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Research Article

**PREVALENCE OF ALLERGIC CONJUNCTIVITIS AND  
COMORBIDITIES AMONG SAUDI ADULTS IN THE WESTERN  
REGION; A CROSS SECTIONAL OBSERVATIONAL STUDY****Khaled Abdullah Alqurashi<sup>1</sup>, Ashjan Yousef Bamahfouz<sup>2,3</sup>,  
Bayan Mutlaq Almasoudi<sup>4</sup>**<sup>1</sup> Faculty of medicine, Taif University, Taif, Saudi Arabia<sup>2</sup> Department of Ophthalmology, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia<sup>3</sup> Department of Ophthalmology, King Abdullah Medical City, Makkah, Saudi Arabia<sup>4</sup> College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia**Abstract:**

**Purpose:** Allergic conjunctivitis is one of the common conditions encountered by ophthalmologists. It affects up to 40% of the general population. Symptoms may vary from mild to severe and can negatively affect the quality of life. The objective of this study was to determine the prevalence of allergic conjunctivitis and comorbidities such as bronchial asthma and allergic rhinitis among Saudi adults in the western region. **Methods:** Adult male and female subjects, who provided verbal consent to participate, were included in this cross-sectional study. The study was conducted between April 2017 and June 2018 in the three main cities of the western region in Saudi Arabia; Taif, Makkah, and Jeddah. A pilot survey was carried out before conducting this study in order to test the applicability of the questionnaire used.

**Results:** Prevalence of allergic conjunctivitis among the studied population was found to be 18.3% (95% CI= 16.7% to 20%). Data showed a higher prevalence of allergic conjunctivitis among patients with bronchial asthma ( $p < 0.001$ ), patients with allergic rhinitis ( $p < 0.001$ ), elderly patient ( $p < 0.001$ ), and residents of Jeddah compared to Makkah and Taif ( $p < 0.001$ ) while there was no difference between the prevalence among males and that among females. **Conclusion:** Results of the current study suggest that allergic conjunctivitis affects a considerable proportion of Saudi adults in the western region and it is associated with allergic rhinitis and bronchial asthma. Adequate recognition of these associations can allow earlier diagnosis and more efficient management of these conditions.

**Keywords:** Allergic conjunctivitis, allergic rhinitis, bronchial asthma, prevalence, comorbidities, Saudi Arabia

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**INTRODUCTION:**

Numerous factors could contribute to ocular allergy such as air pollution, pets, or exposure to certain allergen during early childhood [1]. Although ocular allergy rarely contributes to visual loss, the related symptoms can negatively affect the quality of life [2-4].

According to the different hypersensitivity mechanisms introduced by Gell and Coombs in 1963, ocular allergy can be classified into seasonal allergic conjunctivitis (SAC), perennial allergic conjunctivitis (PAC), vernal keratoconjunctivitis (VKC), atopic keratoconjunctivitis (AKC), contact dermatitis (CD), and giant papillary conjunctivitis (GPC) [2, 5].

In 2001, a revised nomenclature was introduced by the European Academy of Allergy and Clinical Immunology (EAACI) and the Nomenclature Review Committee of the World Allergy Committee (WAO). This nomenclature distinguishes between allergic hypersensitivity reactions –that were further divided into IgE-mediated and non-IgE-mediated hypersensitivities- and non-allergic hypersensitivity reactions [2, 5].

Accordingly, allergic conjunctivitis was classified into intermittent, IgE-mediated allergic conjunctivitis, persistent, IgE-mediated allergic conjunctivitis, IgE-mediated vernal keratoconjunctivitis, and IgE-mediated atopic keratoconjunctivitis. It was also advised that all other forms of conjunctivitis should be listed under non-allergic conjunctivitis [6].

This classification has serious limitations in regards to CDC and contact lens-related GPC [7]. As suggested by Mashige KP, a new classification system based on the varied pathophysiological mechanisms of the different forms of ocular allergy is hence desirable [2].

