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Research Article

Assessment Status Of The Seroconversion Of Anti-Aspergillus Immunoglobulin G Sera Antibody Among Chronic Persistent Asthma In Allergic Condition And Evaluates The Severe Asthma With Fungal Sensitization (SAFS)

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Abstract

Background: Aspergillus is one of the most common types of fungi in the environment and can cause Chronic Pulmonary Aspergillus (CPA). Severe Asthma with Fungal Sensitization (SAFS) is one of the clinical manifestations of aspergillosis and CPA.

The aim of the study assessed the seroconversion of Anti– *Aspergillus* immunoglobulin G antibody among allergic chronic persistent asthma and evaluated the frequency of the SAFS.

Material&Methods: Allergic asthmatic patients were enrolled in the study. *Aspergillus* Antibodies in serum and Immediate Skin Prick Test (SPT) were performed as based on the designed study protocol.

Results: A total 56 allergic chronic persistent asthma completed the protocol of the study. The mean age was 36.4±12.2 SD years.The sex differences were 52% males and 48% females.The meaning of *Aspergillu*s antibodies in serum recorded 48.9±126.9 SD. The seroconversion rate of *Aspergillu*s antibody in serum study was 82%. The rate of the SAFS frequency was diagnosed 18% among allergic asthmatic patients.

Discussion: It suggested the high frequency of seroconversion of *Aspergillus* antibody among the allergic chronic persistent asthma. However, our findings disclosed that the clinical features of aspergillosis infection such as CPA and SAFE should be considered as a causal factor in exacerbation, prognoses, and bronchial asthma management.

Keywords: Aspergillus, Aspergillosis, Allergic Asthma, Atopy, Severe Asthma with Fungal Sensitisation,

Introduction

Aspergillus fumigatus (A.Fumigatus*)* is identified as a filamentous fungus, opportunistic infection, and relative resistance to azole.Characteristic features of the fungus have been predisposed to widespread distribution in the environment. Human interaction with *Aspergillus* gave rise to permanent inhalation, and to be colonized as chronic saprophytic within the airways[1]. However, it is considered as a causal risk factor among patients with immunocompromised conditions such as long-term using antibiotic and corticosteroid, a chronic respiratory disease with obstructive pattern and impaired clearance of respiratory airway tract [2].

Asthma is a chronic obstructive inflammatory disease with bronchial hyperresponsiveness and associated with the allergic phenotype. Allergic asthma is an IgE-mediated and one of the subtypes of atopic diseases,[3]. Moreover, both asthmatic and atopic patients are susceptible to aspergillosis[4,5],

Chronic Pulmonary Aspergillosis (CPA) is a term refers to residence *Aspergillus* species within the damaged lung. The reliable diagnosis of CPA is based on the assay of seroconversion of *Aspergillus* IgG antibody in serum[6]. The CPA has a hidden manner progression with 5-year survival. It is less than 50% [7]. Its clinical manifestations have a direct relationship to the integrity of an immunity host, and background risked factors.

The clinical features of aspergillosis in atopic patients consist of Severe

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Asthma Associated with Fungal Sensitivity (SAFS), Allergic BronchoPulmonary Aspergillosis (ABPA), and IgE-mediated *Aspergillus*-Induced Asthma (AIA) [8].However, Aspergillosis manifestations among non-atopic patients include hypersensitivity pneumonitis, Aspergilloma, and CPA.The estimated rate of SAFS is 3%[9]. 5-20% of all bronchial asthma disease may be involved to SAFS (6.5 millions) in the world [10].

The aim of the study assessed the seroconversion of Anti–*Aspergillus* immunoglobulin G antibody among allergic chronic persistent asthma and evaluated the frequency of Severe Asthma with Fungal Sensitization (SAFS).

Material & Methods

The study was a cross-sectional. It finalized in Shahid Beheshti University of Medical Sciences (SBUMS), Tehran-Iran, Since 2015.

The sample study was recruited among chronic persistent asthmatic patients who were coming from visiting the chest clinic. Foregoing to the beginning of the study, consent was obtained from all the participants. The allergic state is defined with Total Immunoglobulin E (TIgE) concentration over than 200 Iu/ml in serum. Diagnosis of chronic persistent asthma was based on the American Thoracic Society (ATS) guideline instruction [11].

The severity of asthma was based on the World Health Organization (WHO) criteria. It consisted of using high-dose inhaled corticosteroids plus requiring the second controller for preventing to progress in uncontrolled condition or remain uncontrolled despite this protocol [12]. It was applied in the sample study by a self-report questionnaire.

