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The Frequency and Intensity of Bronchial Hyper-Reactivity in Patients with Allergic Asthma on Immunotherapy

Neziri-Ahmetaj Luljeta[1*], Bakir Mehić[2], Refet Gojak[3], Zhjeqi Valbona[4] and Neziri Arber[5]

[1]*Department of Allergology-Immunology, University Clinical Center of Kosova, Prishtina, Kosovo*

[2]*University Clinical Center of Sarajevo, Clinic of Pulmonary Diseases and TB, Bardakčije 90, 71000 Sarajevo, Bosnia and Herzegovina*

[3]*University Clinical Center Sarajevo, Clinic for Infectious Diseases, Bolnicka 25, 71000, Sarajevo, Bosnia and Herzegovina*

[4]*National Institut for Public Health Kosovo, Social Medicine Department, 10000, Pristina, Kosovo*

[5]*University Clinical Center of Kosova, 10000 Prishtina, Kosovo*

[*]**Corresponding author:** Neziri-Ahmetaj Luljeta, Department of Allergology-Immunology, University Clinical Center of Kosova, Prishtina 10000, Kosovo, Tel: 00381385006002802; E-mail: luljetaahmetaj@gmail.com

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Abstract

Allergen immunotherapy significantly reduced asthma symptoms and medications requirements. Treated patients were significantly less likely to report symptomatic deterioration and less likely to require increased medication. This immunotherapy showed no consistent effect on lung function.

The aim of study: In this study, we have determined the difference in the frequency and intensity of bronchial hyper-reactivity in patients with allergic asthma on immunotherapy compared to the patients with allergic asthma receiving only anti-asthmatic pharmacotherapy during one year period of time.

Methods: 60 patients were included with allergic asthma, where genders were subsequently divided into two treatment groups. The study group included 30 patients who had received immunotherapy (immunotherapy group) and control group of 30 patients treated with standard pharmacotherapy, but not with immunotherapy (GINA proposal). Each patient in the immunotherapy group was treated with subcutaneous specific immunotherapy (SCIT). The criteria for the inclusion of the patients were clinical diagnosis of allergic asthma, age between 15 and 30 years, and both sexes. The criteria for the exclusion of the patients were the presence of other acute and chronic diseases of respiratory airways, other allergic diseases (skin allergies, nutritive allergies etc.), and acute and chronic diseases of other organic systems.

Results: During the 1st trimester, the median FEV1 values in control group of patients was 60.5% (46.7-78.25%) and following bronchodilators therapy, it was 81% (56-82.2%), which was a significant (p=0.005). In the immunotherapy group, median FEV1 value was 74% (66.0-77.0%) and following bronchodilator therapy it was 84% (76-89.5%), which was a significant increase (p=0.005). During the 2nd trimester, the median FEV1 value in control group of patients was 75% (50-79.5%) and following bronchodilators therapy it increased up to 84% (66-88.5%) but the difference was not significantly different (p=0.08). In immunotherapy group, median FEV1 value was 78% (75.5-79.0%) and following bronchodilator therapy, it increased to 82% (79.5-83.75%) but the difference was not significant (p=0.066). During the 3rd trimester, the median FEV1 value in control group of patients was 70% (43-75%) and not significantly increased following bronchodilators therapy up to 84% (51-85%) (p=0.08). In experimental (immunotherapy) group, median FEV1 value was 77% (70-79%) and following bronchodilator therapy, it did not significantly change 76% (68-85%) (p=0.273). During the 4th trimester, the median FEV1 value in control group of patients was 65% (54-75%) and significantly increased following bronchodilators therapy to 79% (55-83%) (p=0.018). In immunotherapy group, median FEV1 value was 79% (68-79.5%) and did not change significantly following bronchodilator therapy 90% (67.5-95.75%)) (p=0.18).

Conclusion: In this study, the frequency of bronchial hyper reactivity was not significantly different in patients with allergic asthma treated with immunotherapy compared to the patients receiving only anti-asthmatic pharmacotherapy during one year period of time. Although the decrease was not significant (χ^2=3.166 p=0.065) in our sample, there was a trend toward a decrease in BHR in our patients treated with specific immunotherapy.

