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Rhinosinusitis Predispose Asthmatic Patients to Severe Bronchial AsthmaAhad Aazami¹, Afshan Sharghi², Mohsen Ghofrani³, Hassan Anari⁴, and Elham Habibzadeh⁵¹ Department of Internal Medicine, Ardabil University of Medical Sciences, Ardabil, Iran² Department of Community Medicine, Ardabil University of Medical Sciences, Ardabil, Iran³ Private Clinic (Radiology), California, USA⁴ Department of Radiology, Ardabil University of Medical Sciences, Ardabil, Iran⁵ Medical School, Ardabil University of Medical Sciences, Ardabil, Iran

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ABSTRACT

In this study, we evaluated the relationship between rhinosinusitis to the severity of asthma in asthmatic patients.

This cross-sectional study was conducted on 90 patients with asthma referring to Imam Khomeini Hospital in Ardabil city. Asthma control stepping method was used for staging of asthma severity. Patients' clinical signs and paraclinical findings were individually evaluated and compared with particular attention to the presence or absence of rhinosinusitis. Chi square and t-test were used to analyze the data in SPSS15 software.

Rhinosinusitis was found in 66 (73%) of the 90 patients. The Forced Expiratory Volume in 1 second (FEV1) was significantly lower in the patients who also had rhinosinusitis ($P=0.002$). Comparing severity of asthma, most of the patients with rhinosinusitis were in stage3 (42.4%) but most of the patients without rhinosinusitis were in stage1 (41.6%) ($p=0.002$).

The results of this study confirm the correlation between asthma severity and rhinosinusitis in asthmatic patients. Therefore, in diagnosing asthma in patients, the possibility of the rhinosinusitis should be determined and treated.

Key words: Asthma; Correlation; Rhinosinusitis; Severity**INTRODUCTION**

Asthma is a chronic inflammatory disease of the bronchial airways, which physiologically appears as diffuse narrowing of airways, and clinically as periodical attacks of dyspnea, cough and wheezing.¹

The prevalence of asthma is increasing, especially in the young and developing countries, and it is estimated that by 2020, 10 million people will die from asthma, 90% of whom are living in developing countries.²

According to a world-wide report on asthma published in 2003, the prevalence of asthma in Iran is estimated to be about 5.5 percent.³ Allergenic particles, pharmacologic stimulators, environmental pollution, occupational factors, infections, exercise, and psychological stress are stimulators that result in an

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acute asthma attack.¹ In addition, allergic rhinitis and sinusitis are recurrently related to asthma attacks,⁴ 25% of patients afflicted by chronic rhinosinusitis have asthma, and 70% of asthmatics have concomitant sinusitis.⁵

There is some evidence regarding the relationship between rhinosinusitis and asthma, but it has not been clear whether rhinosinusitis is a directly triggering or underlying factor for asthma,⁶ or else these are different manifestations of the same pathological process.⁷ Evidence shows the role of rhinosinusitis in triggering an asthma attack and the observation that remission of asthma symptoms follows medical or surgical treatment of rhinosinusitis.⁸⁻¹⁰ Besides, patients with allergic rhinitis demonstrate a high prevalence of asthma compared to the normal population in a 20-years follow-up.¹¹

In this study, we evaluated the relationship between rhinosinusitis to the severity of asthma in asthmatic patients.

PATIENTS AND METHODS

This cross-sectional study was conducted on patients in Imam Khomeini Hospital, Ardabil city from November 2007 to May 2008. Asthma was diagnosed in these patients by spirometry, with and without bronchodilator. Paranasal sinus radiographs were used to diagnose rhinosinusitis. Data which were collected from the hospital were divided into three categories, which was documented in each patient's questionnaire:

1. Demographic data including age and gender, allergic history, asthma history, history of using anti-asthmatic medication and history of the number of hospital admission times for treatment of asthma

2. Asthma and rhinosinusitis clinical signs and symptoms including respiratory distress, cyanosis and pulsus paradoxus.

3. Paraclinical results from chest radiography, paranasal sinus radiograph and spirometry.

To determine asthma severity in each patient, the asthma control staging method was used. According to this, as shown in table 1, severity of asthma in patients depended on the number of times of signs (coughing, dyspnea, wheezing) occurring during one day or night, week or month or based on the amount of FEV1 (Forced Expiratory Volume in 1 second). Patients were divided into four stages: mild intermittent, mild persistent, moderate persistent, and severe persistent.^{1,12}

According to these groupings, patients who showed disease signs twice in one week or two nights in a month had mild asthma and were grouped as stage 1 or 2. Patients who showed it daily or for more than one night per week had moderate asthma and were grouped as stage 3. And at the end, patients who showed the signs everyday continuously and all over nights had severe asthma were grouped as stage 4. Also according to the amount of FEV1, patients who their the FEV1 was about 80% or more had mild asthma (first and second stage), if it was between 60% and 80%, they had moderate asthma (third stage) and if it was less than 60%, they had severe asthma (fourth stage).

All radiographs of patients were read and reported by a single radiologist conforming to the blind method of assessment.

