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Research article

Epidemiological profile and pharmacological management of allergic conjunctivitis: A study in Ghana

S.Abokyi[1,2] , G.A.Koffuor[1]*, M.Ntodie[2], S.Kyei[2], L.Gyanfosu[3]

[1]*Department of Pharmacology, Faculty of Pharmacy and Pharmaceutical Sciences, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*
[2]*Department of Optometry, University of Cape Coast, Cape Coast, Ghana*
[3]*Optometrist, Jubilee Eye Centre, St Michael's Catholic Hospital, Jachie-Pramso, Ghana*

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ABSTRACT

Background: The prevalence of allergic conjunctivitis has gained the dimension to be recognized as a public health problem in Africa. **Aim**: This study therefore sought to determine the epidemiological profile and other associated ocular surface disorders of patients with allergic conjunctivitis, and its pharmacological management in Ghana. **Methodology**: A retrospective cross sectional study, involving 1718 patients diagnosed of this atopic disease, in two prominent referral eye care centers in Ghana was conducted. Associations between variables were determined using Fisher Exact Chi-Square (χ^2), Relative Risk, and Binary Logistical Regression. **Results**: The prevalence of allergic conjunctivitis was 9.1% with females constituting 61.8%. The mean age ± SD of the study population was 21.92±18.29 years. Vernal keratoconjunctivitis was more prevalent (P<0.001) in males and children (mean age ± SD: 6.24 ± 5.6 years). Topical steroids (69.7%) and systemic antihistamines (48.8%) were the most commonly prescribed medication for allergic conjunctivitis. Topical steroids were mostly prescribed for atopic keratoconjuntivitis and systemic antihistamines for the acute forms of allergic conjunctivitis. Sodium cromoglicate was the only topical mast cell stabilizer prescribed and was prescribed mostly for patients with vernal keratoconjunctivitis and perennial allergic conjunctivitis. Dry eye (5.2%) was the most prevalent associated ocular surface disorder and corneal abrasion (1.0%) was the commonest ocular complication presented. **Conclusion**: Allergic conjunctivitis remains a burden to the young population and occupations including, traders, artisans and students. Proper management with anti-allergic medications is vital to prevent the development of ocular complications.

Key words: Antihistamines, Corneal abrasion, Dry eye, Mast cell stabilizers, Vernal keratoconjunctivitis

1. INTRODUCTION

Allergic conjunctivitis (inflammatory disorder of the transparent mucous membrane that covers the sclera) is an atopic disorder commonly encountered in ocular clinical practice [1,2]. It has been reported that about one-fifth of the entire human population suffers one form of allergy or another of which about 20% is due to allergic conjunctivitis [3]. The prevalence of allergic conjunctivitis varies worldwide, usually ranging between 15 to 40% [4]. These variations may be attributed both to genetic and environmental factors (including warm dry climate and extent of pollution) [5,6].

Allergic conjunctivitis is associated with ocular discomfort such itching, redness, tearing, pains, burning sensation and foreign body sensation. These symptoms would usually affect academic performance and the quality of life of sufferers resulting in loss of productivity [7, 8]. It was reported by Palmares *et al*. [8] that individuals who suffered allergic conjunctivitis experienced averagely not less than 5 episodes per year.

Although allergic conjunctivitis is known to be caused by pollen, animal dander and house dust mites, some food substances also trigger allergic conjunctivitis. According to Obeng *et al*. [9], these foods which require mentioning (because of the high consumption in Ghana) are groundnuts

*Corresponding Author. Tel: +233 277400312 Fax:
Email: gkoffuor@yahoo.com

(peanuts) and pineapple. Poor management of allergic conjunctivitis results in persistent rubbing of the eye leading to other ocular complications such as corneal abrasion, ulcers, corneal pannus, cataract, keratoconus, and corneal perforation which may significantly impair vision [10,11]. There is also a risk of varied ocular microbial infections due to rubbing and some medications [10].

The most common and effective way of management of allergic conjunctivitis in patients has been by the use of anti-allergic medications. Systemic antihistamines have been reported to be among the most highly patronized anti-allergic medications by patients with allergic conjunctivitis because of the associated allergic rhinitis [12,13]. Most of these antihistamines are available and sold over the counter in pharmacies in Ghana. Use of antihistamines has however been associated with some adverse systemic and ocular effects. Despite the global increase in the role of anti-allergic drugs in the management of allergic disorders, little is known about the pattern of anti-allergic medication use among patients with allergic conjunctivitis in Ghana.

