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Rates of New Asthma Diagnosis in Patients with Allergic Rhinitis in Otorhinolaryngology Practice in the Eastern Black Sea Region

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Background: Allergic rhinitis (AR) is a common disease observed in otorhinolaryngology (ORL) practice. The aim of the study was to determine the rates of new asthma diagnosis in the patient population newly diagnosed with AR in otorhinolaryngology (ORL) practice in the Eastern Black Sea region.

Material/Methods: This study retrospectively evaluated the files of patients admitted to an ORL outpatient clinic in Rize, Turkey between April 2011 and June 2012 and who were diagnosed with AR for the first time upon detection of aero-allergen sensitization in the prick test. Within this patient group, the files of patients who were also diagnosed with asthma in the same time period were examined. The files of patients who had previously been diagnosed with or treated for AR and/or asthma and with nasal polyposis and lower respiratory tract disease were excluded from the study.

Results: There were 267 patients with a mean age of 37.5±14.9 (10–77 years) diagnosed with AR for the first time in the ORL outpatient clinic. The most common allergens were *Dermatophagoides pteronyssinus* (81.3% [217/267]), *D. farinae* (73.8% [197/267]), and grass mix (61.4% [164/267]). Of this patient group, 29.2% were diagnosed with asthma: 15% (40/267) with intermittent asthma, 13.9% (37/267) with mild persistent asthma, and 0.3% (1/267) with moderate persistent asthma.

Conclusions: A rate of 29.2% for new asthma diagnoses in the Eastern Black Sea region in patients diagnosed with AR for the first time indicates a need to examine asthma complaints in all patients newly diagnosed with AR in ORL practices.

MeSH Keywords: **Allergy and Immunology • Antigens, Dermatophagoides • Asthma • Otorhinolaryngologic Diseases • Rhinitis, Allergic, Seasonal**

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Background

Allergic rhinitis (AR) is the most commonly allergic disease. Its prevalence increases about 3.5% every 10 years, and AR affects 10–25% of the world's population [1,2].

AR, which is frequently encountered by ORL physicians, is a chronic inflammatory disease of the upper respiratory tracts, mainly the nasal mucosa. It is an immunoglobulin E (Ig E)-dependent disease characterized by concomitant paroxysmal sneezing, abundant aqueous nasal discharge, nasal blockage, and pruritus symptoms [3]. Like AR, asthma is a chronic inflammatory disease, but it mostly affects the lower respiratory tracts, where it is characterized by concomitant airway hyperreactivity resulting in paroxysmal dyspnea, wheezing, shortness of breath, and coughing [4].

Possible interactions between the lower and upper respiratory tracts have been suggested since the 1990s. Today, although the notion of "single airway disease" has gained importance due to the physiopathologic points, there are differences in the diagnosis and treatment of AR and asthma [5–7].

Asthma affects 4–11% of the overall world population. According to several studies, the rate of asthma in patients with rhinitis varies between 10% and 40%. However, chronic rhinitis symptoms are detected in patients with asthma at rates as high as 80% [8–10].

Turkey consists of regions with markedly different geographical features and climates. The prevalence of asthma detected by physicians in epidemiological studies conducted in Turkey varies between 3.1 and 9.4% [11]. Although studies examining the prevalence of AR and asthma in the Western and Middle Black Sea regions exist, no epidemiological study reporting the rate of asthma detected in patients with AR in the Eastern Black Sea region in Turkey is available. The Eastern Black Sea region in northeast Turkey has a rainy and humid climate, which provides a suitable environment for the proliferation of house dust mites and molds.

The association of AR with asthma is characterized by severe clinical course and increased treatment costs [12]. Limited data is available with respect to the cost of asthma in Turkey. Cost increases as the severity of the disease advances. Although there are different reports of costs in centers around the world, yearly costs have been associated with frequent physician visits, hospitalization, severity of asthma, and school or work day loss [13]. In a study done in and around Malatya in the Eastern Anatolia region of Turkey by Hacıevliyagil et al., asthma is the fourth most common reason for hospitalization in the pulmonology service [14].

Because asthma symptoms appear at intervals and are not specific to this disease, physicians and patients may not be adequately concerned about them or may fail to recognize their severity. Therefore, diagnosis of asthma in some patients may be delayed [15].

Material and Methods

Participants and procedure

A retrospective evaluation was done of patients examined in the ORL outpatient clinic between April 2011 and June 2012 and diagnosed with AR for the first time (according to ARIA 2008 guideline criteria) and who displayed positive aeroallergen sensitization in the prick test. Within this patient group, those who were directed to a pulmonology outpatient clinic due to lower respiratory tract complaints and who were subsequently diagnosed with asthma (according to the Global Initiative for Asthma [GINA 2010] criteria) were retrospectively detected. Patients who had been previously diagnosed with and treated for AR and/or asthma were excluded from the study. The study protocol was approved by the Ethics Committee of our institution (identification number: 2015-19).