Keywords: Atopic asthma; Specific immunotherapy; Bronchial hyperreactivity

Abbreviations

GINA: Global Initiative for Asthma; FEV1: Forced Expiratory Volume in First Secunde; BHR: Bronchial Hyperreactivity; Th: T Helper; IgE: Immunoglobulin E; IL: Interleukin; GM-CSF:

Granulocyte Macrophage Colony-Stimulating Factor; PAF: Platelet Activating Factor

Introduction

According to the data from "Global Atlas of Asthma" [2], the prevalence of asthma varies across different countries and depends on the research methodology. According to the ECHRS (European community respiratory health survey) wheezing is defined as "Have you had wheezing or whistling in your chest at any time in the last 12 months?" The diagnosis of asthma is defined as "Age and sex standardized prevalence of positive response to at least one the following: 1) an asthma attack in the last 12 months; and 2) currently taking medication for the treatment of asthma." The prevalence of asthma varies from 2.0 (Estonia), 4.1 (Bombay, India), 11.9 (Australia) to 32.0 (Dublin, Ireland) in 20-44 year old adults. GALEN (Global Allergy and Asthma Network of Excellence), is a study which included 15 European countries within the age range of the participants 15-74 years (2008-2009), reporting asthma prevalence from 5.1 (Macedonia) to 16.8 (Portugal) [2].

Asthma patients with mild disease tend to have a unique form of inflammation in the airways, which is characterized by mast cells, mediator release, eosinophilic infiltration, and activated T cells. Mast cells and eosinophils are the major effector cells, regardless of whether the patient has allergic or intrinsic asthma [1,2]. The T cell has important roles in asthma. Most inflammatory responses are dominated by Th1 cells which promote the more typical inflammatory response involving neutrophils. Th1 cells also produce interferon-γ which inhibits IgE formation [1].

In atopic asthma patients, a Th2 response predominates, at least in allergy target organs (conjunctiva, skin, nasal mucosa, airways). Th0 cells (undifferentiated T helper cells) are converted to Th2 cells after interaction with antigen-presenting cells, such as alveolar macrophages, carrying processed allergen and under the influence of cytokines [2]. The Th2 cells secrete a selective panel of cytokines: IL-3-6,-9,-10 and -13, and granulocyte-macrophage colony-stimulating factors (GM-CSF). IL-3 serves as a growth and priming factor for mast cells and basophiles; IL-4, -6, -10 and -13 along with contact with B- and T-cells promote the transformation of B cells into IgE producing plasma cells. IL-3, -4 and GM-CSF are growth and priming factors for eosinophils, and IL-5 promotes the activation of eosinophils. The specific IgE formed against the allergen becomes affixed to the surface of the mast cells in the allergic target organs. Th2 cells therefore regulate the allergic inflammation and establish disease chronicity. In nonatopic asthma patients, IL-5 is produced as part of the inflammatory response but not IL-4. The lack of IL-4 may explain the lack of IgE in the nonatopic asthma patients, but the presence of IL-5 allows for a similar degree of eosinophilia [2,3].

Allergen immunotherapy significantly reduced asthma symptoms and the treated patients were significantly less likely to report symptomatic deterioration. Allergen immunotherapy also significantly reduced medications requirements and the treated patients were significantly less likely to require increased medication. There was no consistent effect on lung function.

There was an overall reduction in nonspecific bronchial hyper-reactivity following immunotherapy and the treated patients were significantly less likely to develop increased BHR.

A fundamental advantage of immunotherapy in the treatment of allergy may be its interference with the pathophysiologic mechanisms responsible for mediator release [4]. Hypothetically, the mechanisms of immunotherapy could "turn of" the allergic reaction, thereby interrupting the chain of events characterizing allergic disease. Firstly, immunotherapy induces a switch of the preferential differentiation into Th2-type effector cells to the Th1-type cells [6]. The switch of cytokine profile to a primary IL-2 and IFN-γ response results in inhibition of the IL-4 dependent IgE production, reinforced by a decrease in the production of IL-4 from Th2 cells. Secondly, the activity of mast cells is reduced because of a lack of IL-3 dependent activation, a reduced local production of IgE, and a decreased production of histamine-releasing factors [5,6]. A cytokine-independent decrease in mediator release from mast cells could concurrently be present, as well as a switch from IgE+ to IgE- phenotype [5]. The decreased activity of mast cells results in a decreased release of allergic mediators, thereby diminishing vascular permeability, smooth-muscle contraction, and the activity of chemotactic factors such as PAF and eosinophil chemotactic activity [7-11]. In combination with a reduced production of IL-5, the activity of eosinophils is decreased, resulting in less inflammation and destruction [8-10].

