

IgE Abnormalities in Patients with Bronchial Asthma

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Abstract

Original Research Article

Introduction: Bronchial asthma is a medical condition that causes a deformity in the airway path of the lungs, causing them to swell and get narrow. The swelling produces excess mucus in the pathway, making it hard to breathe, and this results in coughing, short breath, and wheezing. This is often caused by allergic reaction to outside stimulants. The allergic reaction causes the body to produce Immunoglobulin E antibodies that help the immune system fight back against allergens, but excess production of IgE can lead to severe allergic reaction and respiratory difficulties. **Aim of the study:** The aim of the study was to observe the IgE levels of Bronchial Asthma patients. **Methods:** This was a prospective cross-sectional study was conducted in the Department of Medicine, Mainamoti Medical College Hospital, Cumilla, Bangladesh during the period from January 2020 to July 2020. Fifty-three (53) patients were selected maintain inclusion criteria. Proper written consents were taken from all the participants before starting data collection. A pre-designed questionnaire was used in patent data collection. All data were processed, analyzed and disseminated by MS Office and SPSS version as per needed. **Result:** The present study had 53 participants in total. 45.28% of the participants were aged between 41-60 years, and 32.08% were aged between 21-40 years. 34% were male and 66% were female, and the male: female ratio was 1:1.95. 49 participants were diagnosed with bronchial asthma while 4 did not have asthma. 30.19% had mild asthma with Mean±SD IgE of 464.000±57.10, 26.42% had moderate asthma and Mean±SD IgE of 695.410±82.09, and 35.85% had severe asthma with Mean±SD IgE of 1045.320±14.16 IU/ml. **Conclusion:** The study found that asthma can be different according to age, and older women have a higher prevalence of asthma, compared to older male population. IgE levels of above 100 IU/ml can be abnormal, and according to WHO guidelines, IgE levels of >150 can be considered as an asthma risk factor, but not all who have higher than 150 IU/ml IgE have asthma. IgE levels can be used to determine the severity of asthma in a patient. **Keywords:** Asthma, Bronchial, Respiratory, Allergic, IgE.

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INTRODUCTION

Asthma is a chronic disease of the lung and asthma attacks can occur anytime, and can be immediate delayed or dual in onset. Bronchial asthma is a medical condition that causes a deformity in the airway path of the lungs, causing them to swell and get narrow. The swelling produces excess mucus in the pathway, making it hard to breathe, and this results in coughing, short breath, and wheezing. Acute bronchial asthma is a chronic disease that interferes with the regular lifestyle of a person, and it affects 4 to 7% of

the global population.^[1] Bronchial asthma is more prevalent among children aging six-seven, and the prevalence ranges from 4-32% among children [1]. Even developed countries like USA and UK suffer greatly at the hands of this disease, as the US currently has the highest prevalence rate of bronchial asthma in the world [2]. Patients with bronchial asthma are unable to lead a healthy and normal life, constantly facing the complications of asthma like wheezing, coughing, tightness in chest, dyspnea, and in severe cases, asthma attacks and respiratory failures are also possible. The

development of asthma is greatly influenced by atopy. It is the single most important risk factor for the development of Asthma. Atopy is the tendency to produce excessive amount of IgE antibodies in response to allergens [3]. IgE is a type of antibody only found in mammals, and is produced by the body's immune system in response to a perceived threat. In 1968, the presence of IgE as a fifth immunoglobulin isotype was announced by the WHO International Reference Centre for Immunoglobulins [4]. IgE is generally present in plasma and has a half-life of about two days in serum [5]. Since the time of its discovery, IgE is considered as the most important biological target when treating allergy and asthma, while many investigators are researching ways to interfere with the production of IgE and its function in the immune system [6]. Although a significant success can be counted with the success of the anti-IgE monoclonal antibody (mAb) in the treatment of allergy and asthma, adverse reaction to the treatment are not rare, and the repeated therapy procedure becomes necessary for prolonged effectiveness, which comes with extremely high cost [7]. The general levels of IgE in the blood can be from 150 to 300 IU/ml, and anything above 1000 IU/ml is recognized as hyper IgE syndrome (HIES), a rare primary immunodeficiency disease that results in recurrent infections and connective tissue abnormalities [8]. HIES can lead to various abnormalities including coronary complications. The present study was conducted with the goal of observing IgE related abnormalities in Asthma patients.

