

## ORIGINAL ARTICLE

# Effect of Immunotherapy on the Quality of Life in Patients with Allergic Rhinitis Sensitive to House Dust Mite

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## ABSTRACT

**Key words:**

Allergic rhinitis, House dust mite, Quality of Life, immunotherapy

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**Background:** Allergic rhinitis (AR) has serious effects on the quality of life (QoL) of patients. It leads to impairments in daily activities, work and school performance, and practical problems. **Objectives:** To assess the effects of HDM immunotherapy on the QoL in patients with AR. **Methodology:** The QoL was assessed in 120 AR patients sensitive to HDM using Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ). Patients received HDM-specific immunotherapy for 6 months after which the QoL was assessed again. **Results:** showed that rhinorrhea was the most common symptom (92.5%) while nasal itching was the least (55.8 %). After immunotherapy, a significant number of patients showed improvement of nasal obstruction and rhinorrhea. A significant improvement in the RQLQ score was also observed regarding activity limitation, sleep problems, nose symptoms, eye symptoms, practical problems and emotional function ( $p < 0.5$ ). **Conclusion:** HDM immunotherapy improves the QoL in AR patients sensitive to HDM allergens.

## INTRODUCTION

Allergic rhinitis (AR) is a common inflammatory affecting about 10 to 40% of the population worldwide<sup>1</sup>. It is induced after inhalation of allergens leading to production of an immunoglobulin E (IgE)-mediated inflammation of the nasal mucosa<sup>2</sup>. When an inhaled allergen enters the body, it leads to the release of many mediators which increase vascular permeability and cause watery nasal secretion and edema in the nasal cavity, nasal congestion, and increased mucous secretion. Moreover, sensitive nerve endings are stimulated leading to nasal itching and sneezing<sup>3</sup>.

House dust mite (HDM) allergens are major causes for the development of allergic diseases such as allergic rhinitis and asthma. Approximately 50% of patients with a clinical diagnosis of allergic rhinitis have a sensitization to HDM allergens<sup>4</sup>. Apart from allergen avoidance, pharmacotherapy and allergen-specific immunotherapy (AIT) are used for the treatment of HDM allergy. AIT aims to accomplish clinical tolerance to the causative allergens through the administration of allergen extracts to patients with allergic disease<sup>5</sup>. AIT is effective in alleviating the symptoms of AR, reducing the use of medication, and improving the quality of life. It also shows long-lasting improvement, even after cessation of the treatment<sup>6</sup>.

Symptoms of AR are always irritating and can seriously impact social functioning. It is usually

associated with impairments in daily activities, work and school performance, and practical problems. In addition, patients suffer also from sleep disturbances and emotional problems<sup>7</sup>. So, assessment of the severity of AR is based not only on the severity of symptoms but also on the impact of symptoms on the quality of life<sup>8</sup>. This study aims to assess the effects of HDM immunotherapy on the quality of life in patients with AR.

## METHODOLOGY

### Patients and study design:

A prospective comparative study was carried to assess the effects of HDM immunotherapy in improving the quality of life in allergic rhinitis patients. The study included 120 patients with perennial AR attending the otolaryngology and allergy clinics in Suez Canal University Hospitals, Ismailia, Egypt. HDM sensitization was confirmed by skin prick test. Patients of either sex with age ranging from 18 to 50 years were eligible for the study. Pregnant women and patients with other allergic diseases than AR, respiratory tract infections or chronic diseases were excluded from the study.

The patients were evaluated by full medical history and nasal examination including signs of AR as hypertrophy/pallor of the inferior turbinates, hyaline secretion and post-nasal drip. The quality of life (QoL)

was assessed for all patients before treatment. Patients were then treated by a conventional build up course of immunotherapy for 6 months after which the QoL was re-assessed. Improvement in the QoL was determined by comparing it with the baseline scores. Written informed consent was obtained from all study participants. Ethics committee of Faculty of Medicine, Suez Canal University had reviewed and approved the study.

#### Assessment of the QoL:

It was assessed by the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ)<sup>9</sup>. Each patient was asked to answer the questionnaires before starting immunotherapy. The RQLQ has 28 points in 7 domains which are activity limitation, sleep problems, nose symptoms, eye symptoms, non-nose/eye symptoms, practical problems and emotional function. A score ranging from 0 to 3 was used for each symptom; 0 for no symptoms, 1 for mild symptoms (symptom present but easily tolerated), 2 for moderate symptoms (symptom is frequently troublesome but does not interfere daily activity or sleep) and 3 for severe symptoms (symptoms that interfered with daily activity and sleep). Assessment was done before immunotherapy and after completing the 6-month course of immunotherapy.

#### HDM immunotherapy:

Patients were treated by HDM allergen-specific conventional immunotherapy (Omega, Montreal, Canada) according to the protocol of American Academy of Asthma Allergy and Immunology (AAAAI), 2011<sup>10</sup>. The treatment schedule consists of weekly subcutaneous injection for 6 months.

