



Prevalence of Allergic Rhinitis Among Students of University of Hail, Saudi Arabia

Abdullah D Alotaibi^{1*}, Mohammad Salem Alshammari², Abdullah Ahmed Alkhalaf², Hamoud Khalid Alshaya², Turki Ahmed Alghassab², Saleh Abdulrahman Alrusayni² and Hussain Gadelkarim Ahmed²

¹Department of Otolaryngology Head and Neck Surgery, College of Medicine, University of Hail, Hail, Saudi Arabia

²College of Medicine, University of Hail, Hail, Saudi Arabia

*Corresponding e-mail: abdullahdak.md@gmail.com

ABSTRACT

Background: Allergic rhinitis (AR) is a disease with a high global disease burden. There is an inadequate data on the epidemiology of allergic disorders in Saudi Arabia. **Objective:** The aim of the present study was to assess the prevalence of AR and identify risk factors among University of Hail students, Northern Saudi Arabia. **Methodology:** This is a cross-sectional survey conducted in Hail University, Northern Saudi Arabia, which included 1578 participants, to assess the epidemiology of AR, and its possible risk factors. **Results:** The overall prevalence of AR was 51% and the prevalence of AR for males was 55%, hence, the prevalence among females was 42%. Moreover, the prevalence of rhino conjunctivitis in this study was 21%. **Conclusion:** AR is prevalent among Hail University students with relatively higher risk in males. More research is required for identifying the most frequent environmental and occupation allergies for better future control.

Keywords: Allergic rhinitis, Rhinoconjunctivitis, Saudi Arabia, Prevalence

INTRODUCTION

Allergic rhinitis (AR) is the conventional allergic disorder that is frequently encountered by otolaryngologists. Consideration of the epidemiological characteristics of AR is essential for understanding both rhinitis symptoms and allergy tests [1]. AR is a disease with a high global disease burden, but most risk factors that cause this disorder are still not well understood [2]. The prevalence of AR is high in both developed and developing countries [3]. Epidemiological studies reveal noticeable variability globally in the prevalence of both rhinitis symptoms and allergy tests. Self-reported seasonal or perennial rhinitis symptoms, which significantly overestimate the prevalence of AR that is well-defined by a positive history and positive allergy tests. Positive allergy tests are also common in patients without self-reported rhinitis symptoms [1].

AR is described as inflammation of the nasal mucosa, causing symptoms of pruritus, rhinorrhea, sneezing and congestion. AR has affected nearly 400 million population of the world [4,5]. AR has harmful influence on the performance of daily activities, quality of sleep, work, and school performance as well as, psychosocial comfort [6,7].

The most common encountered risk factors for AR comprise having atopy, asthma, eczema, and other allergic illnesses [8-11]. Parental history of allergic illness is also a well-known risk factor. The risk of AR rises in children of parents with AR, asthma, hay fever and pollen allergies [12-14]. Factors such as, vitamin D, obesity, exposure to cigarette smoke, amplified overall serum IgE, elevated blood eosinophils and other environmental exposures shared in urban settings were also reported to contribute to AR [15,16].

There is an inadequate data on the epidemiology of allergic disorders in Saudi Arabia. Symptoms suggestive of allergic disease are very common in Saudi Arabia, which is relatively comparable to the highest risk regions worldwide [17]. Therefore, inclusive population-based assessment on AR are necessary for better apprehend the relative importance of the related risk factors. Thus, the aim of the present study was to assess the prevalence of AR and identify risk factors among University of Hail students, Northern Saudi Arabia.

PATIENTS AND METHODS

This cross-sectional survey data was obtained from 1578 consecutive participants at University of Hail, Northern Saudi Arabia. Each participant filled a questionnaire containing items on nasal problems and related features of AR and was then examined by an otolaryngologist. The otolaryngologist who ascertained atopic status of the participant.

