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Original article

Prevalence and Seasonal Variation of Allergic Rhinitis Among Patients Attending the ENT Outpatient Clinic at Zawia Central Hospital in 2025: A Retrospective Study

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Abstract
Allergic rhinitis (AR) is a chronic inflammatory disease of the nasal mucosa mediated by immunoglobulin E (IgE) following exposure to allergens. It is clinically characterized by sneezing, rhinorrhea, nasal obstruction, and pruritus. According to the Allergic Rhinitis and its Impact on Asthma (ARIA) guideline, AR represents a major global health problem with significant effects on sleep quality, daily productivity, and academic performance. Seasonal changes, particularly those related to pollen exposure, dust, climate fluctuations, and environmental allergens, play an important role in symptom exacerbation and healthcare visits. Despite extensive global research, epidemiological data regarding AR prevalence and seasonal patterns in Western Libya remain limited. To determine the prevalence and seasonal variation of allergic rhinitis among patients attending the Ear, Nose, and Throat (ENT) outpatient clinic at Zawia Central Hospital, Western Libya. A hospital-based retrospective descriptive cross-sectional study was conducted at the ENT outpatient clinic of Zawia Central Hospital. Data were extracted from patient records covering one year from 1 January 2025 to 31 December 2025. All patients diagnosed with allergic rhinitis by an ENT specialist during the study period were included. Demographic characteristics, monthly distribution, seasonal patterns, and associated diagnoses were analyzed using descriptive statistics and the chi-square test. Of 6,427 patients attending the ENT outpatient clinic during the study period, 1,102 were diagnosed with allergic rhinitis, giving an overall prevalence of 17.1%. Females comprised 61.3% of cases, and the largest age group was 18–39 years (27.3%). Cases occurred throughout the year, with the highest monthly frequency in February (10.0%) and the highest monthly prevalence in March (25.1%). Seasonal distribution was highest in autumn (26.2%) and lowest in summer (23.5%), with no significant seasonal difference ($\chi^2 = 1.782$, $p = 0.619$). Most patients (77.0%) had no associated diagnosis; upper respiratory tract infection (4.0%) and Eustachian tube dysfunction (3.3%) were the most frequent associated conditions. Allergic rhinitis is a common condition among patients attending the ENT outpatient clinic, affecting approximately one in six patients. These findings provide baseline epidemiological data for Western Libya. Further multicenter studies involving different regions of Libya are recommended to evaluate geographic variations and investigate environmental, demographic, and other contributing factors associated with allergic rhinitis.
Keywords. Allergic Rhinitis, Prevalence, Seasonal Variation, ENT clinic, Zawia, Libya.

Introduction

Allergic rhinitis (AR) is an atopic disease characterized by an IgE-mediated immune response against inhaled allergens. This initiates the early-phase response, marked by the release of histamine, which is subsequently followed by a late-phase response primarily driven by leukotrienes [1]. AR is considered one of the most common diseases worldwide, which is significantly affecting health-related quality of life [2,3]. Patients presenting to the outpatient department exhibit a variety of symptoms. While these symptoms are occasionally solitary, they more frequently appear in clusters [4,5]. The clinical presentation varies from paroxysmal sneezing and profuse rhinorrhea, which are the most characteristic manifestations of the early-phase response. These often accompanied by pruritus of the nose, throat, and ears [4]. Not to mention the nasal obstruction, which is a prominent reason for seeking medical consultation, and which initiates at the early phase response and becomes significantly more pronounced during the late phase response [1].

Frequently, patients experience treatment exhaustion from long-term medication use, leading them to present late to the clinic with secondary complications. These primarily include rhinosinusitis, pharyngitis, and otitis media with effusion, as well as adenoiditis in the pediatric population. In addition to these infections, late clinical presentation often involves olfactory dysfunction and sleep-disordered breathing. Poorly controlled allergic rhinitis may contribute to significant morbidity, including impaired quality of life, sleep disturbance, olfactory dysfunction, and increased risk of associated upper airway conditions. [6]. Nasal polyposis in susceptible individual considered a significant complication associated with high morbidity, as it profoundly impairs the patient's quality of life [7]. All of this not only increases the clinical challenges but also highlights the significant economic impact of the disease.

