and redness were reported in 90% and 85%, respectively.[14]

In our study mixed disease was present in 15.3% of the cases as against the Ethiopian study which showed that 81 % of the children had Mixed VKC.[15]

We found a significant association of gender with type of conjunctivitis, *p*-value =0.000. Vernal kerato-conjunctivitis (VKC) was common in males while perennial variety was more prevalent in female patients. Similar results were reported by an Ethiopian investigation on children with VKC. 65% of the affected children were male.[15] Similarly, a local study done in Karachi reported, 22.3% males and 17.9% females were affected by allergic conjunctivitis.[4] A European study reported male majority in all the types of allergic conjunctivitis.[13] Whereas another investigation carried out in Saudi Arabia did not find significant difference in allergic conjunctivitis prevalence by gender both in adults and children.[17]

Our results showed that half of the patients (n= 123, 52.1%) reported chronic conjunctivitis as disease interfering with their daily routine vision related activities, this in contrast with a population-based study conducted on school children where only 10.6% of young students and 5.7% of teens reported mild to severe daily life interference caused by allergic conjunctivitis.[16]

This current study found that 52.1% patients had associated collateral atopic disease. Among those with collateral atopy, allergic rhinitis (28.8%) was most common co-existing allergic condition followed by allergic dermatitis (14.8%). These findings match with another Asian study (China) where the most common coexisting allergic condition was allergic rhinitis 61%, but percentage of such cases was quite

high as compared to our study, it was followed by asthma at 29% and atopic dermatitis at 25%.[16]

According to a study conducted on Iranian population, 12.3% of patients had both allergic conjunctivitis and allergic rhinitis.[18] According to this study prevalence of allergic conjunctivitis in Iran is 15.9% which is less than our country. Another investigation carried out in Korea reported that children with allergic conjunctivitis have other allergic diseases like atopic dermatitis 29.9% and allergic rhinitis 65.3%.[19] Allergic rhinitis was the most common co-morbidity and was present in 97.6% of children aged 4–18 years in Thailand.[13] According to another Asian study allergic rhinitis was present in 25% of patients with allergic conjunctivitis.[17]

About 47.9% of patients had no collateral atopy in our study while in a Chinese study only 6.1% and 7.3% of the young and teen group, respectively had no other allergic disease being investigated.[16] [16]. The findings noted in the present study once again might suggest a common pathogenesis for these allergic diseases, i.e., allergic conjunctivitis, rhinitis and dermatitis. Ophthalmologists should also be attentive for the presence of collateral atopic disease in patients with allergic conjunctivitis. All patients of atopic dermatitis, asthma and allergic rhinitis should be periodically checked for conjunctivitis and counselled to undergo standard eye treatment whenever required.

In our study SPT was positive in 153 patients (79.7% of those undergoing SPT). In a local article of the total 65067 patients undergoing SPT, 68.6% were SPT positive.[20] Another study conducted in Saudi Arabia reported less percentage of positive SPT reaction (42.7%).[17] While in an Italian investigation only 35% of patients undertook a SPT, with positive allergy tests found in 82% which is comparable to our study.[14]

The present study had numerous strengths. First, it had a large and properly calculated sample size, secondly multiple investigative tools were used to gather data regarding the factors associated with allergic conjunctivitis. These tools included a questionnaire; an ophthalmologic examination was also included which is usually deficient in surveys, and skin prick tests. This study also had a wide age groups range, which helped to study all types of allergic conjunctivitis.

The present study also has some limitations. First, this study includes a non-random selection of patients, and secondly our results are built on cross-sectional analysis, and we therefore cannot deduce time-based relationships or interconnection for any of the reported associations.

CONCLUSION

In conclusion an insight into epidemiology of allergic conjunctivitis is essential as the disease involves certain modifiable and treatable environmental conditions which are often not recognized. It can impair quality of life to varying degrees and some cases are quite refractory to management and may require multidisciplinary approach for treatment.

Ophthalmologist should keep in mind the probability of having allergic comorbidities in such patients to make diagnosis and management efficient, and accordingly better quality of life. Keeping in view the high percentage of positive skin prick test we recommend further studies to rule out the specific type of allergens in in such patients.

AUTHORS' CONTRIBUTION

AK: Conception of study, data collection, statistical analysis, interpretation of data, drafting and final approval of manuscript. NA: Conception of study, data collection and data entry, drafting manuscript, and critical revision final approval of version to be published. NA: Conception of study, Data collection, Critical revision, final approval of version to be published.