This study therefore determined the epidemiological profile of allergic conjunctivitis and its pharmacological management in Ghana. The study also determined other ocular surface disorders associated with allergic conjunctivitis.

2. MATERIALS AND METHODS

2.1. Study area

A retrospective study was conducted in two eye clinics namely; St. Michael Hospital and Our Lady of Grace Hospital both run by the Catholic Mission in Ghana and supported by the Ghana Health Service. The St. Michael Hospital is located at Pramso in the Bosomtwe District of the Ashanti Region of Ghana. The facility serves Kumasi the Capital City of the Ashanti Region and its environs. The eye clinic is the biggest in the District with one Ophthalmologist, one Optometrist, two Ophthalmic Nurses and one intern Optometrist service person.

Our Lady of Grace Hospital is located at Asikuma-Odoben-Brakwa District in the Central Region of Ghana. This is the District Hospital designated to serving Asikuma, Odoben, Ahwhiam, Kuntanase, Jamra, Kokoso and Bedum and its environs. Over the years the great expertise of health care providers and Staff has made the Hospital a very important Centre for the people in the District. The eye care team comprises one Ophthalmologist, two Ophthalmic nurses, one Enrolled Nurse and two Ward Maids.

2.2. Ethical considerations

The study was approved by the ethics committee of the College of Health Sciences, Kwame Nkrumah university of Science and Technology, Kumasi, Ghana. Permission was also sought from the Hospital Directors of the health facilities. Confidentiality and anonymity was ensured with the patients' medical records and the information collected was used solely for the purpose of this study.

2.3. Study conduct and design

A cross sectional study design was employed and this involved purposive sampling of the medical records of 1718 patients diagnosed of allergic conjunctivitis out of the total 18,896 outpatient turnout from January to December 2010. Cases of allergic conjunctivitis sampled were based on diagnoses of the condition using clinical presentations which include ocular pruritus and discharge, chemosis, hyperemia, or papillae of the conjunctiva. Further classification into specific types of allergic conjunctivitis i.e. seasonal allergic conjunctivitis (SAC), perennial allergic conjunctivitis (PAC), vernal allergic conjunctivitis (VKC) and atopic keratoconjunctivitis (AKC) was based on patient's history of the allergic conjunctivitis and atopy and clinical signs observed. Information regarding allergic conjunctivitis such as: patient's symptoms, onset and duration of disease and associated topic diseases were also recorded. Patients' demographic data including gender, age, and occupation were taken.

2.4. Data analysis

Data was compiled using the Statistical Packages for Social Sciences (SPSS) version 17 (SPSS Inc., Chicago, IL, 2008) and GraphPad Prism 5.0 for Windows (GraphPad Software, San Diego, CA, USA). Measures of central tendencies and dispersion, frequencies, and percentages were used in analysis of the patient's data. Fishers Exact Chi Square (χ^2) test was used to determine significant associations in the categorical variables (type of allergic conjunctivitis, gender, occupation and age group). Confidence intervals (CIs) for estimates of relative risks (RRs) of patients for allergic conjunctivitis were calculated. An association was considered significant if $p \leq 0.05$. Binary logistic regression was used in analyzing the pattern of prescription of anti-allergic drugs within the various types of allergic conjunctivitis by computing Odds ratios (ORs) to estimate the likelihood of prescription of these drugs within the various forms of AC.

3. RESULTS AND DISCUSSION

Allergic conjunctivitis is an ocular disorder that is influenced by both the genetic make-up of the individual and environmental conditions such as pollution which comes along with urbanization [5, 6]. These factors therefore are essential in the variations observed in the prevalence of AC worldwide. Of a total of 18,896 individuals who visited the two eye care facilities over the study period, 1,718 were diagnosed of allergic conjunctivitis (AC); a prevalence of 9.1%. A hospital based study conducted in the Gambia by