Exclusion scale encompassed non-allergic chronic persistent asthma, lack of interest and non-compliance with research criteria.

The definition of SAFA comprised an extreme degree of asthma disease, TIgE up to1000KU/L in serum and antifungal IgE at least 0.4Ku/L or positive Immediate Skin Prick Test (SPT) to Aspergillus antigen 8.

In the next step, assay of Aspergillus antibody in serum was measured by the commercial kit. The *Aspergillus* extract was made Greer, USA. Allergic sensitization was evaluated using Aspergillus antigen SPT. It was applied to all subjects with positive seroconversion Aspergillus antibody. The antigen was injected into the subcutaneous skin with the control test on the forearm surface. The result of the test was accepted as Positive if the skin reaction was over than three mm larger than the control [13]. Positive and negative controls were histamine (1: 1000) and glycerol, respectively.

The statistical program was SPSS, 20 ver. The frequency was recorded in the percent, and the meanings of the variable were recorded as Mean±SD. Normality was detected with the Kolmogorov-Smirnov test (P_{Age}=0.04,P_{IgE}=0.01).Comparing means were carried out with nonparametric tests, K-independent sample test (Kruskal-Wallis H Test). The P value was set at <0.05 throughout the study.

Results

A total 56 subjects completed the protocol of the study. They were allergic and chronic persistent asthma. The mean age of the sample was 36.4±12.2 SD years, ranged 20-67; Median=34 and Mode =43 years. The sex differences were 52% males and 48% females.The meaning of TIgE in serum was measured 399.7 ±132.9 Iu/ml, low to high levels 210-1000; Median=395 and Mode=500 Iu/ml. The meaning of *Aspergillus* antibody in serum was recorded 23.3±25.8 SD, set out between 1-90. Median and Mode were 8.8 and 2, respectively. The seroconversion rate of *Aspergillus* antibody in serum study was 82%. {Figure1} reveals the distribution of seroconversion of *Aspergillus* antibodies within different age classes.

The positive immediate SPT to *Aspergillus* antigen was recorded 18% (10) in our sample study. The frequency of SAFS was detected in 18% our sample study. The characteristics positive seroconversion *Aspergillus* antibodies subsets are displayed in [Table 1]. {Figure2} shows the distribution of SAFS patients within different age classes.

No significant differences were found between TIgE in SAFS and Non-SAFS subsets (P>0.05). The average mean of TIgE in the serum of SAFS subset (405.6) was higher than a Non-SAFS subset (398.5 Iu/ml).

Discussion

Marked seroconversion Aspergillus Ab detected in our study. The clinical course of bronchial asthma as chronic disease and the epidemiologic character of the *Aspergillus* fungus may be able to interpret as a noticeable outbreak of the seroprevalence antibodies based on the following findings.

Respiratory allergies (RAs) are worldwide diseases with a prevalence rate 20-30% of the population [14]. They are IgE–mediated diseases with response to the aeroallergens and fungus. The hallmark of clinical manifestation includes increased

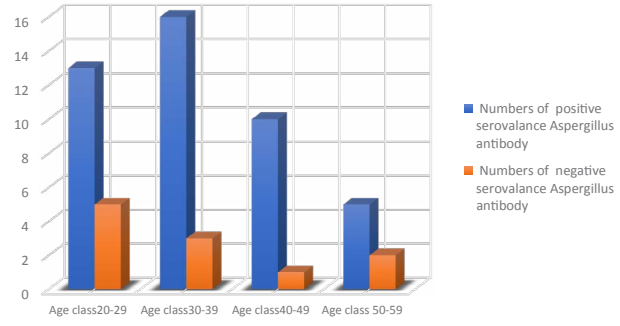

Figure 1: The distribution of seroconversion of *Aspergillus* antibodies within different age classes.

Table1: Charachteristics positive seroconversion of *Aspergillus* antibodies subsets; SAFS and Non-SAFS.