REFERENCES

1. Arif AS, Aaqil B, Siddiqui A, Nazneen Z, Farooq U. Corneal Complications And Visual Impairment In Vernal Keratoconjunctivitis Patients. J Ayub Med Coll Abbottabad 2017;29(1):58–60.
2. Bielory L, Delgado L, Katelaris CH, Leonardi A, Rosario N, Vichyanoud P. ICON: Diagnosis and management of allergic conjunctivitis. Ann Allergy Asthma Immunol 2020;124(2):118–34.
3. Thong BY. Allergic conjunctivitis in Asia. Asia Pac Allergy 2017;7(2):57–64.
4. Baig R, Ali AW, Ali T, Ali A, Shah MN, Sarfaraz A, *et al*. Prevalence of allergic conjunctivitis in school children of Karachi. J Pak Med Assoc 2010;60(5):371–3.
5. Leonardi A, Doan S, Fauquert JL, Bozkurt B, Allegri P, Marmouz F, *et al*. Diagnostic tools in ocular allergy. Allergy 2017;72(10):1485–98.
6. Kang SY, Song WJ, Cho SH, Chang YS. Time trends of the prevalence of allergic diseases in Korea: A systematic literature review. Asia Pac Allergy 2018;8(1):e8.
7. Miyazaki D, Fukagawa K, Okamoto S, Fukushima A, Uchio E, Ebihara N, *et al*. Epidemiological aspects of allergic conjunctivitis. Allergol Int 2020;69(4):487–95.
8. Mpairwe H, Nkurunungi G, Tumwesige P, Akurut H, Namutebi M, Nambuya I, *et al*. Risk factors associated with rhinitis, allergic conjunctivitis and eczema among schoolchildren in Uganda. Clin Exp Allergy 2021;51(1):108–19.
9. Singh S, Sharma BB, Salvi S, Chhatwal J, Jain KC, Kumar L, *et al*. Allergic rhinitis, rhinoconjunctivitis, and eczema: prevalence and associated factors in children. Clin Respir J 2018;12(2):547–56.
10. Dupuis P, Prokopich CL, Hynes A, Kim H. A contemporary look at allergic conjunctivitis. Allergy Asthma Clin Immunol 2020;16:5.
11. Abo-Ali FH, Farres MN, Shahin RY, Eissa AM, Ahmed A, Abdel-Monsef A, *et al*. Skin Prick Test Reactivity to

Aeroallergens among Egyptian Patients with Isolated Allergic Conjunctival Disease. Egypt J Immunol 2015;22(2):41–7.
12. Leonardi A, Castegnaro A, Valerio AL, Lazzarini D. Epidemiology of allergic conjunctivitis: clinical appearance and treatment patterns in a population-based study. Curr Opin Allergy Clin Immunol 2015;15(5):482–8.
13. Jongvanitpak R, Vichyanond P, Jirapongsananuruk O, Visitsunthorn N, Pacharn P. Clinical characteristics and outcomes of ocular allergy in Thai children. Asian Pac J Allergy Immunol 2020;2020:1–7.
14. Leonardi A, Piliego F, Castegnaro A, Lazzarini D, La Gloria Valerio A, Mattana P, *et al*. Allergic conjunctivitis: a cross-sectional study. Clin Exp Allergy 2015;45(6):1118–25.
15. 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(1):167.
16. Feng Y, Wang X, Wang F, Liu R, Chen L, Wu S, *et al*. The Prevalence of Ocular Allergy and Comorbidities in Chinese School Children in Shanghai. Biomed Res Int 2017;2017:7190987.
17. Alqurashi KA, Bamahfouz AY, Almasoudi BM. Prevalence and causative agents of allergic conjunctivitis and its determinants in adult citizens of Western Saudi Arabia: A survey. Oman J Ophthalmol 2020;13(1):29–33.
18. Shokouhi Shoormasti R, Pourpak Z, Fazlollahi MR, Kazemnejad A, Nadali F, Ebadi Z, *et al*. The Prevalence of Allergic Rhinitis, Allergic Conjunctivitis, Atopic Dermatitis and Asthma among Adults of Tehran. Iran J Public Health 2018;47(11):1749–55.
19. Kim Y, Oh I, Lee J, Sim CS, Oh YS, Lee JH. Astigmatism Associated with Allergic Conjunctivitis in Urban School Children. J Ophthalmol 2019;2019:9453872.
20. Ahmed A, Minhas K, Micheal S, Ahmad F. Prevalence of skin test reactivity to aeroallergens in the Pakistani population. Public Health 2011;125(5):324–6.

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