Table 1

Patient demographic characteristics and the type of allergic conjunctivitis

	SAC (n = 993)			PAC (n = 425)			VKC (n = 284)			AKC (n = 16)		
	Dist.	RR (CI)	p-value	Dist.	RR (CI)	p-value	Dist.	RR (CI)	p-value	Dist.	RR (CI)	p-value
Gender												
Male	365 ns (36.8%)	0.94 (0.86-1.02)	0.145	137 ** (32.2%)	0.77 (0.64-0.92)*	0.003	150 *** (52.8%)	1.81 (1.46-2.23)	<0.001	5 ns (31.3%)	0.73 (0.25-2.10)	0.617
Female	628 (63.2%)	1.00	-	288 (67.8%)	1.00	-	134 (47.2%)	1.00	-	11 (68.8%)	1.00	-
Age												
<15.0	357 ns (36.0%)	1.23 (0.92-1.66)	0.154	86 *** (20.2%)	0.21 (0.16-0.28)	<0.001	252*** (88.7%)	8.11 (5.70-11.54)	<0.001	2 ns (12.5%)	0.19 (0.02-2.03)	0.235
15-40	468 *** (47.1%)	1.57 (1.17-2.10)	<0.001	209 *** (49.2%)	0.51 (0.40-0.65)	<0.001	32 ns (11.3%)	1.00	-	9 (56.3%)	0.82 (0.11-6.33)	0.582
41-65	141 ** (14.2%)	1.43 (1.05-1.94)	0.008	93* (21.9%)	0.69 (0.53-0.90)	0.011	0 ***	NA	<0.001	4 (25.0%)	1.09 (0.12-9.96)	1.000
>65	27 (2.7%)	1.00	-	37 (8.7%)	1.00	-	0	NA	0.101	1 (6.3%)	1.00	-

Data is presented as number of individuals with percentage distribution in parenthesis. Dist. = Distribution; CI = 95% Confidence interval; RR= Relative risk; SAC=Seasonal allergic conjunctivitis; PAC=Perennial allergic conjunctivitis; VKC=vernal keratoconjunctivitis; AKC=Atopic keratoconjunctivitis. Significance in any relationship was established using Fishers Exact Chi-square test and the Exact p-value or Monte Carlo p-value was reported for all variables. $P \leq 0.05$ was considered statistically significant. *** implies $p \leq 0.001$; ** implies $p \leq 0.01$; * implies $p \leq 0.05$; ns implies $p > 0.05$; ud implies undefined. Females were used as the reference group for gender; >65 was used as reference group for age group for all types of AC other than VKC (used 15-40 as reference). RRs for VKC could not be computed because there were no individuals with VKC in the reference age group (>65). NA=not applicable.

Table 2

Bivariate analysis of patients' occupation and the type of allergic conjunctivitis

Occupation	SAC (n = 993)			PAC (n = 425)			VKC (n = 284)			AKC (n = 16)		
	Dist.	RR (CI)	p-value	Dist.	RR (CI)	p-value	Dist.	RR (CI)	p-value	Dist.	RR (CI)	p-value
Students	473 ns (47.6%)	1.01 (0.84-1.22)	0.906	172 ** (40.5%)	0.62 (0.45-0.86)*	0.009	135 *** (47.5%)	13.98 (1.98-98.67)	<0.001	2 ** (12.5%)	0.07 (0.01-0.41)	0.007
Artisans	84 ns (8.5%)	1.15 (0.93-1.43)	0.230	36 ns (8.5%)	0.83 (0.56-1.25)	0.444	1 ns (0.4%)	0.67 (0.04-10.60)	1.000	1 ns (6.3%)	0.22 (0.02-2.12)	0.305
Farmers	38 ns (3.8%)	0.86 (0.65-1.14)	0.334	33 ns (7.8%)	1.26 (0.86-1.86)	0.256	0 ns (0%)	NA	1.000	3 ns (18.8%)	1.11 (0.23-5.32)	1.000
Traders	127 ns (12.8%)	0.99 (0.81-1.22)	1.000	82 ns (19.3%)	1.08 (0.77-1.52)	0.688	3 ns (1.1%)	0.26 (0.04-1.50)	1.000	2 ns (12.5%)	0.26 (0.04-1.50)	0.132
Teachers	26 ns (2.6%)	0.95 (0.69-1.29)	0.852	16 ns (3.8%)	0.98 (0.60-1.61)	1.000	1 ns (0.4%)	1.78 (0.38-8.48)	1.000	3 ns (18.8%)	1.78 (0.38-8.48)	0.666
Others	74 ns (7.5%)	0.99 (0.79-1.25)	1.000	48 ns (11.3%)	1.09 (0.75-1.57)	0.769	1 ns (0.4%)	0.44 (0.08-2.56)	1.000	2 ns (12.5%)	0.44 (0.08-2.56)	0.387
None (Children)	122 * (12.3%)	0.75 (0.60-0.93)	0.023	9 *** (2.1%)	0.09 (0.46-0.19)	<0.001	142 *** (50%)	42.13 (6.0-296.4)	<0.001	0 * (0%)	NA	0.012
None (Adults)	49 (4.9%)	1.00	-	29 (6.8%)	1.00	-	1 (0.4%)	1.00	-	3 (18.8%)	1.00	-

