ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

# The Effect of House Dust Mite Immunotherapy on Quality of Life and Symptom Scores in Patients with Allergic Rhinitis

## Alerjik Rinit Hastalarında Ev Tozu Akarı İmmünoterapisinin Yaşam Kalitesi ve Semptom Skorlarına Etkisi

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### Abstract

**Introduction:** It was aimed to evaluate the post-treatment clinical findings and quality of life among patients treated with allergen-specific subcutaneous immunotherapy (SCIT).

**Materials and Methods:** Our study included 39 pediatric patients who underwent SCIT in October 2022 in the department of pediatric allergy and immunology, who were allergic to house dust mites, diagnosed with allergic rhinitis or combined allergic rhinitis and asthma. Socio-demographic characteristics, laboratory and clinical features of the patients were evaluated. Visual analog scale (VAS) and Rhino Conjunctivits Scoring System (RCSS) were used to evaluate the disease symptoms quantitatively after allergen-specific immunotherapy. Disease-related quality of life was evaluated with the Pediatric Rhinoconjunctivitis Quality of Life Questionnaire (PRQLQ) questionnaire.

**Results:** Of the 39 pediatric patients evaluated, 33 (84.6%) were diagnosed with allergic rhinitis; 6 (15.4%) were diagnosed with asthma and allergic rhinitis. Of the patients, 66.7% (n=26) were male. The median age was 10.0 years (6.0-17.0). The relationship between the total number of SCIT injections administered to the patients and the patients' VAS, RCSS and PRQLQ scores was evaluated. A moderate to strong negative correlation was seen with all scores. Except for the RCSS ocular-redness subscore, all correlations were statistically significant ($p<0.05$).

**Conclusion:** In patients in the further stages of SCIT treatment, the quality of life was higher and the severity of clinical findings was lower. It is presented that the severity of clinical findings related to allergic rhinitis decreased during SCIT treatment.

**Keywords**
Allergic rhinitis, subcutaneous immunotherapy, quality of life

**Anahtar kelimeler**
Alerjik rinit, subkütan immünoterapi tedavisi, yaşam kalitesi

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### Öz

**Giriş:** Çalışmamızda alerjen spesifik subkütan immünoterapi (SKİT) tedavisi uygulanan hastaların tedavi sonrası klinik bulgularının ve yaşam kalitelerinin değerlendirilmesi amaçlanmıştır.

**Gereç ve Yöntem:** Çalışmamıza çocuk alerji ve immünoloji bilim dalında 2022 yılı Ekim ayında SKİT uygulanan, ev tozu akarı alerjisi olan, sadece alerjik rinit tanılı veya alerjik rinit ile astım birlikteliği gösteren 39 çocuk hasta dahil edilmiştir. Hastaların sosyo-demografik özellikleri, laboratuvar parametreleri, klinik bulguları değerlendirilmiştir. Spesifik immünoterapi tedavisi sonrası

hastalık semptomlarının kantitatif olarak değerlendirilebilmesi için Görsel Analog Ölçeği (VAS) ve Rinokonjonktivit Skorlama Sistemi (RCSS) kullanılmıştır. Hastalığa bağlı yaşam kalitesi ise Pediatrik Rinokonjunktivit Yaşam Kalitesi Anketi (PRQLQ) anketi ile değerlendirilmiştir.

**Bulgular:** Çalışma kapsamında değerlendirilen 39 çocuk hastanın 33'ü (%84,6) alerjik rinit tanılı iken 6'sı (%15,4) astım ve alerjik rinit tanılıydı. Hastaların %66,7'si (n=26) erkekti. Medyan yaş 10 yıldı (6.0-17.0). Hastalara uygulanan toplam SKİT enjeksiyon sayısının hastaların VAS, RCSS ve PRQLQ skorları ile ilişkisi değerlendirildi. Tüm puanlar ile orta-güçlü negatif korelasyon görüldü. RCSS oküler-kızarıklık alt puanı hariç tüm korelasyonlar istatistiksel olarak anlamlıydı (p<0,05).