#### Statistical analysis:

Data input and analysis were done using Statistical Package for the Social Sciences (SPSS) version "24" computer program. All results were expressed as mean  $\pm$  standard error. Mean values of the different groups were compared using one way analysis of variance. Least significant difference (LSD) post hoc analysis was used to identify significantly different mean values. P value  $< 0.05$  was accepted to denote a significant difference.

## RESULTS

The patients included in this study were 44.17% males and 55.83% females. Their mean age was  $34.06 \pm 9.05$  and the mean duration of symptoms was  $6.2 \pm 3.5$ . Demographic characteristics of the studied group are shown in table 1.

**Table 1: Demographic characteristics of the studied patients (n=120):**

Parameter	Studied group
Age in years (Mean $\pm$ SD)	34.06 $\pm$ 9.05
Gender (%)	
• Male	53 (44.17%)
• Female	67 (55.83%)
Duration of symptoms in weeks (Mean $\pm$ SD)	6.2 $\pm$ 3.5

The frequency of AR symptoms varied in the studied population. Rhinorrhea was the most common symptom (92.5%) while nasal itching was the least (55.8 %). History of medications was present in 62.5% of patients. Table 2 shows the frequency of AR symptoms in the studied patients.

**Table 2: Frequency of AR symptoms in the studied patients:**

Symptom	Frequency
Rhinorrhea	111 (92.5%)
Nasal itching	67 (55.8%)
Nasal obstruction	95 (79.2%)
Sneezing	89 (74.2%)
Disturbance of sleep	71 (59.2%)
History of medication	75 (62.5%)

After HDM immunotherapy, a significant number of patients showed improvement of nasal obstruction and rhinorrhea. Before IT, 79.2% of the patients were complaining of nasal congestion and significantly decreased to 2.5% after IT. Also, the percentage of patients complaining of rhinorrhea significantly decreased from 92.5% to 4.2% after IT (table 3).

**Table 3: Number of patients showing nasal obstruction and rhinorrhea before and after immunotherapy:**

Parameter	Before IT	After IT	Z score	P value
Nasal obstruction	95 (79.2%)	3 (2.5%)	12.08	$<0.001^*$
Rhinorrhea	111 (92.5%)	5 (4.2%)	13.69	$<0.001^*$

\* Significant.

A significant improvement in the RQLQ score was also observed regarding activity limitation, sleep problems, nose symptoms, eye symptoms, practical problems and emotional function (table 4).

**Table 4: Assessment of quality of life by RQLQ before and after IT:**

Parameter	Before IT	After IT	X <sup>2</sup> test	P value
Activity limitation	12.3 ± 0.88	5.7 ± 0.68	4.38	<0.001*
Sleep problems	12.0 ± 0.73	3.0 ± 0.61	5.64	<0.001*
Nose symptoms	12.6 ± 0.58	5.1 ± 0.75	4.94	<0.001*
Eye symptoms	9.9 ± 1.13	3.9 ± 0.81	3.2	<0.05*
Practical problems	11.1 ± 0.98	4.18 ± 0.73	4.18	<0.001*
Emotional function	12.6 ± 0.91	6.6 ± 0.72	3.85	<0.001*

\*Significant.

Before HDM immunotherapy, most of the patients were in the scores 2 and 3 of the RQLQ domains, and after immunotherapy, their scores were decreased and most of them were in the scores 0 and 1 (table 5). No

systemic reactions occurred during the treatment course. Local swelling and erythema occurred in few cases at the site of injections which lasted for only few hours.

**Table 5: Percentage of patients in each score of the RQLQ domains before and after immunotherapy:**

RQLQ domain	Score (0)	Score (1)	Score (2)	Score (3)
<b>Activity limitation</b>				
Before	6 (5.0%)	24 (20.0%)	48 (40.0%)	42 (35.0%)
After	30 (25.0%)	56 (46.7%)	30 (25.0%)	4 (3.3%)
<b>Sleep problems</b>				
Before	1 (0.8%)	29 (24.2%)	61 (50.8%)	29 (24.2%)
After	37 (30.8%)	74 (61.7%)	9 (7.5%)	0 (0.0%)
<b>Nose symptoms</b>				
Before	7 (5.8%)	17 (14.2%)	55 (45.8%)	41 (34.2%)
After	44 (36.7%)	52 (43.3%)	21 (17.5%)	3 (2.5%)
<b>Eye symptoms</b>				
Before	26 (21.7%)	29 (24.2%)	31 (25.8%)	34 (28.3%)
After	63 (52.5%)	33 (27.5%)	22 (18.3%)	2 (1.7%)
<b>Practical problems</b>				
Before	35 (29.2%)	43 (35.8%)	29 (24.2%)	13 (10.8%)
After	51 (42.5%)	48 (40.0%)	20 (16.7%)	1 (0.8%)
<b>Emotional function</b>				
Before	2 (1.7%)	25 (20.8%)	44 (36.7%)	49 (40.8%)
After	22 (18.3%)	62 (51.7%)	34 (28.3%)	2 (1.7%)

## DISCUSSION

The current study was designed to assess the effect of HDM immunotherapy on the quality of life in patients with allergic rhinitis. The main complaint of our patients was runny nose (rhinorrhea) that was present in 92.5% of patients followed by nasal obstruction (79.2%). Nasal itching was the least presenting complaint (55.8%). A history of anti-allergy medication was present in 62.5% of patients. These results were in accordance with Jaruvongvanich *et al.*<sup>11</sup> who noticed that blocked nose, rhinorrhea and sneezing were the major symptoms of AR in more than 70% of patients with moderate severity of the disease.