Data is presented as number of individuals with percentage distribution in parenthesis. Dist. = Distribution; CI = 95% Confidence interval; RR= Relative risk; SAC=Seasonal allergic conjunctivitis; PAC=Perennial allergic conjunctivitis; VKC=vernal keratoconjunctivitis; AKC=Atopic keratoconjunctivitis. Significance in any relationship was established using Fishers Exact Chi-square test and the Exact p-value or Monte Carlo p-value was reported for all variables. $p \leq 0.05$ was considered statistically significant. *** implies $p \leq 0.001$; ** implies $p \leq 0.01$; * implies $p \leq 0.05$; ns implies $p > 0.05$. None (adults) representing unemployed adults were used as the reference for occupation. NA=not applicable

Table 3

Ocular symptoms and complications due to AC, other presenting ocular surface disorders and systemic atopic disorders

Ocular symptoms presented	n (%)	Ocular complications from allergic conjunctivitis *	n (%)	Ocular disorders *	n (%)	Associated atopic disease	n (%)
Pain	480 (37.4%)	Corneal Abrasion	17(1.0%)	Pingueculum	17 (1.0%)	Hay fever	342 (19.9%)
Redness	408 (29.4%)	Corneal pannus	7(0.4%)	Pterygium	31 (1.80%)	Asthma	57 (3.3%)
Tearing	627 (46.1%)	Keratoconus	1(0.1%)	Stye	7 (0.4%)	Atopic dermatitis	16 (0.9%)
Photophobia	205 (16.2%)	Steroid-induced glaucoma	1(0.1%)	Chalazion	11 (0.6%)		
Foreign body sensation	277 (22.2%)			Blepharitis	10 (0.6%)		
Ropy Discharge	551 (37.2%)			Dry eyes	89 (5.2%)		
Burning Sensation	183 (14.5%)						
Swollen Eye Lids	126 (9.7%)						

Data is presented as number of individuals "n" with percentage distribution in parenthesis. FBS=Foreign body sensation,

* Ocular complications and disorders recorded were those presented prior to treatment of allergic conjunctivitis

Wade *et al*. [14] found the prevalence of AC to be 7.9%. Another clinical study conducted by Oluwatoyin *et al.* [15] in Nigeria reported a prevalence of AC to be 17.8%. Though Ghana and Nigeria have similar seasonal variations, the study in Nigeria included only children who were below 15 years old and allergies are known to be predominant among children. This therefore indicates that AC is really significant as a community health care problem.

The population of patients with allergic conjunctivitis comprised 657 (38.2%) males and 1061 (61.8%) females. Evidence from epidemiological studies regarding which sex (male or female) is more susceptible to AC has been controversial irrespective of the genetic factor that is agreed to be involved in this ocular allergic disorder. According to our study, it was indicated that females had a higher burden of AC compared to their male counterparts. This finding is consistent with a study in Nigeria which found that of the total number of females, 59.3% had AC compared 32% of their fellow mates in primary school [16]. Since the genetic composition of females is different from males, it may be the cause of the predisposition females to AC. In addition, it was found out in this study that females generally had a positive attitude to hospital attendance than males as they outnumbered the males reporting for eye care. This assertion is supported by a cohort study conducted by Hamilton *et al.* [17] that assessed the attendance pattern of referred patients from 26 health practitioners which found out that males were worse culprits regarding non-attendance. Patients' mean age ± SD for this study was 21.92 ± 18.29 years. This suggests that AC is essentially a disease of children and young adults. Our study indicated that males were significantly at risk of VKC ($p<0.001$) but less susceptible to PAC ($p=0.003$) than females (Table 1), with VKC patients having the least mean age ± SD of 6.24 ± 5.6 years among all types of AC (Fig.1). A study on VKC carried out in Uganda revealed that about 80% out of 420 children with VKC were below the age of 15years [18].