The epidemiological questionnaire on nasal problems included the following items: Nasal symptoms in the past year, including sneezing, runny nose, and blocked nose when the subject did not have a cold or 'flu', in the past year, nasal symptoms accompanied by itchy-watery eyes (rhinoconjunctivitis), months of the year in which nasal symptoms occur. Seasonal (pollen season) versus perennial rhinitis could be assessed according to the pollen calendar of each region. Triggers nasal symptoms includes pollens, house dust mites, house dust and epithelia, perceived allergic status, previous medical diagnosis of allergy, previous positive tests of allergy, familial history of allergy.

Data Analysis

Statistical Package for Social Sciences (version 16) was used for analysis and to perform Pearson's Chi-square test for statistical significance (p-value). The 95% confidence level and confidence intervals were used. $P < 0.05$ was considered statistically significant.

Ethical Consent

Each participant was asked to sign a written ethical consent during the questionnaire interview. The informed ethical consent form was designed and approved by the ethical committee of the College of Medicine (University of Hail, KSA) Research Board.

RESULTS

The present study investigated the presence of allergic rhinitis in 1578 individuals, in which 1096 (69.5%) were males and 482 (30.5%) were females presenting a ratio of 2.27: 1.00. Out of the 1578 study subjects, allergic rhinitis symptoms were identified in 1166 (74%) and couldn't be ascertained in 412 (26%) of the study subjects. Out of the 1166 with allergic rhinitis, 568 (48.7%) were found with blocked nose, runny nose and sneezing in the past year, while 303 (26%) were found with blocked, sneezing or running nose and runny nose, sneezing, and 295 (25.3%) were identified with blocked, sneezing, runny nose, as indicated in Table 1.

Table 1 Distribution of the study population by symptoms of allergic rhinitis

Variables	Males	Females	Total
Symptoms of allergic rhinitis			
No symptoms	297	115	412
Blocked nose, runny nose and sneezing in the past year	370	198	568
Blocked, sneezing, or running nose and runny, sneezing	214	89	303
Blocked, sneezing, runny nose	215	80	295
Total	1096	482	1578
Perennial plus pollen season			
Yes	539	182	721
No	374	233	607
Total	913	415	1328

Out of 1096 males, allergic rhinitis was ascertained in 799 (73%). Out of the 799 males with allergic rhinitis, 370 (46.3%) were found with blocked nose, runny nose and sneezing in the past year, while 214 (26.7%) were found with blocked, sneezing or running nose and runny, sneezing, and 799 (27%) were identified with blocked, sneezing, runny nose, as indicated in Table 1.

Out of 482 females, allergic rhinitis was ascertained in 367 (76%). Out of the 367 females with allergic rhinitis, 198 (54%) were found with blocked nose, runny nose and sneezing in the past year, 89 (24%) were found with blocked, sneezing or running nose and runny, sneezing, and 80 (22%) were identified with blocked, sneezing, runny nose, as indicated in Table 1.

Perennial allergic rhinitis was indicated in 721 persons of whom 539 (75%) were males and 182 (25%) were females, as shown in Table 2 and Figure 1.

Table 2 Distribution of the study population by season and triggers

Variables	Males	Females	Total
Perennial plus pollen season			
Yes	539	182	721
No	374	233	607
Total	913	415	1328
Triggers			
None	14	20	34
Epithelia (cat, dog)	68	24	92
Pollens, house dust, mites, dust	682	306	988
Epithelia (cat, dog), house dust, mites, dust	76	51	127
Total	840	401	1241