**Sonuç:** Subkütan immünoterapi tedavisinin daha ileri dönemlerinde olan hastaların klinik bulgularının şiddeti daha düşük iken yaşam kaliteleri daha yüksektir. Bu bulgular; alerjik rinit tanılı hastaların klinik bulgularının şiddetinin SKİT tedavisi süresince azaldığını göstermektedir.

## Introduction

The prevalence of allergic diseases is increasing worldwide, especially in middle- and low-income countries (1). The most common clinical presentation of allergy is allergic respiratory diseases such as allergic rhinitis (AR) and asthma (2). Allergic rhinitis is an immunoglobulin E-mediated inflammatory response of the nasal mucosa to allergens (3,4). Common symptoms of allergic rhinitis include sneezing, itching, rhinorrhea, nasal congestion, red and watery eyes (5). Asthma is characterized by lower airway inflammation, bronchial hyperactivity, and airway obstruction (6). Asthmatic patients have frequently clinical symptoms such as cough, wheezing, shortness of breath, chest pain (7).

Treatment options for allergic asthma and allergic rhinitis are allergen avoidance, pharmacotherapy, and allergen-specific immunotherapy (AIT) (8). In some patients, pharmacotherapy is insufficient to control of allergic symptoms. Immunotherapy; which is an effective option for the treatment of IgE-mediated diseases such as allergic rhinitis and asthma, is the only option for etiological-based treatment beside the avoidance of allergen exposure (2,9,10). With AIT, patient-specific allergens are administered in increasing doses gradually for a few weeks until the effective dose is reached, and then maintenance doses are started (11).

AIT is administered sublingually (SLIT) or often as subcutaneous injections (SCIT) (12). SCIT's reliability and effectiveness has been proven in the treatment of allergic rhinitis, allergic conjunctivitis, allergic asthma and hypersensitivity to bee venom (13). In a study conducted among pediatric patients in our country, the incidence of local side effects such as redness, itching and swelling at the injection site after SCIT was 17.8%; the incidence of extensive local side effects has been reported as 10.9% (14). Besides the local side effetcs, systemic reactions can be seen after SCIT. However, systemic reactions related to SCIT are rare and their prevalence after injection doses varies between 1% and 0.1% (15).

In the literature, it has been reported that both the use of drugs for asthma and allergic rhinitis and clinical findings related to asthma and allergic rhinitis decreased after SCIT and SLIT application (16,17). According to the results of a randomized controlled study conducted among children with asthma; statistically significant improvement in asthma symptoms and a decrease in drug intake were observed in children receiving SCIT. In addition, in the same study, a significant decrease in bronchial hyperreactivity was observed in children who received SCIT (18).

Clinical findings of the allergic rhinitis such as rhinorrhea and sneezing can affect the quality of life of children. For this reason, it is important to evaluate the quality of life in children with allergic rhinitis and asthma, as well as the control of symptoms. In our study, it was aimed to evaluate the clinical findings and quality of life related to allergic rhinitis after treatment in patients who received allergen-specific SCIT.

## Materials and Methods

In our study, 39 pediatric patients who were treated with SCIT in October 2022 in the department of pediatric allergy and immunology, who were allergic to house dust mites, diagnosed with only allergic rhinitis or combined allergic rhinitis and asthma were included. Patients who received SCIT in a one-month period were included, and no sample was calculated. Socio-demographic characteristics of the patients, laboratory parameters (eosinophil, total IgE), clinical findings of allergic rhinitis and asthma after SCIT injections were asked with a questionnaire.

*Measures*

Visual Analog Scale (VAS), Rhino Conjunctivits Scoring System (RCSS), Pediatric Rhinoconjunctivitis Quality of Life Questionnaire (PRQLQ) were used for the quantitative evaluation of the severity of disease symptoms.

*1. Visual Analog Scale:* VAS is frequently used to evaluate the severity of the allergic rhinitis clinic and symptom scores. Patients mark the severity of their complaints on a strip with numbers from 1 to 10 (19). VAS is a test in which patients determine the severity of their own complaints. In VAS, a horizontal or vertical 100 mm long line is usually drawn on a paper and asked to mark the intensity of symptoms felt. The application and evaluation of the test is quite simple and has been used for many years in many diseases (20). To evaluate the symptom severity of the patients in our study; all allergic rhinitis-related symptoms including nasal itching, nasal congestion and rhinorrhea, sneezing, red and watery eye were asked as a single question. The severity of these findings, which are caused by allergic rhinitis, was subjectively marked and scored by the patients on a scale of 1 to 10, with 1 being the least severe and 10 the most severe.