OBJECTIVE

- To assess the IgE abnormalities in patients with Bronchial asthma.

METHODS

This was a prospective cross-sectional study was conducted in the Department of Medicine, Mainamoti Medical College Hospital, Cumilla, Bangladesh during the period from January 2020 to July 2020. Fifty-three (53) patients were selected maintain inclusion criteria. Proper written consents were taken from all the participants before starting data collection. A pre-designed questionnaire was used in patent data collection. All data were processed, analyzed and disseminated by MS Office and SPSS version as per needed. The study sample size was initially determined to be 80, but due to timing and funding constrains, the sample size was later adjusted to be 53. Serum IgE levels of all participants were measured, and recorded in a data sheet. Spirometry and PEF test was done to diagnose bronchial asthma among the participants. Informed consent was taken from each of the participants, and ethical approval was obtained from the Institutional Ethics Committee.

Inclusion Criteria

- Serum IgE levels of >120 IU/ml
- Participants older than 10 years

Exclusion Criteria

- Participants older than 80 years
- Serum IgE levels of \leq 120 IU/ml
- Participants unwilling to share personal information

RESULTS

The present study had 53 participants in total. 45.28% of the participants were aged between 41-60 years, and 32.08% were aged between 21-40 years. 34% were male and 66% were female, and the male:female ratio was 1:1.95. Forty-nine (49) participants were diagnosed with bronchial asthma while 4 did not have asthma. 30.19% had mild asthma with Mean \pm SD IgE of 464.000 \pm 57.10, 26.42% had moderate asthma and Mean \pm SD IgE of 695.410 \pm 82.09, and 35.85% had severe asthma with Mean \pm SD IgE of 1045.320 \pm 14.16 IU/ml

Table-1: Age distribution of the study patients (n=53)

Age group (years)	Frequency	Percentage (%)
\leq 20	3	5.66%
21-40	17	32.08%
41-60	24	45.28%
61-80	9	16.98%
Total	53	100

The 53 patients in the present study were divided into 4 different groups based on their age, and the age range of the patients were 10-80 years. Majority of the patients (45.28%) were between the age of 41-60 years, 32.08% were from the age group of 21-40 years, and 16.98% were aged between 61-80 years. Only 5.66% were aged 20 or less. The Mean \pm SD age of the participants was 45.5 \pm 15.658 years.

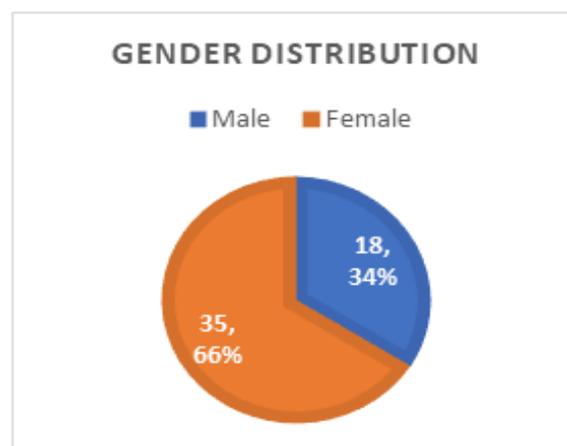


Figure 1: Gender distribution of study participants.

Among the participants, female predominance was observed, as almost 2/3rd were female, and only 34% were male. The male to female ratio was 1:1.95.

Table-2: Comparison of IgE between with or without bronchial asthma patients (n=53)

Variable	Bronchial asthma		p-value
	Present (n=49) Mean± SD	Absent (n=4) Mean± SD	
IgE	734.91±51.70	151.950±37.61	0.0324 ^s

p-value reached from Unpaired t-test, ns=not significant

Among the 53 patients, 49 had bronchial asthma, while 4 participants did not have bronchial asthma. The Mean± SD IgE levels in the bronchial asthma present participants was 734.91±51.70, and in

the bronchial asthma absent participants, the Mean± SD was 151.950±37.61. The difference between the mean IgE levels of the two groups was statistically significant.