After collecting the data and staging the asthma severity, patients clinical signs and paraclinical results were individually evaluated and compared based on the presence or absence of rhinosinusitis. Chi square and t-test were used to analyze the data in SPSS15 software.

RESULTS

Ninety patients with bronchial asthma were included in the study. The patients' mean age was 47.9 ±13.6, half being male.

Characteristics of patients without rhinosinusitis were as under:

Twenty-four patients (27%) had bronchial asthma without rhinosinusitis, 15 of them (62%) were female, with a mean age of 50 + 9.13. On chest radiograph, 9 patients (37.5%) showed lung hyperinflation, and 1 patient (4%) showed cardiomegaly.

The average of FEV1 in these patients was 83.1%±14 %, therefore regarding this average they were in the first or second stage (or mild asthma). Among them 17 patients (70.8%) had about 80 % FEV1 or more, amount of FEV1 for 6 patients (25%) was about 60 % to 80%, 1 patient (4.1%) had FEV1 of about 60 % or less.

Twenty-two patients (91.7%) used anti-asthmatic medications, 21 of them used beta-adrenergics, twelve patients used anti-cholinergic, and four used inhalational steroids. None of the patients without

Rhinosinusitis used neither oral nor inhalational steroids. These patients had an average of 12.4 + 10.5 years of asthma history, and only 20% of them reported

Rhinosinusitis and the Severity of Asthma

being admitted to a hospital for treatment of asthma. Characteristics of patients with rhinosinusitis were as:

Based on clinical signs and radiographic findings of the sinuses, 66 out of 90 patients (73%) had concomitant rhinosinusitis. The mean age of these patients was 47+13.4 years, and 45% of them were male. The most common clinical symptoms which the patients reported were: nasal congestion in 26 patients (39.4%), facial pain and pressure in 22 patients (33.3%), postnasal drip in 20 patients (30.3%), recurrent flu symptoms in 12 patients (18.1%), recurrent sneezing in 10 patients (15.2%), nasal drip in 9 patients (13.6%), nasal polyp in 4 patients (6.1%), and nasal itching in 2 patients (3%). A total of 27 patients (41%) simultaneously had two or fewer signs and 39 patients (59%) had more than 2 clinical signs.

When these patients were referred to the hospital, 23 patients (34.8%) had dyspnea, 3 patients (4.5%) had cyanosis, and 2 patients (3%) had pulsus paradoxus.

All 66 patients had positive findings on the paranasal sinus radiographs. In terms of sinus disease, 48 patients (72.7%) had bilateral maxillary sinus disease, 14 patients (21.3%) unilateral maxillary sinus disease, 15 patients (22.7%) bilateral frontal sinus disease, 6 patients (9.1%) unilateral frontal sinus disease, and 1 patient (1.5%) had ethmoid sinus disease. Other reported findings on the paranasal sinus radiographs were as follows: conchal edema in 4 patients (6.1%), nasal polyp in 3 patients (4.5%), and mucosal retention cyst and septal deviation each in 2 patients.

On chest radiographs, 30 patients (45.5%) had lung hyperinflation, 1 patient had cardiomegaly, and 1 patient had evidence of pulmonary hypertension.

The average of FEV1 in these patients was 70.5% ±17.3 % ,thus regarding this average they were in the third stage (or moderate asthma) .Among them 22 patients (33.3%) had about 80% FEV1 or more , amount of FEV1 for 30 patients (45%) was about 60% to 80% and 14 patients (21.2%) had FEV1 about 60% or less. Among the above 66 patients, 57 cases (86.4%) used anti-asthmatic medications, of which 54 patients (81.8%) used beta-adrenergics, 38 (57.6%) used anticholinergics, 24 (36.4%) used inhalational steroids, 7 (10.6%) used periodic oral steroids, 10 (15.2%) had a history of steroid injection during an asthma attack, and 11 (16.7%) used other medications such as theophylline. The average history of asthma in these patients was 11.4 + 7.51 years, and 54.5 % of patients had a history of hospital admission.

Comparison of allergic history in patients:

Among 66 asthmatic patients with rhinosinusitis, 39 (59.1%) had allergy history and among 24 patients without rhinosinusitis, 10 patients (41.7%) had it .There was not a significant difference between both groups (p = 0.1).

Comparison of asthma severity in two groups:

Classification of the asthma severity according to clinical signs and FEV1 in both groups is being shown (Table 2). Among 24 patients of asthma without rhinosinusitis, 17 subjects (70.8%) were in stage 1 and 2 (mild asthma), while only 22 patients (33.3 %) of 66 patients afflicted by asthma with rhinosinusitis were in first and second stage.

Table 1. Classification of asthma severity based on clinical features or PEFR or FEV1.

	Symptoms*		PEFR or FEV1 (PEFR Variability)
	Day	Night	
Step 1: mild intermittent	≤2days/Week	≤2nights/month	≥80% (<20%)
Step 2:mild persistent	≤2days/Week But <1per Day	≤2nights/month	≥80% (20-30%)
Step 3:moderate persistent	Daily	>1night/week	>60% -<80% (>30%)
Step 4: Severe Persistent	Continual	Frequent	≤60% (>30%)

PEFR: Peak Expiratory Flow Rate; FEV1: Forced Expiratory Volume in 1 s.