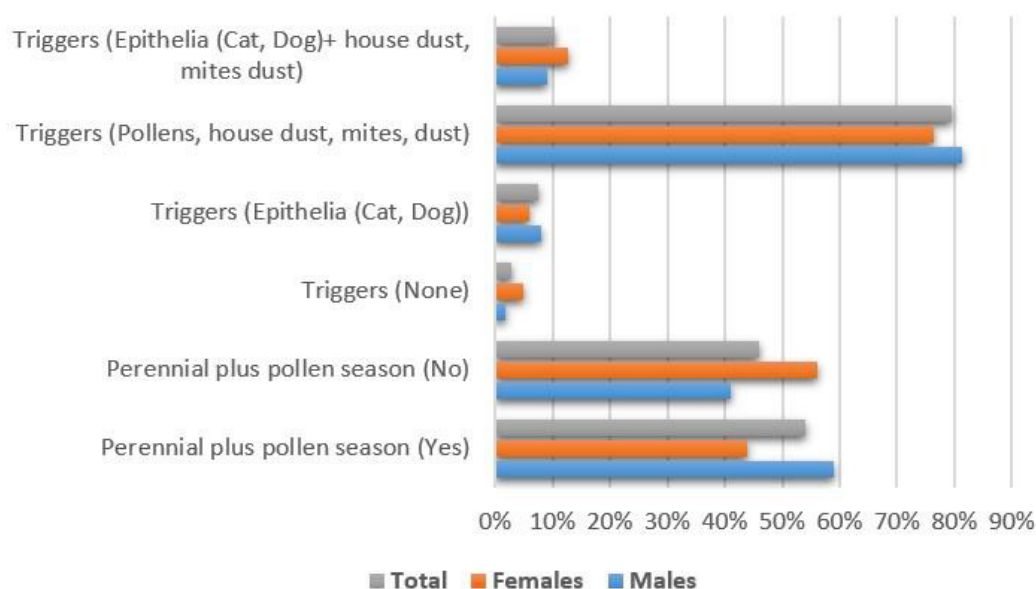


Figure 1 Description of the study population by season and triggers

About the triggers, 1207 persons were found to be sensitive to various triggers. Out of 1207 study subjects with sensitivity to triggers, 92 (7.6%) were found to be sensitive to epithelia (cat, dog), 988 (81.4%) were found to be sensitive to pollens, house dust, mites, dust, and 127 (11%) were found to be sensitive to epithelia (cat, dog) as well as house dust, mites, dust. Out of the 840 respondents' males, 826 were found to be sensitive to various triggers. Out of 826 male subjects, 68 (8.2%) were found to be sensitive to epithelia (cat, dog), while 682 (82.6%) were found to be sensitive to pollens, house dust, mites, dust, and 76 (9.2%) were found to be sensitive to epithelia (cat, dog) as well as house dust, mites, dust.

Out of the 401 respondent females, 381 were found to be sensitive to various triggers. Out of 381 males subjects, 24 (6.3%) were found to be sensitive to epithelia (cat, dog), while 306 (80.3%) were found to be sensitive to pollens, house dust, mites, dust, and 51 (13.4%) were found to be sensitive to epithelia (cat, dog) as well as house dust, mites, dust. With regard to the previous allergic history, 707 (55%) persons out of 1287 indicated positive family history of allergic rhinitis. Out of 707 individuals with family history of allergic rhinitis, 423 (47.4%) were males and 284 (72%) were females, as shown in Table 3 and Figure 2.

Table 3 Distribution of the study population by previous allergy status

Variables	Males	Females	Total
Family history of allergy			
Yes	423	284	707

No	469	111	580
Total	892	395	1287
Previous allergic diagnosis			
Yes	253	158	411
No	620	225	845
Total	873	383	1256
Rhinoconjunctivitis			
Yes	141	124	265
No	707	280	987
Total	848	404	1252