In the present study, the difference in the frequency and intensity of bronchial hyper-reactivity in patients with allergic asthma on immunotherapy was investigated in comparison with patients having allergic asthma receiving only anti-asthmatic pharmacotherapy.

Methods

A prospective, comparative clinical study was performed at the University Clinical Hospital in Prishtina, Kosovo, and in cooperation with specialized Allergology Center Ylli in Pristina. 60 patients with allergic asthma and both genders were included in the study and were subsequently divided into two treatment groups. One study group included 30 patients who received immunotherapy (immunotherapy group). The control group included 30 patients treated with standard pharmacotherapy, but not with immunotherapy (GINA proposal). Each patient in the immunotherapy group was treated with subcutaneous specific immunotherapy (SCIT). The criteria for the inclusion of the patients were: clinical diagnosis of allergic asthma, age between 15 and 30 years, both sexes. The criteria for the exclusion of the patients were: presence of other acute and chronic diseases of respiratory airways, presence of other allergic diseases (skin allergies, nutritive allergies etc.), the presence of acute and chronic diseases of other organic systems.

Diagnosis of bronchial asthma was established based on clinical history of recurrent wheezing, breathlessness, or cough (GINA) associated with significant reversibility of FEV1 (>15% from baseline) after inhalation of 400 μg salbutamol when baseline was <80% predicted in addition to positive skin tests and increased serum level of IgE. We measured FEV1 during exacerbations of asthma symptoms during viral infections every trimester (first to fourth) during one year period of time.

Sensitivity to certain allergens was determined by skin prick tests (SPTs). According to the practical guide to skin prick tests in allergy to aeroallergens, the wheal and erythema have been used to assess the positivity of the skin test. However, only the wheal is needed. The largest size of the wheal is considered to be sufficient. Wheal diameters ≥ 3 mm are considered positive in SPTs. It is considered that small wheals fewer than 3 mm of diameters are not significant in clinical

studies whereas they are considered to be positive in epidemiologic studies [18]. Here, we used the Test Kit G, Allergopharma Joachim Ganzer, Germany. We treated our patients with immunotherapy if they present IgE mediated disease proven to benefit from immunotherapy, stable allergic asthma, documentation of sensitivity to allergens associated with symptoms and symptoms of sufficient duration and severity:

a. Two seasons of seasonal symptoms despite avoidance measures and pharmacologic therapy

b. Perennial symptoms failing trials of avoidance measures and chronic pharmacologic therapy

Relative contraindications to Immunotherapy were beta-2 blocker treatment, pregnancy hypersensitivity conditions not exclusively depended on IgE mechanisms, immune complex and autoimmune disease, immunodeficiency, unstable asthma. Instead, we used subcutaneous immunotherapy Novo Helisen Depot, Allergopharma Joachim Ganzer, Germany.

Statistical analysis

In order to perform statistical analyses for the results of this study, a SPSS for Windows statistical program (version 19.0, SPSS Inc, Chicago, Illinois, USA) and Microsoft Excel (version 11. Microsoft Corporation, Redmond, WA, USA) were used. For the analysis of nominal and ordinal variables, we used χ^2 test. In the case the expected frequencies were absent, the Fisher's exact test was used (for tables of contingency). A Shapirov Vilk test was used to analyze the symmetry of the distribution of continuous variables. When the distribution of the continuous variables was asymetric in order to show their mean values and to measure the dispersion, a median and interquartile range was used for comparison analysed with non-parametric tests (Mann-Whitney U test, Wilcoxon Test).

For analyzing connections and directions of the connections between variables, correlation tests were used depending on the type of variables (Spearman, Pearson). The McNemar test was used in repeated analysis of the variables with two different outcomes (binary variables). For the statistical significance of the results, the 95% confidence interval was used (value of α=0.05). The p value of the statistical test signified either accepting or rejecting the hypothesis ($p \geq \alpha$: hypothesis is accepted; $p<\alpha$: hypothesis is rejected).

During the 1st trimester, 10 patients in the control and in immunotherapy group had FEV1<80%. After administration of bronchodilators, 7 patients in immunotherapy and 7 in control group had an increase in FEV1>20%, which was a significant difference compared to baseline FEV1 values (p=0.016) (Figure 1).