Allergic rhinitis presents a clear cost-effectiveness challenge, as persistent cases lead to increased direct medical expenses and indirect costs related to lost productivity. To manage these pressures, the role of allergen avoidance and patient education is paramount. Equipping patients with the knowledge to identify local triggers and implement environmental controls is a first-line, cost-effective strategy. This approach reduces the reliance on long-term pharmacotherapy and helps prevent the progression to more severe chronic conditions [6,8]. AR is strongly associated with a family history of atopic disease, particularly when multiple atopic conditions are present among first-degree relatives. According to the ARIA (Allergic Rhinitis and its Impact on Asthma) guidelines, AR is considered a major risk factor for the

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development of asthma. The relationship is reciprocal: approximately 40% of patients with AR have comorbid asthma, whereas up to 60-80% of asthmatics suffer from AR, illustrating the 'one airway, one disease' concept [7]. In addition to genetic susceptibility, environmental factors play an important role in the occurrence and expression of AR. Long-term epidemiological studies have shown that seasonal patterns of AR are influenced by climatic conditions, particularly ambient air temperature and aeroallergen exposure, although these associations vary according to geographical region [9]. Allergic diseases remain a major global public health challenge, contributing substantially to morbidity and reduced quality of life across all age groups. Global Burden of Disease estimates indicate that asthma and atopic dermatitis continue to affect hundreds of millions of people worldwide, highlighting the growing impact of allergic disorders and the need for effective prevention and management strategies [10]. Allergic rhinitis is among the most prevalent chronic inflammatory disorders worldwide and represents an important public health concern because of its adverse effects on quality of life, sleep, educational performance, occupational productivity, and healthcare utilization.

The epidemiology of AR is shaped by a complex interaction between genetic susceptibility, environmental exposures, climate, urbanization, and lifestyle factors, resulting in substantial geographic variation in disease prevalence and clinical patterns, as highlighted by the International Consensus Statement on Allergy and Rhinology (ICAR) and supported by recent evidence on environmental risk factors [11,12]. Therefore, local epidemiological data are essential to identify regional disease characteristics, evaluate healthcare burden, and guide appropriate preventive and management strategies. Despite the clinical significance of allergic rhinitis, epidemiological data in Libya remain limited and fragmented, with a notable lack of studies focusing on the western region of the country. This study was conducted to address this knowledge gap by determining the prevalence, demographic characteristics, and seasonal distribution of allergic rhinitis among patients attending the ENT outpatient clinic at Zawia Central Hospital. The findings provide baseline epidemiological data for western Libya and may support healthcare planning, resource allocation, and future research on allergic rhinitis in the region.

Materials and Methods

Study Design and Setting

This hospital-based retrospective descriptive cross-sectional study was conducted at the Ear, Nose, and Throat (ENT) outpatient clinic of Zawia Central Hospital, Libya. The study included patient records from a one-year period extending from 1 January 2025 to 31 December 2025.

Study Population and Sampling

A total enumeration sampling technique was used, including all eligible patient records from the ENT outpatient clinic during the study period. The study population comprised patients with a documented clinical diagnosis of allergic rhinitis (AR) confirmed by an ENT specialist. During the study period, 6,427 ENT outpatient visits were reviewed, of which 1,102 records met the inclusion criteria and were included in the analysis.

Inclusion and Exclusion Criteria

Inclusion criteria

All records of patients with a confirmed diagnosis of allergic rhinitis were included. No specific exclusion criteria were applied. However, records representing a follow-up visit for the same clinical episode were excluded to avoid duplication

Data Collection and Variables

Data were extracted from medical records using a structured data collection form. The collected variables included demographic characteristics (age, sex, and residence), associated diagnoses, and temporal variables including visit date, month, and season. For seasonal analysis, the year was divided into four seasons: winter (December–February), spring (March–May), summer (June–August), and autumn (September–November).