*2. Rhino Conjunctivits Scoring System:*

RCSS evaluates 6 symptoms including nasal itching, nasal congestion, rhinorrhea, sneezing, redness of the eye and watery eyes. In our study, children were asked to score their complaints as 0 (none), 1 (mild), 2 (moderate), 3 (severe), and the total RCSS was determined by dividing the sum of the scores for each six symptoms into six (21).

*3. Pediatric Rhinoconjunctivitis Quality of Life Questionnaire:*

PRQLQ was developed by Juniper et al. (22), and its Turkish version was tested for validity and reliability by Yüksel et al. (23). It evaluates the quality of life of patients with allergic rhinitis and conjunctivitis. The questionnaire consists of 23 questions and is divided into three subgroups: Symptoms, emotional functions and activity limitation. Questionnaire is scored between 0-6 for each question, and the increase in the score indicates that the negative impact from the disease also increases. For calculation of subscores; the total score received by the items is divided the number of items. The overall quality of life is obtained by dividing the score of all items by the number of items, which is 23.

*Allergen Specific Immunotherapy*

Patients receiving house dust mite immunotherapy were given one injection per week in the initial phase. The maintenance period was started one month after the first injection, and injections were administered monthly during this period. SCIT injections were administered subcutaneously by a physician and a trained nurse in the outpatient setting.

*Statistical Analysis*

SPSS (Statistical Package for Social Sciences) for Windows 25.0 program was used for statistical analysis and data recording. In the study, median, minimum and maximum values, numbers (n) and percentages (%) were used for descriptive data. Conformity of continuous variables to normal distribution was examined by visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/ Shapiro-Wilk tests). Spearman correlation test was used for the correlation between two numeric variables, which did not fit the normal distribution. Statistical significance level was determined as $p<0.05$.

Ethics committee approval was obtained from the University of Health Sciences Turkey, Ümraniye Training and Research Hospital Ethics Committee on 29/09/2022 with decision number 310.

## Results

Of the 39 pediatric patients evaluated in the study, 33 (84.6%) were diagnosed with allergic rhinitis, while 6 (15.4%) were diagnosed with combined allergic rhinitis and asthma. Of the patients 33.3% (n=13) were female and 66.7% (n=26) were male. The median age was 10.0 years (6.0-17.0). Absolute eosinophil, eosinophil (%), and total IgE median values were 560.0 $10^3$/uL (130.0-1170.0) IU/mL), 5.5% (1.6-13.5), 230.0 IU/mL (56.0-3524.0), respectively. The median number of SCIT injections was 56.0 (15.0-110.0) (Table 1).

VAS, RCSS and PRQLQ questionnaires were applied to evaluate the clinical findings of the patients due to allergic rhinitis and asthma. The median VAS score of the patients was 2.0 (0.0-7.0). According to the RCSS scores, the highest symptom scores of the

| Table 1. Socio-demographical, clinical and laboratoryfeatures of the patients | | | | |
|---|---|---|---|---|
| | | n | % | |
| Diagnosis | Allergic rhinitis | 33 | 84.6 | |
| | Allergic rhinitis and asthma | 6 | 15.4 | |
| Gender | Female | 13 | 33.3 | |
| | Male | 26 | 66.7 | |
| | | Median | Min. | Max. |
| Age (years) | | 10.0 | 6.0 | 17.0 |
| Eosinophil (absolute) ($10^3$/uL) | | 560.0 | 130.0 | 1170.0 |
| Eosinophil (%) | | 5.5 | 1.6 | 13.5 |
| Total IGE (IU/mL) | | 230.0 | 56.0 | 3524.0 |
| Number of injections | | 56.0 | 15.0 | 110.0 |
| Min-max: Minimum-maximum | | | | |

