

# Evaluation of Quality of Life: Impact of Allergic Rhinitis on Asthma

AF Kalpaklıoğlu, A Baççioğlu

Department of Allergic Diseases, Kırıkkale University Hospital, Kırıkkale, Turkey

## ■ Abstract

*Background:* Health-related quality of Life (HRQOL) has been considered an important variable to be managed in airway diseases. Allergy and asthma can reduce HRQOL as a result of profound physical and psychosocial complications. Most patients with asthma also suffer from rhinitis, which also impairs quality of life. However, the impact of allergic rhinitis on asthmatic patients has not been investigated.

*Objective:* Our objective was to evaluate HRQOL in patients with asthma alone, allergic rhinitis alone, or both diseases.

*Methods:* We compared HRQOL in 316 patients with both diseases or either asthma or rhinitis using the Short Form-36 questionnaire. Data were also collected on patients' sociodemographic characteristics, atopic state, body mass index (BMI), and education.

*Results:* A total of 232 patients with allergic rhinitis, 40 with asthma, and 44 with both diseases were enrolled. The mean (SD) age was 32 (13) years and 65% were females. HRQL was significantly lower in patients with asthma, with or without rhinitis, than in those with allergic rhinitis alone. Female sex, older age, increased BMI and less educational status were found to be the major determinants of impaired quality of life in patients with allergic rhinitis or asthma.

*Conclusions:* The impact of rhinitis on asthma seems to play a minor role in HRQOL.

**Key words:** Allergic rhinitis. Asthma. Quality of life.

## ■ Resumen

*Antecedentes:* La calidad de vida relacionada con la salud (CVRCS) se ha considerado una variable importante a tener en cuenta en las enfermedades de las vías respiratorias. La alergia y el asma pueden reducir la CVRCS, debido a complicaciones físicas y psicosociales importantes. La mayoría de los pacientes con asma también padecen de rinitis, que también perjudica la calidad de vida. No obstante, no se ha investigado el impacto de la rinitis alérgica en los pacientes asmáticos.

*Objetivo:* Nuestro objetivo fue evaluar la CVRCS en pacientes con sólo asma, sólo rinitis alérgica y con ambas enfermedades.

*Métodos:* Comparamos la CVRCS en 316 pacientes con ambas enfermedades o con sólo asma o sólo rinitis, utilizando un cuestionario de salud genérico (Short Form-36). Se recogieron datos sobre las características sociodemográficas de los pacientes, su estado atópico, el índice de masa corporal (IMC) y su nivel cultural.

*Resultados:* Se incluyó un total de 232 pacientes con rinitis alérgica, 40 con asma y 44 con ambas enfermedades. La media (DE) de edad fue de 32 (13) años y el 65% eran mujeres. La CVRCS fue significativamente más baja en pacientes con asma, con o sin rinitis, que en los pacientes con rinitis alérgica sólo. Se observó que los factores determinantes de una calidad de vida alterada en pacientes con rinitis alérgica o asma fueron ser mujer, tener una edad avanzada, un IMC elevado y un menor nivel cultural.

*Conclusiones:* El impacto de la rinitis en el asma parece tener un papel menor en la CVRCS.

**Palabras clave:** Rinitis alérgica. Asma. Calidad de vida.

## Introduction

Evaluation of health related quality of life (HRQOL) provides a primary outcome measure in patients with chronic diseases. This focus on the patient's view of the outcomes of health care has increased both in clinical research and in practice during the last

3 decades, and awareness that HRQOL is an important issue to be managed has made its way into consensus reports [1]. Allergy and asthma are very common conditions that are recognized as causes of reduced quality of life. It was not until the early 1990s, however, that HRQOL questionnaires were introduced into the study and management of asthma and rhinitis [2,3].

Asthma and allergic rhinitis frequently co-occur [4] because both diseases share key elements of pathogenesis and are usually considered different manifestations of the same underlying atopic state [5]. Awareness of the impact of rhinitis on asthma has grown and epidemiological and clinical studies suggest that appropriate treatment of allergic rhinitis results in improvements in asthma symptoms and lower airways function [6,7]. Asthmatic symptoms lead to impairment in the physical, emotional, and social aspects of a patient's life. Likewise, in allergic rhinitis, allergic and non-nasal symptoms from allergen exposure result in difficulties. Both physical and mental health measures have been found to be adversely affected in patients with allergic rhinitis, in a population-based study [8].