During the 2nd trimester, 9 patients in the control group had FEV1<80%. After administration of bronchodilators, 7 patients in the control group had an increase in FEV1>20%, which was a significant difference compared to baseline FEV1 values (p=0.016). In the immunotherapy group, 4 patients had FEV1<80%. After administration of bronchodilators, 3 patients in the immunotherapy group had an increase in FEV1>20%, but the difference was not significant (p=0.250) (Figure 2).

During the 3rd trimester, 7 patients in the control group had FEV1<80%. After administration of bronchodilators, 6 patients in the control group had an increase in FEV1>20%, which was a significant difference compared to baseline FEV1 values (p=0.031) (Table 6). In the immunotherapy group, 4 patients had FEV1<80%. After administration of bronchodilators, 1 patient had an increase in FEV1>20%, but the difference was not significant (p=1.0) (Figure 3).

Results

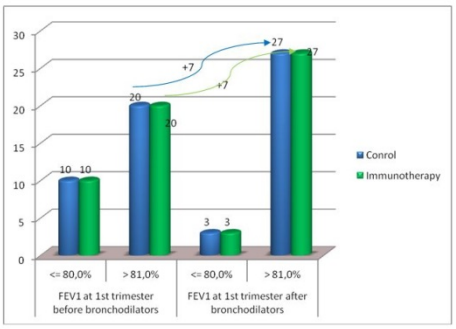

Figure 1: FEV1 at 1st trimester before and after bronchodilators.

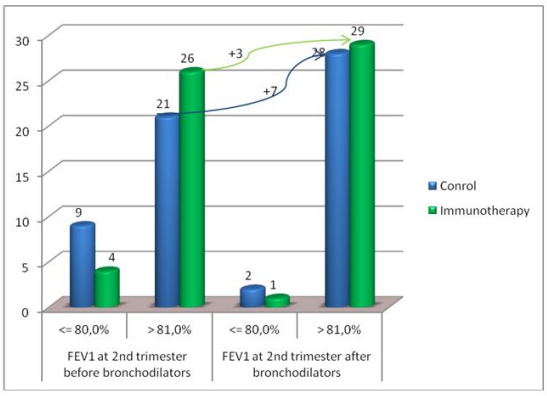

Figure 2: FEV1 at 2nd trimester before and after bronchodilators.

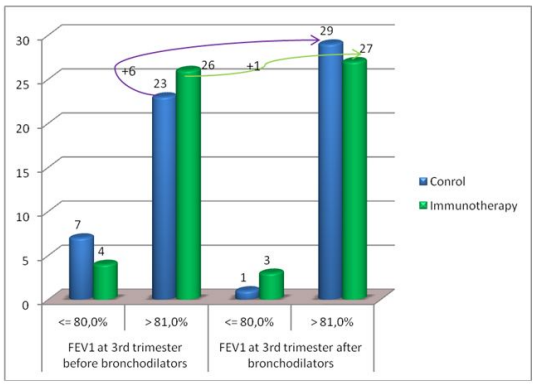

Figure 3: FEV1 at 3rd trimester before and after bronchodilators.

During the 4th trimester, 7 patients in the control group had FEV1<80%. After administration of bronchodilators, 5 patients had an increase in FEV1>20%, but the difference was not significant

(p=0.063). In the immunotherapy group, 1 patient had FEV1<80%. After administration of bronchodilators that 1 patient had an increase in FEV1>20% (Figure 4).

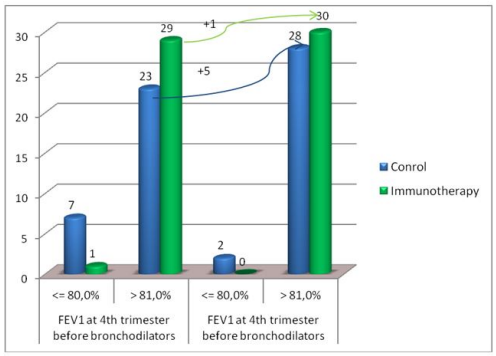

Figure 4: FEV1 at 4th trimester before and after bronchodilators.

During the 1-year follow-up, there were 37 patients with bronchial hyperreactivity; 25 (67%) were in the control group and 12 (32%) were in the immunotherapy group. In our patient sample, there was a trend towards decrease in BHR in patients on immunotherapy, but the decrease was not statistically significant (χ^2=3.166 p=0.065) (Table 1).