Skin prick test

An AR prick test was performed using a multi-prick test kit (ALMED, Lincoln INC) comprising a total of 48 allergens, including grass, tree, weed, mold, epidermal mix, and house dust mites (*D pteronyssinus*, and *D. farinae*).

A. Grass mix containing standardized Bermuda grass, rye grass, timothy, orchard grass, June grass, sweet vernal grass, meadow fescue, and red top.
B. Epidermal mix containing dog, cow, horse, goat, sheep epithelium, cat pelt, cotton lint, and mixed feathers.
C. Tree mix containing birch, olive tree, poplar, hazelnut, oak, elm, ash, alder, willow, beech, maple, linden, red mulberry, juniper, elderberry, and pine.
D. Weed mix containing mugwort, English plantain, lamb's quarter, yellow dock, ragweed (short), wall pellitory, dandelion, and quack grass.
E. Mold mix containing *Alternaria alternata*, *Aspergillus fumigatus*, *Mucorplumbeus*, mixed *Penicillium*, *Cladosporium* species, *Candida albicans*, *Rhizopus nigricans*, and *Botrytis cinerea.*

Severity classification of the patients diagnosed with asthma in the pulmonology outpatient clinic was performed before treatment according to 2010 GINA criteria. The classifications used were intermittent, mild persistent, moderate persistent, and severe persistent.

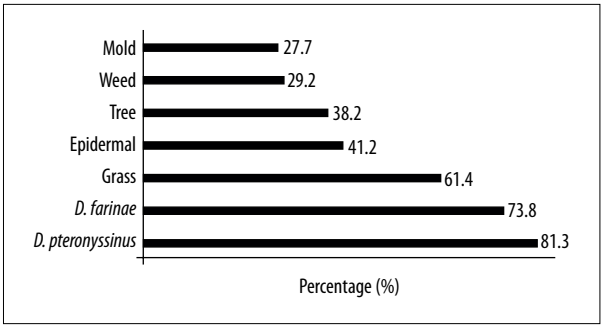

Figure 1. Distrubition of the prick-test positivity to the aeroallergens in the patients with allergic rhinitis (n=267).

In the spirometric examination (Spire ZAN 100, Germany), 15–20 minutes after 4 puffs of short-acting beta-2 agonist(salbutamol 400 micrograms), inhalation in the patients diagnosed with airway obstruction, >12% or >200 ml increase in FEV1 according to the basal values and 20% increase in PEF values indicated that airflow limitation was reversible, and asthma was diagnosed. Methacholine tests were done when asthma was suspected but PFTs were normal.

Statistical analyses

For statistical analyses, the SPSS 18.0 package program was used. The values obtained in the study are given as mean ±SD. Bivariate non-parametric data were evaluated using Pearson's chi-square test. The difference between the groups compared was accepted as significant for the values found as P<0.05.

Results

The study included 267 patients diagnosed with AR for the first time. Mean patient age was 37.5±14.9 (10–77 years); 19.9% (53/267) of the patients were male, and 80.1% (214/267) were female. According to the prick test results of the patients with AR, the highest positivity was detected against the house dust mite *D. pteronyssinus* (Mite 1) at 81.3%, followed by *D. farinae* (Mite 2) at 73.8% and grass mix at 61.4% (Figure 1).

In female patients with AR, sensitization to grasses, weeds, trees, molds, and epidermal allergens was significantly higher than in males (p1=0.007, p2=0.003, p3=0.008, p4=0.029, p5=0.006) (Table 1). There was no difference in sex for sensitization to house dust mites.

Of 267 patients who were diagnosed with AR for the first time during admission, asthma was detected in 15% (40/267) as intermittent, 13.9% (37/267) as mild persistent, and 0.3% (1/267) as moderate persistent (Table 2). There was no sex difference in the incidence rate of asthma in newly diagnosed AR patients (p>0.05); 28.3% (15/53) of the male patients and 29.4% (63/214) of the female patients were diagnosed with asthma. However, when males and females were examined separately for sensitization to allergens, *D. farinae* positivity and grass positivity were significantly higher in males with asthma than in males without asthma. (p=0.038, p=0.002) (Table 3). There was no such difference in females.

Table 1. Sensitization to grass, tree, weed, mold, and epidermal aeroallergens were found to be significantly higher in female patients with AR, when compared with males.

	Male		Female	
	n	%	n	%
Grass[1]				
Positive	24	45.3	140	**65.4**
Negative	29	54.7	74	34.6
Tree[2]				
Positive	11	20.8	91	**42.5**
Negative	42	79. 2	123	57.5
Mold[3]				
Positive	7	13.2	67	**31.3**
Negative	46	86.8	147	68.7
Weed[4]				
Positive	9	17	69	**32.2**
Negative	44	83	145	67.8
Epidermal[5]				
Positive	13	24.5	97	**45.3**
Negative	40	75.5	117	88.2

[1] P=0.007; [2] P=0.003; [3] P=0.008; [4] P=0.029; [5] P=0.006.