Outcome Measures

The primary outcome was the clinic-based prevalence of allergic rhinitis, calculated as the proportion of patients diagnosed with AR among the total number of ENT outpatient consultations during the study period. Secondary outcomes included the monthly and seasonal distribution of AR cases, demographic characteristics of affected patients, and identification of periods with increased clinical presentation.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics. Missing values were treated as missing data during analysis, and available cases were included for each variable. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. The chi-square test was used to assess seasonal variation. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Bioethics Committee of Libyan Medical Research Center, Zawia, Libya (approval reference: NBC:018.H.26.114). Permission to access and use patient records was obtained from Zawia Central Hospital

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through an official request letter from the Dean of the Faculty of Medicine. As this was a retrospective, record-based study involving no direct patient contact or intervention, written informed consent was not required. Patient confidentiality was maintained, with all data anonymized during extraction and no personal identifiers included in the final report.

Results

Overall Prevalence of Allergic Rhinitis

A total of 6427 patients attended the ENT outpatient department during the study period. Of these, 1102 were diagnosed with allergic rhinitis, corresponding to a prevalence of 17.1%.

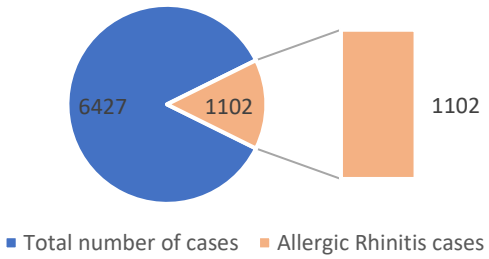

fig1. demonstrate overall prevalence of AR in Z.C.H.

Sociodemographic Characteristics

Among the 1,102 patients diagnosed with allergic rhinitis, 676 (61.3%) were females, and 426 (38.7%) were males. Age information was available for 1,072 patients. Among these, the largest proportion belonged to the 18–39-year age group (293, 27.3%), followed by the 40–59-year age group (287, 26.8%) and the 0–12-year age group (249, 23.2%). Patients aged 13–17 years accounted for 149 (13.9%), while those older than 60 years represented 94 (8.8%). Most patients resided in Zawia (919, 83.4%), while 29 (2.6%) were from outside the city. Residence information was unavailable for 154 (14.0%) patients.

Table 1. Sociodemographic characteristics of patients with allergic rhinitis (N = 1,102).

Characteristic	n	%
Sex (N = 1,102)		
Female	676	61.3
Male	426	38.7
Age group (n = 1,072*)		
0–12 years	249	23.2
13–17 years	149	13.9
18–39 years	293	27.3
40–59 years	287	26.8
≥60 years	94	8.8
Residence (N= 1,102)		
Zawia	919	83.4
Outside Zawia	29	2.6
Unknown	154	14

**Age information was available for 1,072 patients; age data were missing for 30 patients*

Monthly Distribution of Allergic Rhinitis Cases

Allergic rhinitis cases were recorded throughout the year. The highest monthly frequencies were observed in February (110, 10.0%), followed by September (n = 104, 9.4%) and October (n = 103, 9.3%). Conversely, the lowest presentation rate was recorded in December, which accounted for 6.3% (n = 69) of the sample, followed closely by June at 6.7% (n = 74). The remaining months maintained a steady representation, fluctuating between 7.4% and 9.1%. Monthly prevalence varied throughout the year, ranging from 13.4% in June to 25.1% in March.

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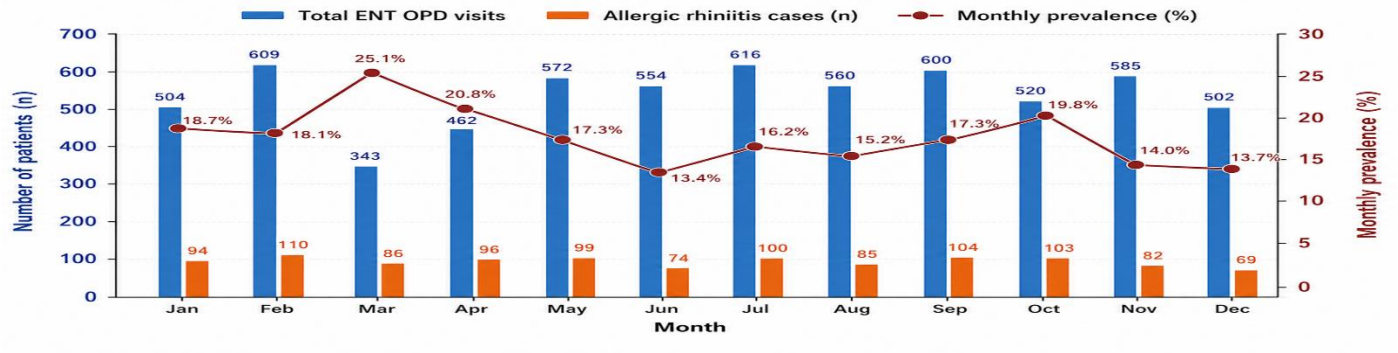