Trimester							
			I	II	III	IV	Total
Group	Control	N	7	7	6	5	25
		%	18.9%	18.9%	16.2%	13.5%	67.6%
	Immunotherapy	N	7	3	1	1	12
		%	18.9%	8.1%	2.7%	2.7%	32.4%
Total		N	14	10	7	6	37
		%	37.8%	27.0%	18.9%	16.2%	100.0%

Table 1: Bronchial hyperreactivity in immunotherapy and control group of patients at different trimesters.

During the 1st trimester, the median FEV1 values in the control group of patients was 60.5% (46.7-78.25%), and following bronchodilators therapy, it was 81% (56-82.2%), which was a significant difference (p=0.005). In immunotherapy group, median FEV1 value was 74% (66.0-77.0%), and following bronchodilator therapy, it was 84% (76-89.5%), which was a significant increase (p=0.005) (Table 2).

Group	I trimester		Percentiles			Wilcoxon Test
	FEV1	N	25th	50th (median)	75th	P value
Control	baseline	10	46.75	60.50	78.25	0.005
	after bronchodilators	7	56.00	81.00	84.25	
Immunotherapy	baseline	10	66.00	74.50	77.00	0.005
	after bronchodilators	7	76.00	84.00	89.50	

Table 2: FEV1 values at 1st trimester in patients before and after bronchodilators in the immunotherapy and control group in the 1st trimester.

During the 2nd trimester, the median FEV1 value in control group of patients was 75% (50-79.5%) and following bronchodilators therapy, it increased up to 84% (66-88.5%) but the difference was not significantly different (p=0.08). In immunotherapy group, median FEV1 value was 78% (75.5-79.0%) and following bronchodilator therapy, it increased to 82% (79.5-83.75%) but the difference was not significant (p=0.066) (Table 3).

Group	II trimester		Percentiles			Wilcoxon Test
	FEV1	N	25th	50th (median)	75th	P value
Control	baseline	9	50.00	75.00	79.50	0.08
	after bronchodilators	7	66.00	84.00	88.50	
Immunotherapy	baseline	4	75.50	78.00	79.00	0.066
	after bronchodilators	3	79.50	82.00	83.75	

Table 3: FEV1 values at 2nd trimester in patients before and after bronchodilators in the immunotherapy and control group.

During the 3rd trimester, the median FEV1 value in the control group of patients was 70% (43-75%) and not significantly increased following bronchodilators therapy up to 84% (51-85%) (p=0.08). In experimental (immunotherapy) group, median FEV1 value was 77% (70-79%) and following bronchodilator therapy, it did not significantly change 76% (68-85%) (p=0.273) (Table 4).

Group	III trimester		Percentiles			Wilcoxon Test
	FEV1	N	25th	50th (median)	75th	P value
Control	baseline	7	43.00	70.00	75.00	0.018
	after bronchodilators	6	51.00	84.00	85.00	
Immunotherapy	baseline	4	70.00	77.00	79.00	0.273
	after bronchodilators	1	68.75	76.50	85.00	

Table 4: FEV1 values at 3rd trimester in patients before and after bronchodilators in the immunotherapy and control group.

During the 4th trimester, the median FEV1 value in control group of patients was 65% (54-75%) and significantly increased following bronchodilators therapy to 79% (55-83%) (p=0.018). In

immunotherapy group, median FEV1 value was 79% (68-79.5%) and did not change significantly following bronchodilator therapy 90% (67.5-95.75%) (p=0.18) (Table 5).

Group	3rd trimester		Percentiles			Wilcoxon Test
	FEV1	N	25th	50th (median)	75th	P value
Control	baseline	7	54.00	65.00	75.00	0.018
	after bronchodilators	5	55.00	79.00	83.00	
Immunotherapy	baseline	1	68.00	79.00	79.50	0.180
	after bronchodilators	1	67.50	90.50	95.75	

Table 5: FEV1 values at 4th trimester in patients before and after bronchodilators in the immunotherapy and control group.

Patients in immunotherapy group showed significant decrease in BHR intensity from 1st to 2nd trimester, while later on, the intensity of BHR did not significantly change from 2nd, 3rd to 4th trimester. In contrast, patients in the control group had constant significant increases in BHR during the 1-year follow-up (Table 6).