Table 2. Distribution of asthma according to gender and severity.

	Male		Female		Total	
	n	%	n	%	n	%
Asthma negative	38	71.7	151	70.6	189	70.8
Intermittent	6	**11.3**	34	**15.9**	40	**15.0**
Mild persistent	9	**17.0**	28	**13.1**	37	**13.9**
Modarete persistent	0	0.0	1	**0.5**	1	**0.3**
Asthma positive	15	**28.3**	63	**29.4**	78	**29.2**

Table 3. Distribution of *D. farinae* and Grass positivity according to gender and asthma condition.

	D. farinae		Grass		Total
	Positive %	Negative %	Positive %	Negative %	n
Male					
Asthma +	**93.3**[1]	6.7	**80.0**[2]	20.0	15
Asthma –	65.8	34.2	31.6	68.4	38
Female					
Asthma +	76.2	23.8	63.5	36.5	63
Asthma –	72.8	27.2	66.2	33.8	151

[1] p=0.038; [2] p=0.002.

Discussion

We detected asthma in 29.2% of patients diagnosed with AR for the first time at an otorhinolaryngology (ORL) outpatient clinic in the Eastern Black Sea region. The association of asthma with AR is well known and it is also well known that AR is a risk factor for asthma [6,7,16]. It has been reported that 76% of adult asthma patients with AR had rhinitis before the asthma developed [17]. There is evidence showing that AR significantly affects the clinical course of asthma [16]. In many allergic rhinitis patients, small airway diseases, bronchial hyperreactivity (BHR), and allergic inflammation markers in the lower respiratory tracts may be detected before asthma develops [18,19]. Various pathophysiological mechanisms have also been suggested in the development of asthma in AR patients and in patients with upper-lower respiratory tract association, including systemic inflammatory response based on bone marrow, adverse effects on the lower respiratory tract dependent on mouth-breathing, naso-bronchial reflex, transient bronchoconstriction secondary to irritant stimulation of nose, and flow of upper respiratory tract secretions to the lower respiratory tract [20,21].

In a survey study comprising 14 provinces, published by the Turkish Thorax Society in 2009, the prevalence of asthma in a study population of Turkish adults was found to be 7.1% in males and 9% in females. Although many studies have reported rates of AR and asthma association, most of these studies did not examine initiation and association periods of AR and asthma. No studies have been done in the Eastern Black Sea region that the rates of newly diagnosed asthma patients concomitantly with a newly diagnosed AR patient population. Such a study would offer an opportunity to evaluate the rates of asthma observed in the AR patient population over time (a rate that is expected to increase) and will provide a basis for prospective cohort studies.

Previous studies have found that the most important allergen source causing asthma is the house dust mite, and that mite intensity in house dust is directly related to sensitization in asthma and to the control of the disease [22–24]. The presence of 500 or more mites in 1 gram of house dust has been detected as a great risk for the development of asthma in a person previously sensitized [25,26].

Likewise, our study found that the highest allergen sensitization in both male and female asthma patients was against house dust mites. Sensitization to house *D. farinae* was more prevalent in male patients with asthma than in females.

Turkey consists of regions with markedly different geographical features and climates. The Eastern Black Sea region in the northeast has a rainy, humid climate, which provides a suitable environment for the proliferation of house dust mites and molds. This could explain the high rates of newly diagnosed

asthma in the patient population diagnosed with AR for the first time. The socio-cultural and economic levels of the patients may lead to disregard of the disease or a decrease in detection of the severity of the symptoms [15].

Optimal treatment of rhinitis and protection from indoor aeroallergens, particularly mites, may be effective in preventing the development of asthma. In a study of pediatric patients by Ferreira et al., a direct connection was found between the presence of nasal symptoms of AR and failure to bring asthma under control [27].

In the Eastern Black Sea region, where the climate is often humid, the highest aeroallergen sensitization was detected against house dust mites in both AR patients and asthma patients with AR. In this regard, early investigation and diagnosis of asthma in AR patients living in this region is more critical than in patients living in dry climates.

Moreover, pulmonologists need to detect signs of bronchial involvement early, with repeated evaluations of the lower respiratory tracts of patients with rhinitis admitted to ORL outpatient clinics, and by making this evaluation part of the clinical routine.

Conclusions

The detection of asthma in almost a third of the patients newly diagnosed with AR underscores the need to systematically examine these patients for asthma complaints. ORL physicians should examine AR patients for asthma upon first diagnosis and refer them for examination by a pulmonologist if necessary. This is especially important for patients living in regions with humid climates and with high sensitization to house dust mites. Early diagnosis of asthma in this patient group will significantly increase the efficacy of the treatment and greatly decrease treatment costs.

Conflict of interest

The authors declare that they have no conflicts of interest.

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