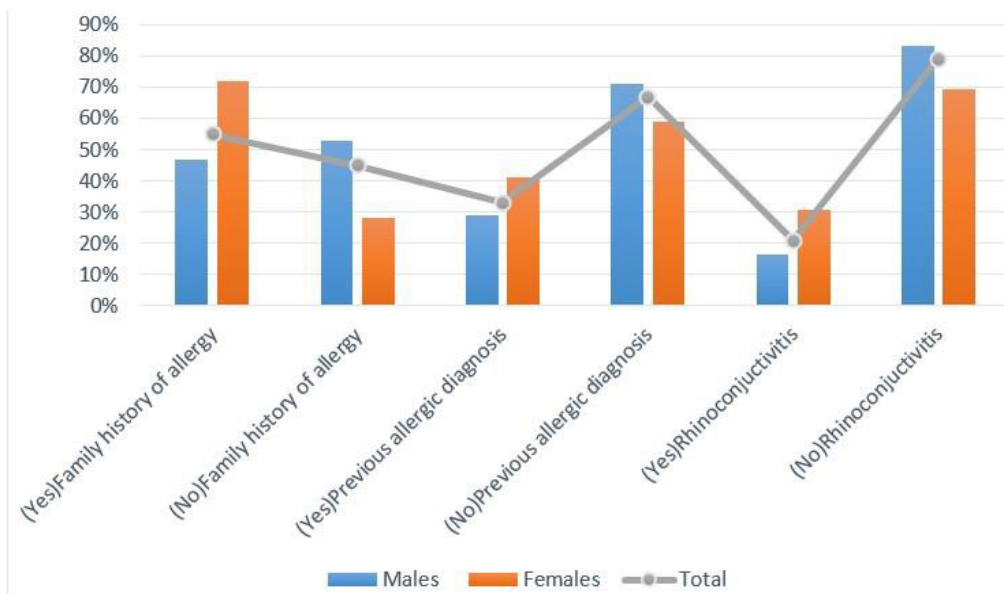


Figure 2 Description of the study population by previous allergy status

Regarding previous allergic diagnosis, 411 (32.7%) persons out of 1256 indicated positive history of diagnosis of allergic rhinitis. Out of 411 individuals with previous diagnosis of allergic rhinitis, 253 (29%) were males and 158 (41%) were females, as shown in Table 3 and Figure 2. About the rhinoconjunctivitis, 265 (21%) persons out of 1252 indicated positive rhinoconjunctivitis. Out of 265 individuals with rhinoconjunctivitis, 141 (16.6%) were males and 124 (30.7%) were females, as shown in Table 3 and Figure 2.

According to allergy diagnosis, out of 1289 individuals, 925 (71.8%) were presented with perceived allergy status of whom 647 (72.4%) were males and 278 (70.2%) were females. Out of 350 individuals, 143 (40.9%) presented with positive allergy test of whom 91 (43%) were males and 52 (37.7%) were females. Positive allergic score (>7 points) was identified in 803 out of 1578 (51%), of whom 600 (55%) were males and 203 (42%) were females, as indicated in Table 4 and Figure 3.

Table 4 Distribution of the study population by allergic diagnosis

Variables	Males	Females	Total
Perceived allergy status			
Yes	647	278	925
No	246	118	364
Total	893	396	1289
Positive allergy test			
Yes	91	52	143
No	121	86	207
Total	212	138	350

Positive allergic score			
>7 points	600	203	803
< 7 points	496	279	775
Total	1096	482	1578