*Symptoms include: cough, dyspnea, wheezing

Source: Modified from National Asthma Education and Preventive Program

Table 2. Staging asthma severity in patients with and without rhinosinusitis.

Stage of Asthma	Based on clinical symptoms		Based on spirometry results	
	Patients without rhinosinusitis	Patients with rhinosinusitis	Patients without rhinosinusitis	Patients with rhinosinusitis
Stage 1: mild intermittent FEV1 \geq 80%	10 (41.6%)	9 (13.6%)	17 (70.8%)	22 (33.3%)
Stage 2: mild persistent FEV1 \geq 80%	7 (29.1%)	15 (22.7%)		
Stage 3: moderate persistent 60%<FEV1 <80%	6 (25%)	28 (42.4%)	6 (25%)	30 (45.5%)
Stage 4: severe persistent FEV1 \leq 60%	1 (4.1%)	14 (21.2%)	1 (4.1%)	14 (21.2%)

FEV1: Forced Expiratory Volume in 1 s.

Also in patients without rhinosinusitis, 6 patients (25%) had moderate asthma and one patient had severe asthma; while patients who suffered from asthma with rhinosinusitis, 30 patients (45.5%) had moderate asthma and 14 (21.2 %) had severe asthma. The difference statistically was significant ($p < 0.05$). In addition, in staging asthma severity based on the presence of cough, dyspnea or wheezing during the day or night, 63.6% of asthmatics with rhinosinusitis (as opposed to the 29.2% without rhinosinusitis) were allocated in the moderate or severe asthma groups, which was a statistically significant finding ($P=0.01$).

DISCUSSION

In this study, 73% of patients with asthma had rhinosinusitis simultaneously, nasal congestion was the most common symptom among them, and most patients had maxillary sinuses affected the most with few where the frontal sinuses were affected. In the study by Talib (2002) in India, conducted on 50 asthmatics, 70% of patients also had rhinosinusitis, and the most common symptoms and most common afflicted sinus were similar to our study. Other radiographic findings of our study were conchal edema (6.1%), nasal polyp (4.5%), and mucosal retention cyst and septal deviation (3%), and in comparison to the study by Talib was less prevalent. It can be due to less accuracy of radiographs comparing to CT scan in diagnosing the above findings.⁵

In terms of medication use, the most commonly used medications in the two groups (in decreasing order) were beta-adrenergics, anti-cholinergics and inhalational steroids. The use of oral and intravenous steroid was only seen in asthmatics with concomitant rhinosinusitis. In terms of hospital admission, 20% of patients with simple asthma and 54.5% of patients with asthma and rhinosinusitis gave such history. In addition, the signs of severe disease such as cyanosis and pulsus paradoxus were only seen in patients whom also had rhinosinusitis. Overall, these signs indicate less strict control of asthma in patients with concomitant rhinosinusitis.

According to conclusions by Dixon Anne et al,⁴ allergic rhinitis and rhinosinusitis correlate with many severe symptoms in asthma, and without strict control will lead to more severe asthma attacks.^{13,14} In the study by Ragab et al,⁸ there was a decrease in asthma signs and symptoms after treating chronic rhinosinusitis in asthmatic patients.

In the current study, asthmatics with rhinosinusitis showed a lower FEV1 compared to those with asthma but without rhinosinusitis (83.3% compared to 70.5%, respectively), which is in contrast with the findings of the Dixon Annes study.

In the Dixons study, the groups under study patients were specific with limited and similar selection, such as groups being treated with low-dose theophylline and those who had received the flu vaccine. But in our study, the asthmatic patients of Imam did not have any specific criteria. In the Dixon Anne study, the FEV1 in

Rhinosinusitis and the Severity of Asthma

patients with simple bronchial asthma was not significantly different from those with rhinosinusitis, but FEV1 improvement was seen after chronic rhinosinusitis treatment in the Ragab study and the Vigac Davor study.^{8, 10}

In our study, 14% of asthmatics with rhinosinusitis were in the severe stage, compared to only 4.2% of patients with simple asthma who were in this stage, which may prove less severity of asthma in patients without rhinosinusitis. The study by Durson et al also showed that 77.5% of asthmatics with rhinosinusitis were in the severe and moderate stages of asthma.¹⁵

In conclusion the results of this study confirm the correlation between asthma severity and rhinosinusitis in asthmatic patients. Therefore, in the case of diagnosing asthma in patients, the possibility of the rhinosinusitis should be determined and treated. In addition, the present cross-sectional study only shows the correlation between severity of asthma and existence of rhinosinusitis in asthmatic patients, but for distinguishing cause and effect relationship between asthma severity and rhinosinusitis, it is better to plan and do longitudinal studies such as a case-control or a cohort study. Also, because of high cost and high radiation dose of CT, we used plain radiography of the sinuses to diagnose rhinosinusitis, but CT scanning, which has a higher accuracy, would be better for diagnostic and therapeutic purposes.

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