According to previous studies cited by Azari AA et al. in the general population, viral conjunctivitis is the most common cause of infectious conjunctivitis, while bacterial conjunctivitis comes in second [8].

Allergic conjunctivitis is affecting up to 40% of the general population [9] and is commonly observed in spring and summer [10].

As data about allergic conjunctivitis is still lacking, therefore we aimed in this study to determine the prevalence of allergic conjunctivitis and the related comorbidities among Saudi adult subjects in the western region. This would provide a better understanding, and accordingly better management of

the disease.

**MATERIALS AND METHODS:****Study design:**

This cross-sectional observational study was conducted between April 2017 and June 2018 in the three main cities of the western region in Saudi Arabia; Taif, Makkah, and Jeddah. A pilot survey was carried out before conducting this study in order to test the questionnaire used.

**Objectives:**

The primary objective of this study was to determine the prevalence of allergic conjunctivitis among Saudi adults in the western region. The secondary objective was to determine the prevalence of coexisting allergic diseases, such as bronchial asthma and allergic rhinitis in Saudi adults who were found to have allergic conjunctivitis.

**Population:**

Adult male and female subjects from Taif, Makkah, and Jeddah, who provided their verbal consent to participate, were included in this study.

**Data collection:**

Based on the pilot survey, a self-administered questionnaire was designed, validated, and then was provided to the study population. This questionnaire was consisted of 3 sections; section A: included questions about subjects' socio-demographic data (such as: age, sex, and residency), section B: included questions about allergic conjunctivitis and the related symptoms, and section C: included questions about coexisting conditions such as bronchial asthma and allergic rhinitis.

**Statistical analyses:**

Data were statistically described in terms of frequencies (number of cases) and valid percentages for categorical variables. Mean, standard deviations, minimum and maximum were used to describe numerical variable. Comparison of categorical variables between the subgroups (cross-tabulation) was done using Chi-square test while comparison of numerical variables between the subgroups was done using one-way Anova test. P values less than 0.05 were considered statistically significant. All statistical calculations were done using computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 21 for Microsoft Windows.

**Ethical considerations:**

Prior to conducting any study-related procedures, institutional research ethics board approval was

acquired.

### RESULTS:

A total of 2103 adult subjects were recruited from 3 cities in the western region of Saudi Arabia. The majority (n = 1556, 74%) were females and 547 (26%) were males. The mean age was  $26.41 \pm 8.97$  years, with a minimum value of 18 years and a maximum value of 75 years.

A total of 891 (42.4%) subjects were from Taif, 844 (40.1%) were from Makkah, and 368 (17.5%) were from Jeddah.

Subjects were asked if they have previously suffered from allergic conjunctivitis symptoms such as eye redness, itching, burning, or excessive tears. The majority (n = 1730, 82.3%) reported that they suffered from at least one of these symptoms. The most frequent cause of these symptoms was dust, as reported by 749 (43.3%) subjects, followed by eye drops or contact lenses (n = 287, 16.6%), and animal fur (n = 103, 6%). Other causes such as chemicals

perfumes and pollen grains were reported with percentages less than 5%. Around one quarter of the subjects (n = 412, 23.8%) reported that no particular cause contributes in the symptoms.

More than two thirds of the subjects (n = 1180, 68.2%) reported that there is no specific time of the year when they have allergic conjunctivitis symptoms. When asked about the frequency of experiencing these symptoms during the 12 month prior to study entry, 933 (53.9%) subjects answered "one to four times", 272 (15.7%) answered "five to ten times" and 261 (15.1%) answered "more than ten times".

The majority (n = 1354, 78.3%) said that they did not visit the ophthalmologist as a result of these symptoms during the 12 months prior to study entry.

More details about allergic conjunctivitis symptoms are provided in table (1).