Table 3: Mean IgE levels between different asthma group patients (n=53)

Asthma Group	Frequency	Percentage (%)	Mean± SD (IU/ml)
Normal	4	7.55%	151.950±37.61
Mild Asthma	16	30.19%	464.000±57.10
Moderate Asthma	14	26.42%	695.410±82.09
Severe Asthma	19	35.85%	1045.320±14.16

The participants were divided in 4 groups based on their level of asthma. 4 participants had above average IgE level and mean IgE of 151.950 IU/ml, but they did not have asthma. 30.19% had mild asthma with Mean±SD IgE of 464.000±57.10, 26.42% had moderate asthma and Mean±SD IgE of 695.410±82.09, and 35.85% had severe asthma with Mean±SD IgE of 1045.320±14.16 IU/ml

DISCUSSION

Asthma is a condition of the body in which the airways narrow and swell, and produce excess mucus that hampers breathing abilities. Bronchial asthma is a type of asthma that causes the airway to the lungs swell and contract. Bronchial asthma is primarily caused by smoking or secondhand smoking, and allergic reactions. Bronchial asthma is a serious lung condition that greatly affects the children and their developing immune system. As a chronic lung condition, asthma doesn't completely go away [9]. Asthma attacks are often triggered by allergic or immunological reactions. It has now been almost thirty years since IgE has been identified as a key factor in causing many hypersensitivity reactions like asthma allergy, food allergy, drug allergy, insect bite allergy and some other types of allergy [10, 11]. It has been found through research that IgE did not evolve to contribute to the pathology of different allergens, rather to protect the human body from parasitic infections like Helminth, which was once considered as a major threat to human survival [12-14]. But in the present medical study, the understanding of the role of IgE in allergic reactions has been a major breakthrough. This discovery has led us to discover many effective treatment methods for diseases. IgE antibodies are generally produced as a response to allergens entering the body [15]. But this protective response doesn't always happen as a response to environmental allergens, but in people with a genetic predisposition called Atopy, the body starts developing IgE antibodies when exposed to harmless allergens,

hence creating a severe allergic reaction from excess buildup of IgE antibodies [16]. Another key factor behind the rising trend of different allergic diseases is increased exposure to sensitizing allergens, as well as a reduced stimulation of the immune system during critical periods of development [17]. In the present study, we observed patients who had above average levels of IgE antibodies in their blood. The present study was conducted with 53 participants in total, who all had IgE levels of above 120 IU/ml. According to both spirometry and PEF test, among the 53 participants, 4 did not have bronchial asthma despite having higher than average IgE levels. While the remaining 49 participants were all diagnosed with bronchial asthma. Majority of the study participants were between the age of 41-60 years, while 32.08% were aged between 21-40 years. While 16.98% of the participants were older than 60 years, only 5.66% of the participants were 20 years or younger. Female predominance was observed among the study participants, which was similar to another study on the epidemiology of Bronchial Asthma, where male predominance was observed during puberty, and female predominance was observed during adulthood [18]. This suggests that women become more vulnerable to asthma during adulthood, which is a hypothesis supported by other studies as well [19, 20]. This, along with the age distribution of the participants in our study leads us to believe that asthma affects children and adult differently, as male predominance is observed during childhood, and female predominance is observed during adulthood [21]. The mean serum IgE level among the bronchial asthma patients was 734.91±51.70 IU/ml, and the mean among the non-asthma patients was 151.950±37.61 IU/ml, and the p-value between these two was 0.0324, which was statistically significant. The bronchial asthma patients were further divided into 3 categories based on the severity of asthma. Majority of the participants (35.85%) had severe asthma, and had a mean IgE level of

1045.320±14.16 IU/ml. 30.19% of the participants had mild asthma with serum IgE levels of 464±57.10 IU/ml, and 26.42% of the participants had moderate levels of asthma with a Mean± SD serum IgE level of 695.410±82.09 IU/ml. It was observed that IgE levels of above 500 IU/ml is dangerous, and IgE levels of above 1000 can be extremely dangerous and life threatening.

Limitations of The Study

The study was conducted in a single hospital with small sample size. So, the results may not represent the whole community.

CONCLUSION

The study found that asthma can be different according to age, and older women have a higher prevalence of asthma, compared to older male population. IgE levels of above 100 IU/ml can be abnormal, and according to WHO guidelines, IgE levels of >150 can be considered as an asthma risk factor, but not all who have higher than 150 IU/ml IgE have asthma. IgE levels can be used to determine the severity of asthma in a patient.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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