Patients' occupation was influential on the type of AC they suffered. While artisans (RR: 1.15, 95%CI: 0.93-1.43) were more susceptible to SAC, traders (RR: 1.08, 95%CI: 0.77-1.52) and farmers (1.26, 95% CI: 0.86-1.86) were more susceptible to PAC (Table 2). Traders are usually found in the market places, lorry stations, along the busy streets, and in areas where sporting and other social gatherings go on; here they are continuously exposed to dust from the environment and exhaust fumes from vehicles. Artisans are exposed to dust and fumes, from materials and equipment they use to work or which are generated from their working processes such as grinding, mixing, scraping, smoothening, gluing, polishing, and painting among others. Considering AC holistically, farmers had a lower prevalence compared to traders and artisans. This finding is consistent with an earlier study which found that farmers were less susceptible to asthma and other allergic disorders [19]. Usually, farmers have past exposure during early-life to the farming environment, which exposes them to helminthic and microbial infections [20, 21], diet (such as unprocessed cow milk) which can be antigenic [22], and contacts with livestock and their fodders [23], which tend to activate and modulate innate and adaptive immune responses.

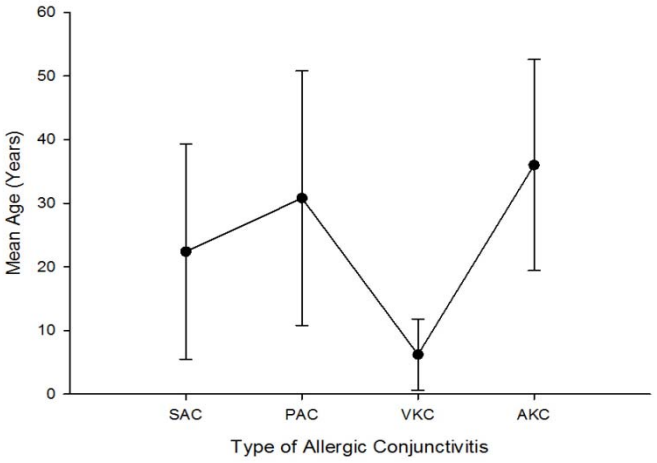

Fig.1. Mean age of patients with the various types of allergic conjunctivitis. SAC = seasonal allergic conjunctivitis; PAC = perennial allergic conjunctivitis; VKC = vernal allergic conjunctivitis; AKC = atopic keratoconjunctivitis.

Regarding ocular symptoms experienced due to AC exempting itching that was reported by all respondents, tearing (46.1%), ocular pain (37.4%) and ropey discharge (37.2%) were the most common (Table 3). The association of AC with other allergic disorders has been widely reported in most studies with some observing higher prevalence of asthma among patients with VKC [24, 25]. According to this study, hay fever (allergic rhinitis) was the most prevalent with about one-fifth of the AC population suffering from this condition. According to a study conducted by Qiao *et al.* [26], AC (especially SAC) mostly coexisted with rhinitis with over 90% of the patients presenting with either AC also having allergic rhinitis (AR) or vice versa.

The commonest ocular complications found in patients with AC were corneal abrasion (1.0%). However, other sight threatening complications such as steroid induced glaucoma 1(0.1%) and keratoconous 1 (0.1%) were found (Table 3). This finding is consistent to an observation by Wakamatsu *et al.* [11] indicating that corneal abrasion was a prevalent complication seen in AC.

Dry eye (5.2%) was the most prevalent ocular surface disorder found coexisting with AC (Table 3). Several risk factors have been noticed to underlie dry eye some of which are AC [27], systemic antihistamines [28], meibomian gland dysfunction [29] and pterygium [30].