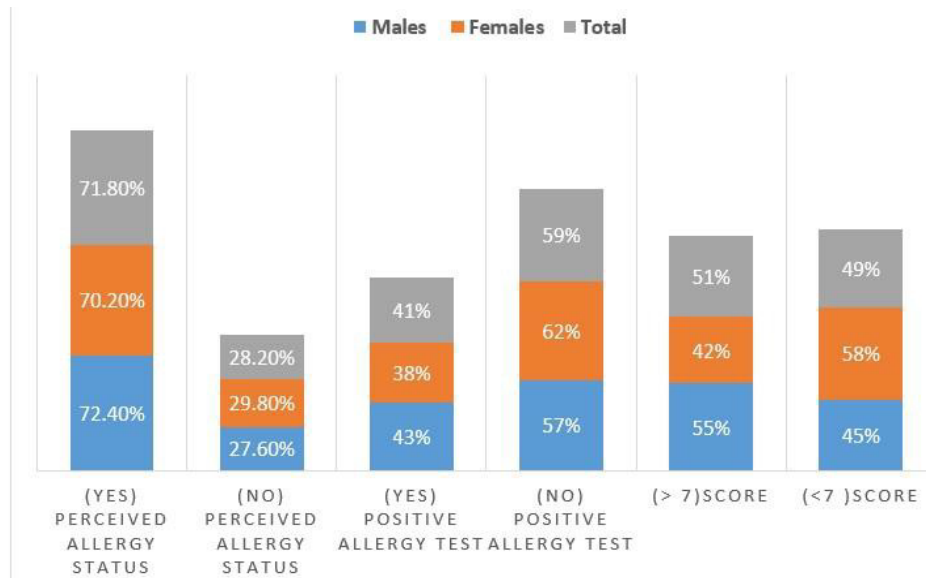


Figure 3 Description of the study population by allergic diagnosis

DISCUSSION

Although, there are inadequate data on the epidemiology of allergic disorders in Saudi Arabia, but symptoms associated with AR are very common all over the country. Since the prevalence of AR strongly depend on the adequacy of the environmental allergies, its epidemiology may greatly vary within the country. To the best of our knowledge this is the first report in this context from Hail Region, Northern Saudi Arabia.

In the present study, the prevalence of symptoms was found to be 74% among Hail University students, which was the highest amongst such reports. Epidemiological studies demonstrate discernible global variation in the prevalence rates of rhinitis symptoms, which might be positive or negative by allergy tests. Self-reported seasonal or perennial rhinitis symptoms significantly overestimate the prevalence of AR well-defined by a positive history and positive allergy tests. However, positive allergy tests are also common in those without self-reported rhinitis symptoms [1].

The most common encountered symptoms in the present study were blocked nose (48.7%) and runny nose (26%) with sneezing. Such symptoms have been previously reported in several studies from different parts of the world [18,19]. In the current study, the prevalence rates of self-reported AR symptoms were relatively similar for males (73%) and females (76%) which were slightly higher among females. It was reported that the prevalence of parallel allergic rhinitis and asthma displays a strong male predominance in childhood and appears to switch to a female predominance in adolescents [20]. Cross-sectional study suggested that allergy prevalence in childhood is higher in boys compared to girls, but it remains uncertain whether this inequality changes after puberty [21].

In the present study and according to the positive allergic score (>7 points), the total prevalence of AR was 51% and the prevalence of AR for males was 55%, hence, the prevalence among females was 42%. Moreover, the prevalence of rhinoconjunctivitis in this study was 21%. However, relatively similar findings were previously published. In a study, the prevalence and comorbidity of allergic diseases in preschool children was assessed, the prevalence of symptoms of AR was found to be 40.7%. The prevalence rates of allergic conjunctivitis were found to be 14.8%. The prevalence of allergic rhinitis in children with asthma was 64.3% and that of asthma in children with allergic rhinitis was 21.6%. The prevalence of rhinitis in children with conjunctivitis was 64.8% and that of conjunctivitis in children with rhinitis was 23.6% [22]. In adult studies, the prevalence rates AR were found in 30% to 90% of patients with asthma [23,24].

Although, literature regarding AR is scarce in Saudi Arabia, AR has certain clinical characteristics and associated

comorbid conditions. In the study, to investigate the prevalence and risk factors associated with allergic diseases among Saudi school children in the southwestern Saudi region of Najran, the overall prevalence of physician-diagnosed asthma, allergic rhinitis and atopic dermatitis was 27.5%, 6.3% and 12.5%, respectively [25]. Another study from Saudi Arabia evaluated the diagnostic yield of skin prick test (SPT) and serum total immunoglobulin E (IgE) antibodies level in patients with allergic rhinitis (AR) and the role of nasal provocation test (NPT) for the determination of local allergic rhinitis (LAR) in patients with non-allergic rhinitis (NAR). The SPT was positive in 77.8% of patients, mostly for grass pollen and dust mites [26].

However, the relationship between AR and asthma is very strong [27]. Studies from Saudi Arabia have showed very high prevalence rates of asthma [28-30], which might contribute to the high prevalence rates of AR in this study. In the present study, about 81.4% of those with AR were found to be sensitive to pollens, house dust, mites.