Although clinical and experimental studies suggest that upper respiratory tract dysfunction may affect the lower airways, rhinitis has not been explored thoroughly as a potential risk factor for HRQOL impairment in asthma. Thus, the primary aim of this study was to assess the burden of upper airway disease on HRQOL and to evaluate the relative impact of allergic rhinitis in asthmatics. Furthermore, the main contributory factors of HRQOL have been determined.

## Patients and Methods

This was a prospective study of 316 patients enrolled from among 481 initially referred for outpatient clinic evaluation of allergy or asthma; eligible patients were diagnosed with either disease or both. The protocol for this study was approved by the hospital ethics committee, and all patients gave their informed consent.

### Study Design

We evaluated HRQOL in patients with allergic rhinitis, with asthma only, and those with rhinitis and concomitant asthma.

Demographic data of the study groups were collected. A diagnosis of asthma was made according to the American Thoracic Society criteria based on symptoms of episodic wheezing, cough and shortness of breath responding to bronchodilators, and reversible airflow obstruction documented in at least 1 previous pulmonary function study [9]. Rhinitis was diagnosed if any symptoms of rhinorrhea, nasal obstruction or itching, or sneezing were documented [10]. Independent variables examined were age, gender, allergen sensitization, body mass index (BMI), educational status as defined by years of schooling, and duration of symptoms. All patients were skin tested in order to confirm possible sensitization to allergens. Skin prick tests (SPT) were performed with a battery of common inhalant allergens (ALK, Madrid, Spain). Histamine hydrochloride 10 mg/mL and phenolated glycerol-saline served as positive and negative controls. The serum level of immunoglobulin E (IgE) was measured. The BMI was calculated by dividing the weight in kilograms by the square of the height in meters.

Subjects who consented to the study were instructed to self-administer a generic 36-item short form health questionnaire

(SF-36), which is based on the Medical Outcomes Study. The SF-36 assesses 8 health concepts as measures of physical and mental health in 8 domains with multiple items: physical functioning, limitations due to physical health problems (role-physical), bodily pain, general health, vitality, social functioning, limitations due to emotional health problems (role-emotional), and mental health [11]. The SF-36 was designed for use in clinical practice and research, health policy evaluations, and general population surveys. In addition to the 8 separate scales, 2 general domain measures were used to provide summary scores: the physical component summary (PCS) and the mental component summary (MCS). Higher scores represent better health status. The general health perceptions scale of the SF-36 questionnaire is multidimensional and represents multiple aspects of health perceptions. Self-completion was encouraged wherever possible although a standardized interview was conducted if necessary. The SF-36 has been validated for the Turkish language [12].

### Statistical Analysis

Statistical analysis was performed using SPSS statistical software, version 10.0 (SPSS Inc, Chicago, Illinois, USA). Differences between qualitative variables were studied by means of the  $\chi^2$  test. For the normally distributed quantitative variables one-way analysis of variance (ANOVA) was used to compare results. Continuous variables were described as means (SD). Multivariate ANOVA was performed with the post-hoc Bonferroni correction for multiple comparisons of age, duration of symptom(s), PCS, and MCS as well as scores on the 8 SF-36 domains. As total serum IgE findings did not follow a normal distribution, comparisons between the 3 study groups were made using a Kruskal-Wallis non-parametric test. Statistical significance was set at  $P < .05$ .

## Results

### Characteristics of the Study Population

Characteristics of the 316 patients are summarized in Table 1. Females predominated and ages ranged from 10 to 69 years. Most of the patients were diagnosed with allergic rhinitis, while diagnoses of asthma alone and both diseases together were equally distributed, with no difference between the genders.

Patients with allergic rhinitis alone were significantly younger and the onset of their symptoms was more recent (shorter duration). SPT positivity was more prominent in patients with rhinitis and in those with co-occurring asthma, compared to asthma alone ( $P = .0001$ ). Neither the ratio of females to males nor the total serum IgE levels differed between the groups.

Patients with asthma either with or without rhinitis tended to be overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) ( $P = .0001$ ).