Subsets of positive seroconversion *Aspergillus* antibodies	Age Mean±SD years	Males/ Females	Status of seroconversion of *Aspergillus* antibody	Positive *Aspergillus* skin test	*Aspergillus* antibody Mean±SD	Immunoglobulin E Mean±SD iu/ml
SAFS	33.2±7.3	5/5	10	10	32.4±25.7	405.6±96.9
Non-SAFS	37±12	24/22	36	0	21.3± 25.7	398.4±140.3

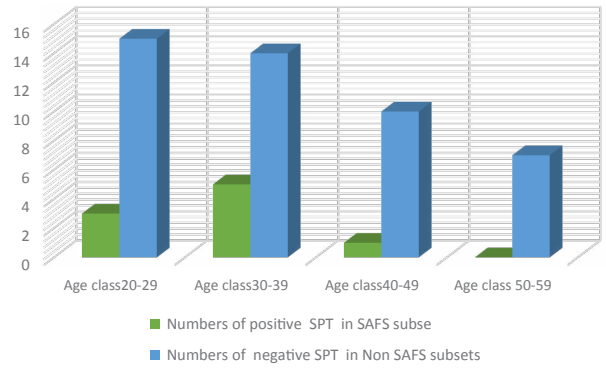

Figure2: The distribution of SAFS patients within different age classes.

total and specific immunoglobulin E in the serum at up to allergic setpoint. In addition, allergy is a potential risk factor for the development of asthma [15]. Our sample was selected from the recent population.

Asthma is a chronic inflammation of the airway disease with the obstructive pattern. Its prevalence has increased over recent years and involved up to 25 million people around the world,[16]. The allergic phenotype of asthma is one of the common clinical presentations[17]. Asthma disease and fungus infection have a unique mechanism for inducing allergy. They have stimulated type I allergic reaction (15).

The fungus is more common airborne allergens. Aspergillus has a more frequency among fungal genera [18]. It is one of the 23 listed allergens can induce RA and can be inhaled continually by human health.The respiratory system and airway tract are the main locations of *Aspergillus* colonization, and chronic inhalant -exposure leads to sensitization of the individual.

The clinical feature of *Aspergillus* colonization in the respiratory system is depended to various conditions. They are using a corticosteroid in the asthma management [19], the degree of severity obstruction pattern[20], abnormal clearance of mucus, underlying structural disease, immunity status, and atopy [21]. The chronic persistent asthma has a high susceptible condition of the characteristic features of Aspergillus colonization.

Our results showed 18% positive SPT to *Aspergillus* antigen within the allergic phenotype of chronic persistent asthma. The *Aspergillus* sensitization has wide-range variation between 16-38% of the population[22]. Hypersensitivity to *Aspergillus* antigen detected by immediate (SPT) and its frequency was reported 28% among asthmatic patients [23,24].

The SAFS has two definitive characters; both increased TIgE level and severity of airway obstruction.The presence of increased serum TIgE in our study may be anticipated to allergic asthma phenotype, *Aspergillus* colonization of the airways, respiratory allergy induced fungus, a CPA and an interaction between recent causal factors. Moreover, the mechanism of Aspergillus-induced diseases may be not associated with increased IgE and colonization. It can be done throughout the fungal protease activity[25].

The degrees of severity of airway obstruction in allergic asthma may be related to the following evidence. Allergic asthma is one of the subtypes of atopic diseases and atopy condition is considered a risk factor for inducing clinical severity among asthmatic patients [26]. However, *Aspergillus* exposed individuals have increased both in allergic diseases and a risk factor for atopic diseases [27]. It causes a reduction of pulmonary function and induced inflammation and severity of airway obstruction among exposed individuals [28] . The severities of asthma manifestations are also influenced by age and gender[16]. It was seen in females greater than males and older-age male[29]. The endpoint of the study had not an improvement with earlier evidence. SAFS subset dermographism was against it.

Opposition articles also suggest that the degree of severe clinical manifestations of allergic asthma is less than non-allergic asthma and also has a reverse association with degree of obstruction and atopy[30,31]. It can be concluded that the presence of a clinical feature of the airway intensity obstruction in asthmatic patients with a SAFS should be considered as an isolated cause of allergy.

In conclusion; It suggested the high frequency of seroconversion of Aspergillus antibody among the allergic chronic persistent asthma. However, our findings disclosed that the clinical features of aspergillosis infection such as CPA and SAFE should be considered as a causal factor in exacerbation, prognoses, and bronchial asthma management.

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Abbreviating Words

Status of Severe Asthma with Fungal Sensitization (SAFS)

Chronic Pulmonary Aspergillus (CPA)

Aspergillus fumigatus (*A.Fumigatus)*

Allergic BronchoPulmonary Aspergillosis (ABPA)

Total immunoglobulin E (TIgE)

Aspergillus-Induced Asthma (AIA)

Skin Prick Test (SPT)

Respiratory allergies (RAs)

Conflict of interests

The author has no conflicts of interest.

Author's contribution

The author has performed all the research phases of the current study including; conception, design, acquisition data, interpretation and analysis data, drafting the article and final approved

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