After HDM immunotherapy, a significant number of patients showed improvement of nasal obstruction and rhinorrhea. The percentage of patients complaining of nasal congestion significantly decreased from 79.2% to 2.5% and those complaining of rhinorrhea decreased

from 92.5% to 4.2%. Sahin *et al.*<sup>12</sup> reported that subcutaneous immunotherapy is an effective treatment for house dust mite induced allergic rhinitis. Soh *et al.*<sup>13</sup> also stated that immunotherapy with HDM extracts is effective as a treatment for patients with house dust mite AR. Đurić-Filipović *et al.*<sup>14</sup> confirmed that subcutaneous immunotherapy reduces the symptoms of AR and the use of medicaments, and improves the quality of life of children with the diseases.

Health related quality of life (HRQOL) refers to the physical, psychological, and social domains of health, seen as distinct areas that are influenced by a person's experiences and perceptions<sup>15</sup>. There is a growing awareness of how allergy can affect the patients' quality of life, school or work performance, and emotional well-being. Besides physical symptoms, patients may exhibit irritability, psychomotor troubles, fatigue, and mood and cognitive disturbances. This combination of

physical, emotional, and functional problems may diminish HRQOL<sup>16</sup>.

In the present study, a significant improvement in the RQLQ score was observed regarding activity limitation, sleep problems, nose symptoms, eye symptoms, practical problems and emotional function. This was in agreement with Novakova *et al.*<sup>17</sup> who reported that immunotherapy with HDM extract significantly increased QoL in patients with allergic rhinitis.

Sleep disorders can impair the quality of life, leading to irritability, fatigue, memory deficits and daytime sleepiness<sup>18</sup>. Sleep disorders are related to the inability to breathe well during the night which is commonly observed in patients with AR. Studies on this topic have shown not only that the impairment of the sleep has an important impact on social life, professional skills and learning of the patients but also that the treatment of AR can improve the quality of sleep and consequently reduce all limitations secondary to the sleep disorders<sup>19</sup>.

Nasal and ocular symptoms that occur in AR can cause concentration impairments during the daytime and also sleep disturbances during night. The outcomes of this condition, including chronic fatigue, loss of appetite, decreased school success, and unemployment, impair the quality of life prominently<sup>3</sup>. Storms *et al.*<sup>20</sup> reported that chronic nasal obstruction has a significant impact on sleep quality, daytime achievement and quality of life. It can also lead to extra-nasal symptoms such as dry mouth and mouth breathing, especially at nighttime, and consequently contribute to daytime sleepiness and fatigue. In general, the patients feel inconvenienced by the symptoms particularly by the nasal obstruction, rhinorrhea and sneezing<sup>15</sup>.

In the study of Camelo-Nunes and Sole, they reported that patients with AR also experience non-nasal symptoms that cause discomfort, such as thirst, headache and inability to concentrate. They describe certain practical problems quite irritating, such as the need to carry tissues or handkerchiefs and to frequently blow their nose. They present with limitations in their activities of daily living, which leaves them irritated and frustrated<sup>21</sup>. Allam *et al.* reported elevated level of IL-9 in AR patients which is significantly associated with the nasal obstruction and also with the irritating symptoms<sup>22</sup>. Moreover, Meltzer *et al.* found that symptoms of AR may predispose adults and children to a variety of comorbid conditions including sinusitis, otitis media, asthma, and frequent respiratory infections which may have further impact on HRQL<sup>23</sup>.

Cox *et al.* demonstrated the superior clinical efficacy of allergen immunotherapy compared with symptomatic drug therapy in improving quality of life and cost effectiveness, and hence allergen immunotherapy became an important choice to patients and healthcare decision-makers<sup>24</sup>. In the present work, no systemic reactions occurred during the treatment course. Local

swelling and erythema occurred in few cases at the site of injections which lasted for only few hours. It was in agreement with Rogala *et al.* who evaluated the side effects of conventional subcutaneous allergen immunotherapy in inhalant allergy and reported that it is a safe method of treatment in inhalant allergy<sup>25</sup>. Fortunately, the study of Elazab concluded that allergen immunotherapy is not affected by nasal carriage of *Staphylococcus aureus* (NCSA)<sup>26</sup>, and hence both NCSA-positive and NCSA-negative patients can enjoy improvement of their QoL after immunotherapy.

We concluded that allergic rhinitis impairs the quality of life in AR patients especially who are sensitive to inhalant allergens as house dust mite. HDM immunotherapy is a safe and effective treatment that improves the quality of life in AR patients sensitive to HDM allergens.

**Conflicts of interest:** The authors declare that they have no financial or non financial conflicts of interest related to the work done in the manuscript.

- Each author listed in the manuscript had seen and approved the submission of this version of the manuscript and takes full responsibility for it.
- This article had not been published anywhere and is not currently under consideration by another journal or a publisher.

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