Two thirds (66%) of the patients had more than 8 years of education (21% high school graduates, 45% university graduates). Allergic rhinitis patients were more likely to be more educated compared to subjects with asthma alone or with rhinitis plus asthma ( $P = .002$ ). More than half the patients with

Table 1. Characteristics of the Study Population

	Total (n = 316)	Allergic Rhinitis (n = 232, 73%)	Asthma (n = 40, 13%)	Allergic Rhinitis + Asthma (n = 44, 14%)	P
Age, mean (SD), y	31.8 (12.6)	29.6 (11.7)	37.4 (12.2)	38.7 (13.9)	.0001 <sup>a</sup>
Sex, n (%)					.132
Male	111 (35)	89 (38)	10 (25)	12 (27)	
Female	205 (65)	143 (62)	30 (75)	32 (73)	
Duration of symptoms, mean (SD), y	6.2 (5.7)	5.3 (4.8)	9.7 (7.8)	8 (6.8)	.0001 <sup>a</sup>
Total IgE, median (range), IU/mL	106 (2-325)	102 (2-325)	126 (3-319)	112 (21-300)	.855
Skin Prick Test, n (%)					.0001 <sup>b</sup>
Positive	225 (72)	177 (77)	18 (46)	30 (68)	
Negative	89 (28)	54 (23)	21 (54)	14 (32)	
BMI, mean (SD), kg/m <sup>2</sup>	25 (5)	24 (4.5)	27.7 (5.2)	27.2 (5.4)	.0001 <sup>a</sup>
BMI < 25, n (%)	167 (59)	138 (67)	13 (34)	16 (39)	
BMI ≥ 25, n (%)	118 (41)	68 (33)	25 (66)	25 (61)	
Education, n (%), y					.002 <sup>a</sup>
0-8	107 (34)	63 (27)	20 (50)	23 (52)	
9-11	68 (21)	51 (22)	9 (22)	8 (18)	
≥ 12	141 (45)	117 (51)	11 (27)	13 (29)	

Abbreviations: BMI, body mass index; IgE, immunoglobulin E.

<sup>a</sup>Significant ( $P < .05$ ): allergic rhinitis vs the other 2 groups, by analysis of variance.

<sup>b</sup>Significant ( $P < .05$ ): asthma vs the other 2 groups, by the  $\chi^2$  test.

rhinitis were university graduates (51%), whereas almost half of the asthmatic patients, and subjects with both allergic rhinitis and asthma had 8 years of education or less.

HRQOL was significantly different between the 3 groups, except for the role-emotional SF-36 domain (Table 2). Significantly higher scores were found among allergic rhinitis patients. Although, quality of life was worse in asthmatic patients compared to patients with rhinitis alone, no significant difference was found between asthmatics and those with both diseases. Mean scores on the SF-36 sub-scales for physical functioning, role-physical, bodily pain, and role-emotional were slightly lower for patients with both diseases than for asthmatic patients, but the difference was not significant (Table 2, part A).

Both PCS and MCS scores differed between the study populations. Although asthmatic patients with or without rhinitis tended to have lower PCS and MCS scores than subjects with isolated allergic rhinitis, the difference between the groups was statistically significant only for PCS scores (Figure 1).

Because females were almost twice as common as males in the study population, particular attention was given to potential confounding by gender in all analyses. All the measures of the SF-36, except for social functioning, were significantly lower in female subjects ( $P = .216$ ).

Individuals with a BMI of less than 25 kg/m<sup>2</sup> had better HRQOL, and significant differences were noted in physical

and social functioning, and role-physical domains ( $P = .001$ ,  $P = .014$ , and  $P = .044$ , respectively).

There was no significant difference between the patients with regard to positive and negative SPT results. Increasing age and duration of symptoms were inversely related to all measures (results not shown).

Educational level was positively correlated with better HRQOL except for the role-physical and social domains (Table 2, part B). Patients with less than 9 years of education were found to have significantly impaired HRQOL for all measures except social functioning and mental health.

## Discussion

Over the last decade, the united airway concept has indicated significant similarities between rhinitis and asthma and influenced ideas about their pathophysiology. Therefore, the united airways concept calls for a special approach to the management of these diseases [13]. Asthma and allergic rhinitis have common risk factors and are often associated [4,5,14]. The statement of the working group on Allergic Rhinitis and its Impact on Asthma (ARIA) and many other publications about the relation between rhinosinusitis and lower airway disease have emphasized the need to take the entire respiratory system into account when treating asthma [10].