With regards to managing AC, only 23 patients were not placed on any pharmacological agent (some were prescribed artificial tears). Thus 1695 prescriptions were made with a mean of 1.9 drugs per prescription. According to this study, polytherapy 1171 (69.1%) was greatly used in the management of AC with topical steroid being both the most prescribed anti-allergic medication (69.7%) and also most

Table 4
Anti-allergic medications prescribed for patients with allergic conjunctivitis

Systemic	n (%)	Topical	n (%)
Cetirizine	825 (48.0%)	Chlorpheniramine/naphazoline	72 (4.2%)
Chlorpheniramine maleate	12 (0.7%)	Diclofenac sodium	9 (0.5%)
Promethazine	2 (0.1%)	Sodium cromoglycate	789 (45.9%)
Diclofenac sodium	71 (4.1%)	Dexamethasone	621 (36.1%)
Ibuprofen	89 (5.2%)	Prednisolone	503 (29.3%)
Acetaminophen*	133 (7.8%)	Hydrocortisone	74 (4.3%)

Data is presented as number of individuals with percentage distribution in parenthesis.
* Acetaminophen which is an analgesic for the purpose of this study was categorized under non-steroidal anti-inflammatory

Table 5
Logistic regression analysis of pattern of prescribed anti-allergic medications within the various forms of AC

Diagnosis	Steroid			TMCS			TNSAID		
	N (%)	p-value = 0.002	OR (95% CI)	N (%)	p-value<0.001	OR (95% CI)	N (%)	p-value=0.937	OR (95% CI)
SAC	718 (59.9)	0.432	0.60 (0.17-2.13)	390 (49.4)	0.387	0.65 (0.24-1.74)	5 (55.6)	-	1.00
PAC	266 (22.2)	0.139	0.38 (0.11-1.37)	220 (27.9)	0.897	1.07 (0.39-2.90)	3 (33.3)	0.645	1.40 (0.33-5.89)
VKC	201 (16.8)	0.383	0.57 (0.16-2.04)	171 (21.7%)	0.411	1.53 (0.56-4.19)	1 (11.1)	0.746	0.70 (0.08-6.02)
AKC	13 (1.1%)	-	1.00	8 (1.0)	-	1.00	0	1	NA

OR=Odds ratio. SAC=Seasonal allergic conjunctivitis; PAC=Perennial allergic conjunctivitis; VKC=vernal keratoconjunctivitis; AKC=Atopic keratoconjunctivitis TNSAID=Non-steroidal anti-inflammatory drug; TMCS=Topical mast cell stabilizer. AKC was used as reference for steroid and TMCS; SAC was used as reference for TNSAID; $p \leq 0.05$ was considered statistically significant.

Table 6
Logistic regression analysis of pattern of prescribed anti-allergic medications within the various forms of AC

Diagnosis	TANTH			SANTH			SNSAID		
	N (%)	p-value=0.117	OR (95% CI)	N (%)	p-value<0.001	OR (95% CI)	N (%)	p-value<0.001	OR (95% CI)
SAC	47 (65.3)	-	1.00	504 (60.1%)	<0.001	2.57 (1.93-3.42)	199 (67.9)	<0.001	4.18 (2.47-7.09)
PAC	21 (29.2)	0.874	1.04 (0.62-1.77)	247 (29.4)	<0.001	3.44 (2.50-4.75)	75 (25.6)	<0.001	3.57 (2.03-6.26)
VKC	4 (5.6)	0.018	0.29 (0.10-0.81)	81 (9.7)	-	1.00	16 (5.5)	-	1.00
AKC	0	1.00	NA	7 (0.8)	0.203	1.94 (0.70-5.38)	3 (1.0)	0.05	3.85 (1.0-14.90)

OR=Odds ratio. SAC=Seasonal allergic conjunctivitis; PAC=Perennial allergic conjunctivitis; VKC=vernal keratoconjunctivitis; AKC=Atopic keratoconjunctivitis. TANTH=Topical antihistamine; SANTH=Systemic antihistamine; SNAID= Systemic non-steroidal anti-inflammatory drug. SAC was used as reference for TANTH; VKC was used as reference for SANTH and SNSAID; $p \leq 0.05$ was considered statistically significant; NA= not applicable.

used drug as monotherapy (16.3%) (Table 4). Since steroids are very potent anti-inflammatory drugs they are therefore very effective in managing allergic reactions. There was a comparatively high preference of topical steroids for patients with AKC in this study, which may be due to the intense symptoms and inflammatory process experienced by patients with this condition. According to González-López *et al.* [31] topical steroids remained the standard and effective treatment for AKC. AKC is due to type I (attributed to the immunoglobulin E (IgE)) and type II hypersensitive reactions (cell-mediated reaction involving T-lymphocytes) which contribute to the inflammatory changes of the conjunctiva and the cornea. Steroids work rapidly to relieve the symptoms in allergic conjunctivitis. They affect the allergic response by inhibiting phospholipase A2, which is an essential enzyme in the synthesis of another group of chemicals which cause inflammation, such as the prostaglandins [32].