| Table 2. VAS, RCSS and PRQLQ scores of the patients | | |
|---|---|---|
| | Mean ± SD | Median (min-max) |
| VAS | 2.1±1.7 | 2.0 (0-7.0) |
| RCSS nasal | | |
| RCSS itching | 0.9±0.9 | 1.0 (0-3.0) |
| RCSS congestion | 0.9±0.9 | 1.0 (0-3.0) |
| RCSS rhinorrhea | 0.7±0.8 | 1.0 (0-3.0) |
| RCSS sneezing | 0.6±0.9 | 0.0 (0-3.0) |
| RCSS ocular | | |
| RCSS redness | 0.3±0.6 | 0.0 (0-2.0) |
| RCSS watery eyes | 0.3±0.6 | 0.0 (0-3.0) |
| RCSS total | 0.6±0.6 | 0.3 (0-2.3) |
| PRQLQ symptom | 1.7±1.2 | 1.0 (0-5.0) |
| PRQLQ emotional functions | 1.7±0.9 | 2.0 (0-4.0) |
| PRQLQ activity limitations | 1.7±1.2 | 1.0 (0-4.0) |
| PRQLQ total | 1.7±1.0 | 1.3 (0.3-4.3) |
| VAS: Visual Analog Scale, RCSS: Rhino Conjunctivits Scoring System, PRQLQ: Pediatric Rhinitis Quality of Life Questionnaire, Min-max: Minimum-maximum | | |

patients was seen in the symptoms of nasal itching and nasal congestion. The median and mean values of the RCSS and PRQLQ scores are shown in Table 2.

The relationship between the total number of SCIT injections administered to the patients and the patients' VAS, RCSS and PRQLQ scores was evaluated. A moderate to strong negative correlation was seen with all scores. All correlations were statistically significant except for the RCSS ocular-redness subscore (Table 3).

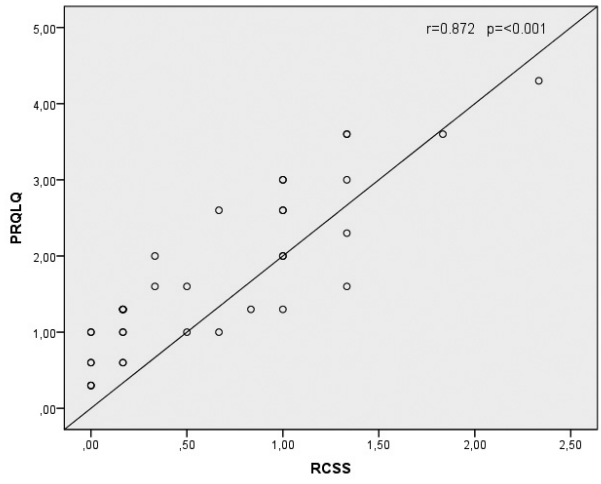


**Figure 1.** Correlation of RCSS and PRQLQ scores.
*RCSS: Rhino Conjunctivits Scoring System, PRQLQ: Pediatric Rhinitis Quality of Life Questionnaire*

As the symptom severity scores of the patients increased, their quality of life scores decreased. When the relationship between RCSS and PRQLQ scores was evaluated, a statistically significant strong positive correlation was observed (r=0.872, p<0.001) (Figure 1).

## Discussion

Immunotherapy treatment prevents clinical findings and disease progression, and also reduces the severity of the disease (24). In our study, we aimed to evaluate the efficacy of SCIT, which is an effective treatment option for patients with allergic rhinitis and asthma.

| Table 3. The correlation of number of total injections with VAS, RCSS and PRQLQ scores | | | |
|---|---|---|---|
| | | Number of total injections | |
| | | r* | p |
| VAS | | -0.746 | **<0.001** |
| RCSS nasal | Itching | -0.759 | **<0.001** |
| | Congestion | -0.739 | **<0.001** |
| | Rhinorrhea | -0.602 | **<0.001** |
| | Sneezing | -0.751 | **<0.001** |
| RCSS ocular | Redness | -0.213 | 0.194 |
| | Watery eye | -0.406 | **0.010** |
| RCSS total | | -0.811 | **<0.001** |
| PRQLQ | Symptom | -0.772 | **<0.001** |
| | Emotional functions | -0.636 | **<0.001** |
| | Activity limitations | -0.701 | **<0.001** |
| PRQLQ total | | -0.731 | **<0.001** |

*Spearman correlation coefficient
VAS: Visual Analog Scale, RCSS: Rhino Conjunctivits Scoring System, PRQLQ: Pediatric Rhinitis Quality of Life Questionnaire

In this study, the disease symptoms of 39 pediatric patients who received SCIT were quantitatively evaluated.