Year	SCIT	p	Significance
1st trimester	without SCIT	0.005	SS
	with SCIT	0.005	SS
2nd trimester	without SCIT	0.08	NS
	with SCIT	0.066	NS
3rd trimester	without SCIT	0.018	SS
	with SCIT	0.273	NS
4th trimester	without SCIT	0.018	SS
	with SCIT	0.180	NS

Table 6: Statistical significance of differences in FEV1 levels (intensity BHR), according to the quarterly monitoring.

Discussion

According to the "Position paper: Immunotherapy" [12], one of the criteria for specific immunotherapy induction is stable allergic asthma with the FEV1 values >70%. In our study, we have included

60 adult patients with 30 in the immunotherapy group, (f/m=11/19, aged 15-53 years old) and 30 in the study group (f/m=17/13, aged 17-52 years old). In our immunotherapy group, 8 (26.6%) patients had intermittent asthma, 14 (46.6%) had mild persistent asthma and 8 (26.6%) had moderate persistent asthma. In the control group of patients, 9 (30%) had intermittent asthma, 6 (20%) mild persistent asthma, and 15 (50%) had moderate persistent asthma, without significant difference in asthma severity degrees between the study groups (χ^2=5.515 p=0.068). Hoheisen et al. [13] included 2,931 patients in their study conducted from October 2001 to December 2005. Out of those patients, 1052 had asthma (49% had mild, 43% moderate and 8% had severe asthma). Trebucon et al. [14] included 735 paediatric patients in their study; 64.0% had asthma out of which 52.7% had mild to moderate asthma.

Several different lung function tests have been used to measure changes in airway diameter following provocation. The decrease in FEV1 values has been most widely accepted (methacoline, histamine, exercise, hyper or hypo osmolar stimuli, sulphur dioxide) (GINA). Also, bronchodilatation is of diagnostic help in demonstrating reversible airflow obstruction only if the baseline measure of pulmonary function is less than or equal to 80% of the predicted normal value (GINA). In our study, we defined the hyperactivity as an improvement in FEV1 more than 20% after administration of a bronchodilator. Here, we aimed to assess bronchial hyperactivity in patients with immunotherapy and in patients on anti-asthmatic therapy during the 1 year follow-up. During the 1st trimester, 10 patients in the control and in immunotherapy group had FEV1<80%. After administration of bronchodilators, 7 patients in immunotherapy and 7 in control group had an increase in FEV1>20%, which was a significant difference compared to baseline FEV1 values (p=0.016) (Figure 1). During the 2nd trimester, 9 patients in the control group had FEV1<80%, out of which 7 had an increase in FEV1>20% after administration of bronchodilators, representing a significant difference compared to baseline FEV1 values (p=0.016). Whereas, in the immunotherapy group, 4 patients had FEV1<80% and after administration of bronchodilators, 3 patients had an increase in FEV1>20%, but the difference was not significant (p=0.250) (Figure 2).

During the 3rd trimester, 7 patients in the control group had FEV1<80% and after administration of bronchodilators, 6 patients had an increase in FEV1>20%, which was a significant difference compared to baseline FEV1 values (p=0.031). In the immunotherapy group 4 patients had FEV1<80% and only 1 patient had an increase in FEV1>20% after administration of bronchodilators, but the difference was not significant (p=1.0) (Figure 3). During the 4th trimester, 7 patients in the control group had FEV1<80% out of which 5 had an increase in FEV1>20% after bronchodilators administration, but the difference was not significant (p=0.063). In the immunotherapy group 1 patient had FEV1<80%, in whom the FEV1values increased >20% after administration of bronchodilators (Figure 4).

During the 1-year follow up, there were 37 patients with bronchial hyperactivity; 25 (67%) were in control and 12 (32%) were in immunotherapy group. In our study sample, there was a trend towards decrease in BHR in patients on immunotherapy, but the decrease was not statistically significant (χ^2=3.166 p=0.065) (Table 1).