Table 2. Health-Related Quality of Life Scores on the SF-36, by Subjects' Characteristics<sup>a</sup>

	SF-36 Domains							
	Physical Functioning	Role Physical	Bodily Pain	General Health	Vitality	Social Functioning	Mental Health	Role-Emotional
<b>A</b>								
Total (n = 316)	80 (22)	59 (41)	68 (25)	55 (20)	54 (22)	74 (25)	62 (21)	69 (39)
Disease groups								
Allergic rhinitis	83 (20)	64 (39)	70 (24)	57 (19)	56 (22)	76 (24)	64 (21)	70 (38)
Asthma	71 (22)	49 (45)	61 (22)	48 (20)	46 (22)	64 (28)	53 (23)	72 (39)
Allergic rhinitis + Asthma	70 (24)	39 (44)	59 (30)	53 (22)	50 (23)	69 (24)	62 (20)	60 (45)
<i>P</i>	.0001 <sup>b</sup>	.0001 <sup>c</sup>	.005 <sup>c</sup>	.031 <sup>d</sup>	.011 <sup>d</sup>	.011 <sup>d</sup>	.008 <sup>d</sup>	.216
<b>B</b>								
Gender								
Male	84 (19)	65 (40)	74 (22)	61 (19)	61 (22)	77 (22)	69 (20)	77 (35)
Female	77 (23)	55 (42)	64 (26)	52 (20)	50 (21)	72 (26)	59 (21)	65 (41)
<i>P</i>	.009 <sup>e</sup>	.037 <sup>e</sup>	.0001 <sup>e</sup>	.0001 <sup>e</sup>	.0001 <sup>e</sup>	.063	.0001 <sup>e</sup>	.009 <sup>e</sup>
BMI, Kg/m								
< 25	83 (21)	63 (40)	70 (22)	56 (19)	56 (21)	77 (22)	64 (19)	73 (37)
≥ 25	74 (23)	53 (43)	64 (29)	52 (21)	51 (23)	69 (27)	59 (23)	66 (42)
<i>P</i>	.001 <sup>e</sup>	.044 <sup>e</sup>	.055	.145	.082	.014 <sup>e</sup>	.064	.140
Skin Prick Test								
Positive	81 (20)	60 (41)	64 (26)	57 (20)	55 (23)	75 (25)	64 (22)	70 (39)
Negative	78 (24)	57 (43)	69 (25)	53 (20)	53 (21)	73 (25)	61 (20)	70 (40)
<i>P</i>	0.196	0.581	0.109	0.116	0.404	0.651	0.256	0.994
Education (years)								
0-8	73 (25)	53 (42)	60 (28)	50 (21)	49 (21)	71 (28)	58 (22)	56 (44)
9-11	83 (16)	60 (39)	73 (20)	59 (20)	60 (19)	74 (22)	66 (20)	77 (36)
≥ 12	84 (21)	63 (42)	74 (23)	57 (19)	55 (24)	76 (24)	65 (22)	76 (36)
<i>P</i>	.0001 <sup>b</sup>	.008 <sup>b</sup>	.0001 <sup>b</sup>	.008 <sup>b</sup>	.005 <sup>d</sup>	.205	.17	.0001 <sup>b</sup>

Abbreviations: BMI, body mass index; SF-36, Short-Form 36 questionnaire.

<sup>a</sup>All results are expressed as mean (SD).

<sup>b</sup>Significant ( $P < .05$ ): allergic rhinitis vs the other 2 groups, by analysis of variance (ANOVA).

<sup>c</sup>Significant ( $P < .05$ ): allergic rhinitis group vs rhinitis plus asthma group, by ANOVA.

<sup>d</sup>Significant ( $P < .05$ ): allergic rhinitis group and the asthma group, by ANOVA.

<sup>e</sup>Significant ( $P < .05$ ),  $\chi^2$  test.

HRQOL is a major outcome in both asthma and rhinitis [15,16]. Asthma represents a global health problem because it interferes with psychological well-being and activities of daily living and affects social as well as economic outcomes [17]. There is a growing awareness of how allergy and asthma can affect patients' quality of life, work or school performance, and emotional well-being. Besides physical symptoms, patients may exhibit fatigue, psychomotor sluggishness, irritability, and mood and cognitive disturbances. This combination of physical, emotional, and functional problems may diminish HRQOL [2].