Fig.2. Monthly distribution and prevalence of allergic rhinitis among ENT outpatient attendees

Seasonal Distribution of Allergic Rhinitis Cases

Allergic rhinitis cases were distributed throughout all four seasons. Autumn recorded the highest number of cases (289, 26.2%), followed by spring (281, 25.5%), winter (273, 24.8%), and summer (259, 23.5%). No statistically significant difference was observed in the seasonal distribution of allergic rhinitis cases ($\chi^2 = 1.782$, $df = 3$, $p = 0.619$).

Table 2. Seasonal distribution of patients diagnosed with allergic rhinitis (N = 1,102).

Season	Frequency (n)	Percentage (%)
Winter	273	24.8
Spring	281	25.5
Summer	259	23.5
Autumn	289	26.2
Total	1,102	100.0

Analysis of seasonal distribution according to age groups showed no significant association between age and season of allergic rhinitis presentation (Pearson $\chi^2 = 11.434$, df = 12, p = 0.492). Similarly, correlation analysis demonstrated no significant relationship between age and seasonal distribution (Pearson's r = −0.034, p = 0.273).

Associated Clinical Diagnoses Among Patients with Allergic Rhinitis

Most patients with allergic rhinitis had no additional associated diagnosis (848, 77.0%). Among those with associated conditions, the most frequently recorded diagnoses were upper respiratory tract infection (44, 4.0%), Eustachian tube dysfunction (36, 3.3%), tonsillitis (26, 2.4%), and impacted wax (21, 1.9%). Other commonly observed conditions included acute otitis media, decreased hearing, chronic pharyngitis, rhinosinusitis, and temporomandibular joint disorder, while adenoid hypertrophy and nasal polyposis were infrequently recorded.

Table 3. Associated diagnoses and clinical conditions among patients with allergic rhinitis:

Associated clinical diagnosis	Frequency (n)	Percentage (%)
No associated diagnosis	848	77.0
Upper respiratory tract infection (URTI)	44	4.0
Eustachian tube dysfunction (ETD)	36	3.3
Tonsillitis	26	2.4
Impacted cerumen	21	1.9
Acute otitis media (AOM)	17	1.5
Decreased hearing	17	1.5
Chronic pharyngitis	16	1.5
Rhinosinusitis	14	1.3
Epistaxis	13	1.2
Temporomandibular joint disorder (TMJ)	13	1.2
Adenoid hypertrophy	4	0.4
Nasal polyposis	2	0.2
Other diagnoses*	30	2.7

**Other diagnoses include dizziness, headache, otitis externa, vertigo, deviated nasal septum, tinnitus, gastroesophageal reflux disease, and laryngitis.*

Discussion

This study provides the first comprehensive assessment of the prevalence and demographic characteristics of allergic rhinitis (AR) among patients attending the ENT outpatient clinic at Zawia Central Hospital, western Libya. During the one-year study period, AR accounted for 17.1% of all ENT outpatient visits (Fig. 1), indicating that approximately one out of every

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six patients attending the clinic was diagnosed with AR. The condition predominantly affected females and young to middle-aged adults, with the highest proportion observed among individuals aged 18–39 years. Furthermore, AR was encountered throughout the year without significant seasonal variation. These findings highlight the substantial contribution of AR to ENT service utilization and provide valuable baseline information regarding its clinical burden in western Libya, where epidemiological data remain limited. The prevalence of allergic rhinitis observed in the present study (17.1%) is comparable to the median global prevalence of 18.1% reported in a recent systematic review, although reported estimates range from 1.0% to 54.5% because of differences in study populations, diagnostic criteria, and case definitions [10]. Consistent with these observations, a comprehensive review of regions outside Europe and North America documented prevalence estimates ranging from 2.9% to 54.1%, highlighting the substantial geographic diversity and increasing public health importance of allergic rhinitis worldwide [13]. This global burden is further illustrated by large population-based surveys from the Middle East, Latin America, and the Asia-Pacific region, which reported physician-diagnosed prevalence estimates of approximately 10%, 7%, and 9%, respectively [14–17].