According to this study, there was monopoly in the choice of topical mast cell stabilizers (TMCS) in favor of sodium cromoglycate neglecting the newer and more effective TMCS such as olopatadine HCl, nedocromil sodium and azelastine (Table 4). This was because sodium cromoglicate was the only topical mast cell stabilizer that was covered under the National Health Insurance Scheme (NHIS). As a result, most pharmacies did not stock these other TMCS and patients have difficulty purchasing them when they were prescribed. Also, these other TMCS were usually inaccessible to patients due to the high cost, thereby making the newer TMCS infrequently prescribed by practitioners.

A significant association ($p<0.001$) existed between the type of AC and the pattern of prescription of TMCS. TMCS were most prescribed for VKC (OR: 1.53, 95% CI: 0.56-4.19) than all other ocular allergies found in this study (Table 5). This finding was expected looking at the chronic nature of the symptoms experienced by patients with VKC and the safety of these drugs for long term usage. TMCS are the treatment of choice in the management of chronic AC as they act by preventing mast cell degranulation which culminates in the release of histamine and other mediators involved in

the inflammatory process. For these reasons, TMCS also play some role in the management of PAC and AKC which are also chronic in nature.

Topical non steroidal anti-inflammatory drugs (TNSAIDs) had a limited use in the management of AC (0.5%) (Table 4) enjoying some use in treating PAC (OR: 1.40, 95%CI: 0.33-5.89) (Table 5). This is consistent with literature as TNSAIDs only play an adjunct role to prevent the allergic response by inhibiting the enzyme cyclo-oxygenase, and can also decrease itching by raising the threshold of the conjunctival nerves [32,33].

Chlorpheniramine (a first generation antihistamine) was used topically in combination with the decongestants mainly for the acute forms of AC (94.5%) and this may be due to the rapid onset of action and their efficacy in alleviating the symptoms. None of the second generation antihistamines which were known to be more effective and non-sedating were prescribed for topical use.

SAC and PAC patients constituted 89.5% of AC patients that were prescribed systemic antihistamines. The prescription of systemic antihistamines was found to be very significantly associated to the type of allergic conjunctivitis ($P<0.001$). The increased use of systemic antihistamines in the management of AC found in this study was consistent with two studies, one in Spain by Cuvillo *et al.* [12], and the other in France by Binder-Foucard *et al*. [34], which have indicated that antihistamines were highly used in managing allergies (which is predominant in children). The frequent prescription of systemic antihistamines for the acute forms of AC may be due to the great advantage of treating concomitantly the symptoms in the eye, nose and throat in these patients. On the contrary to the sole prescription of first generation antihistamines that was found for local route of administration, prescriptions of systemic antihistamines were almost restricted to the second generation. The reason behind the prescription of second generation antihistamines for the systemic route may be due to their safety compared to the first generation antihistamines.

A very significant ($p<0.001$) association was found between the prescription pattern of systemic anti-inflammatory drugs (SNAIDs) within the various types of AC. Patients with SAC and PAC alone contributed 93.5% of those that were prescribed SNAIDs. It was found that the acute types of AC had significantly higher likelihood ($p<0.001$) of being prescribed SNAIDs when compared to VKC (Table 6). Prescription of SNAIDs among patients with AC was due to the discomfort (pain) that was presented in patients with the acute forms of ocular allergy and this is reflected in the increased prescription of acetaminophen which has an effective analgesic property.

4. CONCLUSIONS

Allergic conjunctivitis remains a burden to the young population and occupations including students, traders and artisans. Proper management involving the use of the appropriate anti-allergic medications is vital to prevent ocular complications. Patient's accessibility to the recent and effective anti-allergic medications should be enhanced by including such medications into the NHIS.

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