Our results clearly show the decreased frequency of the patients with FEV1<80% on immunotherapy (decreasing from 10 patients at 1st to 1 patient at 4th trimester) which suggests that immunotherapy decreased the BHR in our patients. Our results are in accordance with the results from Chang et al. [19] who evaluated the immunotherapy effects on the degree of nonspecific bronchial hyperresponsiveness in patients with allergic bronchial asthma and/or allergic rhinitis. They found that the improvement was evident in the group treated with immunotherapy and was evident in 75% of patients with allergic rhinitis, 41.7% of patients with bronchial asthma and in 53.8% of patients with both bronchial asthma and allergic rhinitis (shift of at least two doubling concentrations of metacholine). Also, the results of the study by Blumberga et al. [15] on house dust mite immunotherapy have shown significant improvement in BHR in 26 patients treated with HDM SCIT in comparison to the 28 patients treated with placebo during the 3 years of follow-up.

Desiree et al. [16] have assessed the findings from 31 studies on SCIT and concluded that the patients treated with *D. pteronyssimus* extract experienced 12-fold reduction in specific BHR after only 4-month of treatment compared with no change in the control group (p=0.002). Similar results were obtained in a study by Yukselen et al. [17], which included 10 children treated with SCIT, 10 with SLIT and 10 children were on placebo during one year. The patients treated with SCIT showed significant increase in HDM (house dust mite) - specific bronchial provocation doses after 12 months. Assessing the average FEV1 values in patients with BHR, our results indicated that the patients on immunotherapy exhibited less variation in FEV1 values compared to control group during the 1-year follow-up.

Another aim of this study was to assess the differences in BHR intensity. Here, we measured FEV1 values in patients on immunotherapy and in control group of patients. During the 1st trimester, the median FEV1 values in control group of patients was 60.5% and following bronchodilator therapy, the median FEV1 value increased up to 81% which was a significant increment. In immunotherapy group, a median FEV1 value was 74% and following bronchodilator therapy it also significantly increased up to 84% (Table 2). During the 2nd trimester, the median FEV1 value in control group of patients was 75% and following bronchodilators it increased to 84%, but the difference was not significant. In immunotherapy group, median FEV1 value was 78% and increased to 82% but the difference was not significant in this group either (p=0.066) (Table 3). During the 3rd trimester, the median FEV1 value in control group of patients significantly increased from 70% to 84%. In immunotherapy group, median FEV1 value was 77% and following bronchodilator therapy it did not significantly change (76%) (Table 4). During the 4th trimester, the median FEV1 value in control group of patients was 65% and significantly increased to 79% following bronchodilators therapy. In immunotherapy group, median FEV1 value was 79% and did not change significantly following bronchodilator therapy (90%) (Table 5).

In a study by Chang et al. [19], the authors aimed to evaluate the influence of immunotherapy on BHR in three groups of patients; allergic rhinitis group (n=16), bronchial asthma group (n=24), and bronchial asthma with allergic rhinitis group (n=13) during 12 months of follow-up. The authors concluded that immunotherapy have significant influence on BHR only in bronchial asthma with allergic rhinitis group (86%-92%), suggesting that immunotherapy might be effective in lowering BHR intensity only in cases with moderate BHR. Our finding are absolutely in accordance with Chang et al. [19], because our patients in immunotherapy group showed significant decrease in BHR intensity from 1st to 2nd trimester, while later on, the intensity of BHR did not significantly change from 2nd, 3rd to 4th trimester. In contrast, patients in control group had constant significant increase in BHR during the 1-year follow-up (Table 6).

In a study by Desiree et al. [16], the effects of subcutaneous immunotherapy in Chinese children with asthma have shown that SCIT treatment during 1 year resulted in a reduction of emergency department visits and increase in FEV1 and PEF values. Yekselen et al. [17] have studied the effects of SCIT and SLIT in children with rhinitis and asthma during 12 months. The authors reported mean FEV1 values in the SCIT, SLIT and placebo group which were 99.2 ± 10.0, 97.8 ± 7.6 and 96.2 ± 10.2, respectively. Mean FEV1 values in their study showed an average increase by 6.3% in SCIT, 5.5% in SLIT and 0.7% in the placebo group. When compared with baseline values, FEV1 increased significantly in SCIT and SLIT, but did not change significantly in the placebo group [17].

Conclusion

In our study, we have documented that the frequency of bronchial hyperreactivity was not significantly different in patients with allergic asthma treated with immunotherapy compared to the patients receiving only anti-asthmatic pharmacotherapy during one year period of time. Although the decrease was not statistically significant (χ^2=3.166 p=0.065) in our sample, there was a trend towards decrease in BHR in our patients treated with specific immunotherapy.

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