**Table (1): Allergic conjunctivitis symptoms**

<b>Have you previously suffered from any of the following symptoms (eye redness, itching or burning in the eye, excessive tears in the eye) without fever? (N = 2103)</b>		
<b>Answers</b>	<b>Count</b>	<b>Percentage</b>
<b>No</b>	373	17.7
<b>Yes</b>	<b>1730</b>	<b>82.3</b>
<b>Total</b>	2103	100
<b>If yes, what is the cause of these symptoms? (N = 1730)</b>		
<b>Animals' fur</b>	103	6.0
<b>Chemicals such as detergents</b>	81	4.7
<b>Dust</b>	749	43.3
<b>None</b>	412	23.8
<b>Perfumes</b>	46	2.7
<b>Pollen grains</b>	52	3.0
<b>Some eye drops or contact lenses</b>	287	16.6
<b>If yes, do you suffer from these symptoms during a specific season of the year? (N = 1730)</b>		
<b>All over the year</b>	110	6.4

<b>Autumn</b>	25	1.4
<b>I don't have allergic conjunctivitis</b>	229	13.2
<b>No specific timing in the year</b>	1180	68.2
<b>Spring</b>	88	5.1
<b>Summer</b>	71	4.1
<b>Winter</b>	27	1.6
<b>If yes, during the last 12 months, how many times did you experience these symptoms? (N = 1730)</b>		
<b>Five to ten times</b>	272	15.7
<b>I don't have allergic conjunctivitis</b>	264	15.3
<b>More than 10 times</b>	261	15.1
<b>one to four times</b>	933	53.9
<b>If yes, during the last 12 months, did you visit the ophthalmologist because of these symptoms? (N = 1730)</b>		
<b>Yes</b>	376	21.7
<b>No</b>	1354	78.3

When subjects were asked if they have bronchial asthma, 9.7% (n = 204) answered “yes” and when they were asked if they were diagnosed with allergic rhinitis, 24.7% (n = 520) answered “yes”. Further details are provided in table (2).

**Table (2): Prevalence of bronchial asthma and allergic rhinitis**

<b>Do you have bronchial asthma?</b>		
<b>Answer(s)</b>	<b>Count</b>	<b>Percentage</b>
<b>Yes</b>	204	9.7
<b>No</b>	1899	90.3
<b>Are you diagnosed with allergic rhinitis?</b>		
<b>Yes</b>	520	24.7
<b>No</b>	1583	75.3

**Prevalence of allergic conjunctivitis in adult Saudi population:**

The prevalence of allergic conjunctivitis among the studied population was found to be 18.3% (95% CI= 16.7% to 20%).

**Comorbidities to allergic conjunctivitis in adult Saudi population:**

The prevalence of allergic conjunctivitis among asthmatic subjects (31.4%) was significantly higher ( $p < 0.001$ ) than the prevalence among non-asthmatic subjects (16.9%).

The same as found for allergic rhinitis as the prevalence of allergic conjunctivitis among subjects with allergic rhinitis (36.5%) was significantly higher

( $p < 0.001$ ) than the prevalence among those without allergic rhinitis (12.3%).

In addition, collected data showed that subjects with allergic conjunctivitis (aged  $30.4 \pm 11.0$  years) were significantly ( $p < 0.001$ ) older than those without the disease (aged  $25.2 \pm 8.2$  years). Also, prevalence of allergic conjunctivitis among subjects who live in Jeddah (24.7%) was significantly higher ( $p < 0.001$ ) than the prevalence among those who live in Taif (19.2%) or Makkah (14.6%).

On the other hand, no significant relationship was established between gender distribution and allergic conjunctivitis. Further details are provided in table (3).