In our study, as the number of injection doses of the patients increased; VAS, RCSS, PRQLQ symptom scores decreased. In other words; while the severity of clinical findings was lower, the quality of life was higher among patients who were in further stages of SCIT. This result can be interpreted that; during the receiving of SCIT, the severity of the clinical findings of the patients decreased and their quality of life increased. In the literature, improvement in symptoms was observed in 82% of children with allergic rhinitis who were treated with SCIT for one year (25). In another study; children diagnosed with allergic rhinitis and house dust mite allergy were treated with immunotherapy in two different groups, SCIT and SLIT, for 2 years. There was a significant decrease in VAS and PRQLQ scores and other disease symptom control scores at the end of 2 years in both groups compared to the beginning of treatment (26). In a pilot study planned to investigate the optimal number of allergens that should be included in the immunotherapy treatment regimen in polysensitized patients, single and multiple SLIT treatment regimens were randomized to patients and their treatment efficacy compared. The RCSS and RQLQ scores of the patients were measured at the beginning of the treatment, at 6 weeks, 3 months, 6 months, and 9 months, and a significant decrease was observed in the RCSS and RQLQ scores in all study groups at each interval after the start of SLIT compared to the beginning of treatment (27). In a study in the literature in which 106 patients with allergic rhinitis were randomized to receive SLIT, SCIT or placebo treatment for 2 years, it was shown that SCIT was more effective than SLIT in reducing total nasal symptom scores, but both regimens significantly reduced symptom scores (28). In the consensus report published by the European Academy of Allergy and Clinical Immunology and the American Academy of Allergy, it was shown that both major AIT regimens significantly reduced symptoms compared to pharmacological drugs (29).

When the relationship between allergic rhinitis symptom scores and quality of life scores were evaluated in our study, a significant positive correlation was found between RCSS score and PRQLQ scores. Similarly, in a study conducted in pediatric allergic rhinitis patients in the literature, a significant positive correlation was found between patient' RCSS score and PRQLQ scores ($r=0.468$; $p<0.001$) (30). A high PRQLQ score indicates a low quality of life. It can be interpreted as the disease-related quality of life decreases as the severity of disease-related symptoms

such as rhinorrhea and sneezing in allergic rhinitis patients increases. Reducing the symptoms and complaints related to the disease with treatment in allergic rhinitis patients may also improve the quality of life in children. In this context; SCIT treatment, which will be applied effectively in suitable patients, will both reduce the physical findings of the patients and increase the quality of life in daily and social activities such as sports and school life.

In our study, the severity of allergic rhinitis symptoms was evaluated with a questionnaire applied to the patients during a period of SCIT treatment. Since the symptom severity scores of the patients before the SCIT were not evaluated, it is difficult to interpret the individual level of SCIT treatment effectiveness in our study. This is the limitation of our study. However, the evaluation of both symptoms and quality of life of allergic rhinitis patients in our study is the strength of our study.

## Conclusion

In this study, as the number of SCIT injection doses increased; VAS, RCSS, PRQLQ symptom scores decreased. In other words; while the severity of clinical findings was lower in patients who are in the further stages of SCIT, their quality of life was higher. It can be interpreted that the severity of clinical findings decreases during the treatment of SCIT in patients with a diagnosis of allergic rhinitis or a combination of allergic rhinitis and asthma.

*Ethics*

*Ethics Committee Approval:* Ethics committee approval was obtained from the University of Health Sciences Turkey, Ümraniye Training and Research Hospital Ethics Committee on 29/09/2022 with decision number 310.

*Conflict of Interest:* No conflict of interest was declared by the authors.

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