CONCLUSION

AR is classified according to sensitivity to allergens that occur seasonally, like pollens, or to allergens that are present all year round, like house dust mite, molds, and animal dander, into seasonal and perennial allergic rhinitis. Allergy to pollens causes the same mechanism of inflammation in response to allergens, which is the result of allergen binding to specific IgE antibody. However, patients with pollen allergy usually complain more of sneezing and runny nose, whereas patients with allergy to perennial allergens more often complain of obstruction, with the episodes of sneezing and runny nose occurring only when exposed to higher concentrations of allergens (house cleaning, around pets) [31].

AR is prevalent among Hail University students with relatively higher shift towards males. More research is required for identifying the most frequent environmental and occupation allergies for better future control.

Limitations

The limitations of the present study include its cross-sectional setting as well as non-inclusion of asthma as a risk with AR.

DECLARATIONS

Conflict of Interest

The authors have disclosed no conflict of interest, financial or otherwise.

REFERENCES

- [1] Mims JW. Epidemiology of allergic rhinitis. *International Forum of Allergy & Rhinology*, 2014, pp. S18-20.
- [2] Baumann LM, et al. "Prevalence and risk factors for allergic rhinitis in two resource-limited settings in Peru with disparate degrees of urbanization." *Clinical & Experimental Allergy*, Vol. 45, No. 1, 2015, pp. 192-99.
- [3] Beasley, Richard. "Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC." *The Lancet*, Vol. 351, No. 9111, 1998, pp. 1225-32.
- [4] Greiner AN, Hellings PW, Rotiroti G, Scadding GK. Allergic rhinitis. *Lancet*, Vol. 378, No. 9809, 2011. pp. 2112-22.
- [5] Pawankar, Ruby, et al. "Allergic rhinitis and its impact on asthma in Asia Pacific and the ARIA update 2008." *World Allergy Organization Journal*, Vol. 5, No. 3, 2012, pp. S212.
- [6] Canonica GW, et al. "A survey of the burden of allergic rhinitis in Europe." *Allergy*, Vol. 62, No. 85, 2007, pp. 17-25.
- [7] Valovirta Erkkka and Ruby Pawankar. "Survey on the impact of comorbid allergic rhinitis in patients with asthma." *BMC Pulmonary Medicine*, Vol. 6, No. 1, 2006, pp. S3.
- [8] Sultész Monika, et al. "Prevalence and risk factors for allergic rhinitis in primary schoolchildren in Budapest." *International Journal of Pediatric Otorhinolaryngology*, Vol. 74, No. 5, 2010, pp. 503-09.
- [9] Zhang Ya-Mei, et al. "Prevalence and associated risk factors of allergic rhinitis in preschool children in Beijing." *The Laryngoscope*, Vol. 123, No. 1, 2013, pp. 28-35.
- [10] Skoner, David P. "Allergic rhinitis: Definition, epidemiology, pathophysiology, detection, and diagnosis." *Journal of Allergy and Clinical Immunology*, Vol. 108, No. 1, 2001, pp. S2-S8.