**Table (3): Risk factors for developing allergic conjunctivitis**

Comorbidity		With allergic conjunctivitis Mean± SD / Count (%)	Without allergic conjunctivitis Mean± SD / Count (%)	P value*
Bronchial asthma	Yes	64 (31.4%)	140 (68.6%)	< 0.001
	No	321 (16.9%)	1578 (83.1%)	
Allergic rhinitis	Yes	190 (36.5%)	330 (63.5%)	< 0.001
	No	195 (12.3%)	1388 (87.7%)	
Gender	Male	100 (18.3%)	447 (81.7%)	1.0
	Female	285 (18.3%)	1271 (81.7%)	
City of residence	Jeddah	91 (24.7%)	277 (75.3%)	< 0.001
	Makkah	721 (85.4%)	123 (14.6%)	
	Taif	720 (80.8%)	171 (19.2%)	
Age (years)		30.4± 11.0	25.2± 8.2	< 0.001
* Chi-square test was used to compare the categorical variables between the subgroups (cross-tabulation) while comparison of numerical variables between the subgroups was done using one-way Anova test.				

**DISCUSSION:**

Although allergic conjunctivitis rarely contributes to life-threatening complications, it can significantly affect quality of life and can have serious consequences if left untreated [11, 12].

Over the years, numerous studies have reported variant prevalence of allergic conjunctivitis reaching 40% of the general population in some regions [13 – 15]. Our results were found to be compatible with these findings, as the prevalence of allergic conjunctivitis in our studied population was 18.3% (95% CI= 16.7% to 20%).

Seasonal allergic conjunctivitis accounts for most cases with ocular allergy, and is usually triggered by exposure to airborne pollens that cause hay fever [1, 16]. Conversely, perennial allergic conjunctivitis usually occurs in response to environmental allergens such as dust, animal fur, and chemicals and it present through the year [17–20].

As cited by Azari AA et al [8] ‘seasonal allergic conjunctivitis comprises 90% of all allergic conjunctivitis in the United States. However, our results showed that 68.2% of subjects do not experience allergic conjunctivitis symptoms in specific timing of the year.

In regards to the relationship between bronchial

asthma and allergic conjunctivitis, our study showed that bronchial asthma was significantly associated with higher prevalence of allergic conjunctivitis ( $p < 0.001$ ). Similar results were reported by Heck S et al, as bronchial asthma was found to be strongly associated with allergic conjunctivitis; OR 2.41 (95% CI:2.33–2.52) [21].

Similar trend was also observed in regards to the relationship between allergic rhinitis and allergic conjunctivitis. Our data showed that allergic rhinitis was significantly associated with higher prevalence of allergic conjunctivitis ( $p < 0.001$ ). This was also comparable to the results reported by Williams DC et al, as 95% of patients with allergic rhinitis were found to have allergic conjunctivitis as comorbidity [22].

Because of the exceptionally frequent coexistence of allergic rhinitis and allergic conjunctivitis, they together are often referred to as ‘allergic rhinoconjunctivitis’. This relationship has been demonstrated in various clinical studies. For instance, Michailopoulos P et al. revealed that rhinoconjunctivitis was reported in 85.3% of allergic patients in a study conducted in 1998 [23].

In our study, no significant relationship was established between gender and allergic

conjunctivitis. This was similar to findings from another study conducted in Greece where there was insignificant predominance ( $p=0.367$ ) of women who had allergic conjunctivitis [23].

In contrast, another study conducted to determine the prevalence of allergic conjunctivitis among basic school children in Ghana, reported that allergic conjunctivitis was significantly associated with gender ( $p<0.05$ ), with women predominance of 56.7% [24].

This study reported insignificant association between age and allergic conjunctivitis, while our results demonstrated that older age was significantly associated with higher prevalence of allergic conjunctivitis in the studied population [24].

### CONCLUSION:

In conclusion, our study showed that allergic conjunctivitis affects a considerable proportion of Saudi adult subjects in the western region and that it is significantly associated with allergic rhinitis and bronchial asthma. And accordingly, adequate recognition of these associations by ophthalmologists, allergists and all health care providers is crucial in order to allow earlier diagnosis and more efficient management of these conditions when they co-exist. Preventative measures and timely treatment of the symptoms should be highly recommended in order to provide better management for ocular allergy and accordingly better quality of life.

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