Despite differences in prevalence across regions, these surveys consistently demonstrated that allergic rhinitis is characterized by troublesome nasal symptoms and is associated with impaired quality of life, sleep disturbances, reduced work or school productivity, and persistent treatment gaps, emphasizing the substantial clinical and societal burden of the disease [14–17]. The relatively higher prevalence observed in the current study is expected because our population consisted of patients attending a specialist ENT clinic, where individuals with nasal symptoms are more likely to be identified than in general community surveys. Comparison with hospital-based studies provides a more appropriate context for interpreting our findings. Previous investigations conducted in ENT and tertiary healthcare settings have reported variable AR prevalence rates. In Ghana, Appiah-Thompson and Amuquandoh reported AR among 10.0% of ENT patients attending a tertiary hospital [18]. Similarly, studies from Tanzania and Nigeria reported prevalence estimates of approximately 10.3% and 7.0%, respectively, among patients receiving ENT services [19,20]. In Pakistan, Zeeshan et al. reported allergic rhinitis in 13.2% of patients attending a tertiary ENT outpatient department, although differences in sampling methods and study populations limit direct comparison with the present findings [21].

A multicenter Indian study restricted to patients presenting with nasal symptoms reported an even higher prevalence (53.7%) using the Score for Allergic Rhinitis (SFAR) questionnaire, demonstrating the substantial effect of patient selection criteria on prevalence estimates [22]. Collectively, these findings indicate that AR prevalence varies according to the clinical setting and the characteristics of the population assessed, with symptom-based recruitment strategies identifying a higher proportion of affected individuals compared with studies including all ENT attendees. The findings of the present study are also consistent with available Libyan data. A recent study from Misurata, Libya, reported a predominance of allergic rhinitis among female patients and younger age groups, although direct comparison of prevalence estimates is limited by differences in study objectives and methodology [23]. Nevertheless, the similarity in demographic characteristics between the two Libyan studies supports the observation that AR represents an important ENT condition affecting predominantly young individuals in Libya. The age distribution observed in the present study is consistent with the recognized epidemiological pattern of AR. Patients aged 18–39 years represented the largest age group (27.3%), followed closely by those aged 40–59 years (26.8%), while older adults represented a smaller proportion of cases (Table 1).

The prevalence of AR typically increases from childhood through adolescence and young adulthood, after which a gradual decline may occur in older age groups [12]. Similar age distributions have been reported in Libya and other regional studies, although differences exist depending on the population studied and healthcare setting [19,24]. The predominance of AR among young and middle-aged adults is clinically important because this group represents a major component of the educationally and economically active population. Persistent symptoms in this age range may contribute to impaired sleep, reduced concentration, decreased productivity, and diminished quality of life, emphasizing the importance of early recognition and effective long-term management. Female patients constituted 61.3% of AR cases in the present study, demonstrating a female predominance (Table 1). Similar findings have been reported in Libya and Senegal, whereas studies from Tanzania and Nigeria have shown different sex distributions [19,20,24]. The variation between studies suggests that sex differences in hospital-based AR populations may be influenced by multiple factors, including biological susceptibility, healthcare-seeking behavior, cultural factors, and differences in exposure patterns. Therefore, the female predominance observed in this study should be interpreted within the context of the local healthcare environment rather than considered a universal epidemiological characteristic of AR.