- [11] Bedolla-Barajas, Martín, et al. "Asthma in late adolescents of Western Mexico: Prevalence and associated factors." *Archivos de Bronconeumología*, Vol. 49, No. 2, 2013, pp. 47-53.
- [12] Wang, Qiu-Ping, et al. "Association between maternal allergic rhinitis and asthma on the prevalence of atopic disease in offspring." *International Archives of Allergy and Immunology*, Vol. 157, No. 4, 2012, pp. 379-86.
- [13] Westman M., et al. "The link between parental allergy and offspring allergic and nonallergic rhinitis." *Allergy*, Vol. 68, No. 12, 2013, pp. 1571-78.
- [14] Dold Sigrid, et al. "Genetic risk for asthma, allergic rhinitis, and atopic dermatitis." *Archives of Disease in Childhood*, Vol.67, No. 8, 1992, pp. 1018-22.
- [15] Wright Anne L, et al. "Epidemiology of physician-diagnosed allergic rhinitis in childhood." *Pediatrics*, Vol. 94, No. 6, 1994, pp. 895-901.
- [16] Musaad Salma MA, et al. "Comparison of anthropometric measures of obesity in childhood allergic asthma: central obesity is most relevant." *Journal of Allergy and Clinical Immunology*, Vol. 123, No. 6, 2009, pp. 1321-27.
- [17] Nahhas, Mahmoud, et al. "Prevalence of allergic disorders among primary school-aged children in Madinah, Saudi Arabia: two-stage cross-sectional survey." *PloS One*. Vol. 7, No. 5, 2012, pp. e36848.
- [18] Mancilla-Hernández, Eleazar, et al. "Prevalencia de rinitis alérgica y de sus síntomas en la población escolar de Cuernavaca, Morelos, México." *Revista Alergia México*, Vol. 64, No. 3, 2017, pp. 243-49.
- [19] Shakhova NV, et al. "The prevalence and risk factors of allergic rhinitis among the children of the preschool age." *Vestnik Otorinolaringologii*, Vol. 82, No. 6, 2017, pp. 47-51.
- [20] Fröhlich, Matthias, et al. "Is there a sex-shift in prevalence of allergic rhinitis and comorbid asthma from childhood to adulthood? A meta-analysis." *Clinical and Translational Allergy*, Vol. 7, No. 1, 2017, p. 44.
- [21] Keller, Theresa, et al. "The sex-shift in single disease and multimorbid asthma and rhinitis during puberty-a study by MeDALL." *Allergy*, 2017.
- [22] Kim Hyeong Yun, et al. "Prevalence and comorbidity of allergic diseases in preschool children." *Korean Journal of Pediatrics*, Vol. 56, No. 8, 2013, pp. 338-42.
- [23] Gaugris Sabine, Vasilisa Sazonov-Kocevar, and Mike Thomas. "Burden of concomitant allergic rhinitis in adults with asthma." *Journal of Asthma*, Vol. 43, No. 1, 2006, pp. 1-7.
- [24] Casale Thomas B, and Binita V Amin. "Allergic rhinitis/asthma interrelationships." *Clinical Reviews in Allergy & Immunology*, Vol. 21, No. 1, 2001, 27-49.
- [25] Alqahtani, Jobran M. "Asthma and other allergic diseases among Saudi schoolchildren in Najran: The need for a comprehensive intervention program." *Annals of Saudi Medicine*, Vol. 36, No. 6, 2016, p. 379.
- [26] Badran Hatem S, et al. "Identification and prevalence of allergic, nonallergic, and local allergic rhinitis patients in western area, Saudi Arabia." *Annals of Otolaryngology, Rhinology & Laryngology*, Vol. 125, No. 8, 2016, pp. 634-43.
- [27] Fujisawa, Takao, et al. "Long-term safety of subcutaneous immunotherapy with TO-204 in Japanese patients with house dust mite-induced allergic rhinitis and allergic bronchial asthma: Multicenter, open label clinical trial." *Allergology International*, 2017.
- [28] Al-Ghobain, Mohammed O., Mohamad S. Al-Hajjaj, and Mohamad S. Al Moamary. "Asthma prevalence among 16-to 18-year-old adolescents in Saudi Arabia using the ISAAC questionnaire." *BMC Public Health*, Vol. 12, No. 1, 2012, p. 239.
- [29] Al-Moamary, et al. "Factors leading to refractory asthma in patients from Saudi Arabia." *Annals of Thoracic Medicine*, Vol.12, No. 1, 2017, p. 42.
- [30] Al-Frayh, A. R., et al. "Increased prevalence of asthma in Saudi Arabia." *Annals of Allergy, Asthma & Immunology*, Vol. 86, No. 3, 2001, pp. 292-96.
- [31] Kalogjera L. Rhinitis in adults. *Acta Medica Croatica*, Vol. 65, No. 2, 2011, pp. 181-87.