In the present study, allergic rhinitis cases were observed throughout the year, with a relatively even distribution across seasons and no statistically significant seasonal variation (Fig.2). Although autumn showed the highest proportion of cases (26.2%), followed by spring (25.5%), the differences between seasons were not significant, suggesting that AR presentation in western Libya is not restricted to a specific period of the year (Table 2). This finding differs from several studies reporting marked seasonal patterns in AR occurrence. In Korea, a nationwide population-based study demonstrated clear seasonality of AR, with increased patient visits during autumn, and suggested that fluctuations in temperature and aeroallergen exposure, particularly pollen, contributed to these variations [25]. Similarly, in Kuwait, Behbehani et al. reported two seasonal peaks of AR presentation, mainly during September, October, and April–May, with a strong correlation between AR cases and outdoor pollen concentrations, particularly weed pollens [26]. Furthermore, an Indian ENT-based study demonstrated that seasonal variation was largely dependent on allergen type, with pollens showing higher activity during summer, while dust mites and dust-related allergens were more frequent during winter [27]. The absence of

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significant seasonal variation in our cohort may reflect differences in local environmental conditions, allergen exposure patterns, and the possible contribution of both seasonal and perennial allergens throughout the year.

In addition, the lack of allergen sensitization testing in the present study limits the ability to identify specific environmental triggers responsible for AR presentation. Future studies incorporating skin prick testing, specific IgE assessment, and environmental allergen monitoring are needed to better characterize the seasonal and allergen-related patterns of AR in Libya. Most patients in the present study (75.6%) had no documented associated ENT diagnosis, indicating that AR frequently presented as an isolated condition requiring specialist evaluation. Among patients with additional diagnoses, upper respiratory tract infection, Eustachian tube dysfunction, and tonsillitis were among the most commonly recorded conditions (Table 3). Previous studies have described associations between AR and other upper airway disorders, including otitis media, adenoid hypertrophy, chronic rhinosinusitis, and tonsillar disease [20,28]. The coexistence of allergic rhinitis with other airway inflammatory disorders supports the concept of the unified airway, which recognizes the close relationship between upper and lower respiratory tract inflammatory diseases [29]. Therefore, the identification of associated ENT conditions in patients with AR remains clinically relevant, as comprehensive evaluation may help optimize management and improve patient outcomes.

Strengths and recommendations

The present study provides important baseline epidemiological data on allergic rhinitis among patients attending an ENT outpatient clinic in western Libya. The inclusion of all diagnosed cases during a complete one-year period reduces the effect of short-term temporal variation and provides a comprehensive overview of AR patterns in routine specialist practice. Furthermore, when considered together with our previous school-based screening study in Zawia, the findings highlight the difference between healthcare-presenting disease burden and the potentially larger hidden community burden of allergic rhinitis. Based on these findings, several recommendations can be proposed. First, prospective community-based epidemiological studies using standardized diagnostic criteria and objective allergy assessment, including skin prick testing or serum-specific IgE measurement, are needed to determine the true prevalence of AR and identify the predominant allergen sensitization patterns in western Libya. Second, school-based screening programs should be considered as a strategy for early identification of children with allergic rhinitis and appropriate referral before complications and long-term effects on quality of life occur. Third, improving documentation systems within ENT services, including standardized recording of symptoms, severity, associated conditions, and treatment outcomes, would enhance future surveillance and facilitate better healthcare planning. Finally, increasing awareness among patients, parents, and healthcare providers regarding the chronic nature of allergic rhinitis and the importance of appropriate long-term management may help reduce the burden of undiagnosed and undertreated disease.

Limitations

The main limitation of this study is its retrospective design, which relied on routinely collected outpatient medical records. Incomplete documentation resulted in missing information for some variables and limited the availability of detailed clinical characteristics. In addition, this was a single-center study conducted in a specialist ENT setting, which may limit the generalizability of the findings to the wider Libyan population. The absence of allergen testing also prevented assessment of sensitization patterns and identification of the major environmental triggers associated with AR in this region. Future implementation of standardized data collection forms, electronic medical records, and regular training in clinical documentation may improve data quality and support future epidemiological research.

Conclusion

This study demonstrates that allergic rhinitis represents a substantial burden among patients attending ENT outpatient services in western Libya, accounting for 17.1% of all ENT consultations during the study period. The condition predominantly affected females and young to middle-aged adults and occurred throughout the year without significant seasonal variation. When considered alongside community-based screening findings from the same region [29], these results suggest that the burden of allergic rhinitis extends beyond patients seeking specialist care and may be underestimated when assessed solely through healthcare-based data. These findings emphasize the need for prospective population-based studies, improved allergen surveillance, and early detection strategies, including school-based screening initiatives, to better define the epidemiology and improve the management of allergic rhinitis in Libya.

Conflict of interest. Nil

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