However, the impact of rhinitis on HRQOL in asthma has rarely been investigated [18], a situation that led to the design of our study. We have now shown that all but 1 of the SF-36 domains have higher scores in patients with allergic rhinitis than in those with asthma alone or both diseases. Allergic rhinitis alone tended to be slightly associated with impaired HRQOL in relation to mental health as seen by a nonsignificantly lower MCS. However, this investigation was

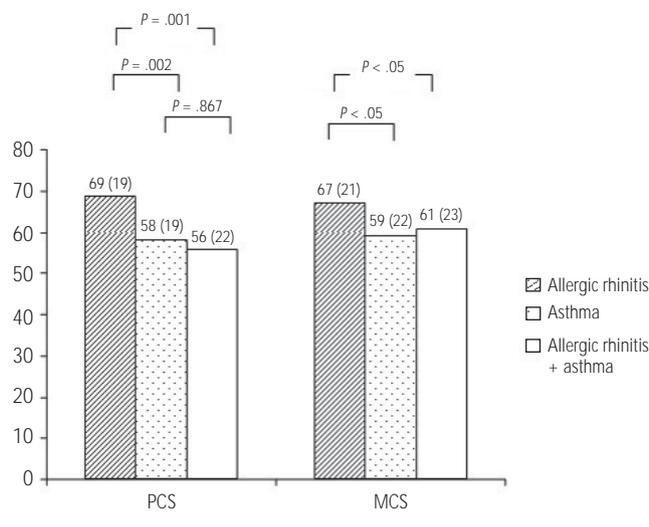


Figure. Mean (SD) physical component summary (PCS) and mental component summary (MCS) health related quality of life scores in the 3 study groups.

performed principally to test the hypothesis that HRQOL is lower in comorbid patients than in patients suffering from isolated disease states. The results indicate that allergic rhinitis does not seem to further impair quality of life in subjects with asthma.

Patients with allergic rhinitis were shown to experience limitations in daily activities, as well as changes in mood and cognitive behavior [19,20]. In contrast, patients with asthma are more likely to have problems with physical activities. This is consistent with our findings that all asthmatic subjects (with or without allergic rhinitis) had significantly greater impairment in physical measures whereas mental health scores in patients with isolated allergic rhinitis were lower than those of asthmatic subjects.

Although there are many studies of HRQOL in patients with allergic rhinitis and patients with asthma, very few have assessed the relative burden of these disease states in a single population. Leynaert and coworkers [21] showed that asthma did not impair HRQOL in patients with rhinitis for concepts primarily related to mental health.

The classical approach to estimate impairment in HRQOL across the borders of disease comprises the use of generic questionnaires. The SF-36 is a widely used generic tool for determining the relative burden of different diseases [11]. In the present study, this comprehensive, reliable, and valid questionnaire was used. Although cross-sectional and longitudinal surveys with this instrument have shown impairment in allergy and asthma, ours is one of the few studies—at least to our knowledge—that evaluates the impact of rhinitis on HRQOL in asthma. Furthermore, little is known about the major correlates of quality of life among patients with allergic asthma symptoms [22]. In this study, several factors have been shown to be important determinants of HRQOL. Older age and longer duration of symptoms were risk factors for reduced HRQOL, particularly in patients with isolated asthma, as they were the oldest group with the longest duration of symptoms. Although significantly impaired quality of life in asthmatic patients with or without rhinitis was assessed, the possible contribution of the relatively younger mean age of rhinitis patients could not be ignored. We also found that the relationship between allergic rhinitis and HRQOL was stronger in women than in men, due to more severe disease seen in women.

Patients with a BMI less than 25 kg/m<sup>2</sup> were shown to have better SF-36 scores in all domains, such that a higher BMI was associated with impairment, as was shown for the first time by our group in another study [23]. Findings from the behavioral risk factor surveillance system showed that BMI is one of the determinants that are associated with HRQOL in asthma, whereas elderly and female patients are likely to experience impairment in quality of life, consistent with our results [24].

In our study, no difference was found between nonatopic subjects and atopic ones as demonstrated by SPT positivity. When Cirillo et al [25] explored the relationship between HRQOL and sensitization in a group of young men with intermittent asthma, however, they found that polysensitization was significantly associated with the worst HRQOL.

We also found that educational level contributed to HRQOL. Most of our patients had had more than 8 years of

education. Patients with allergic rhinitis were more likely to be highly educated as half of them were university graduates (51%), whereas half of the patients with asthma and/or rhinitis were poorly educated ( $\leq 8$  years). The association between a higher educational level and less impairment in HRQOL we demonstrated is consistent with the literature [26].

In conclusion, quality of life was significantly impaired in patients with asthma with or without rhinitis than in those with allergic rhinitis only. However the results of our study suggest that the impairment in HRQOL seen in asthmatic patients may be similar to or not greater than that experienced by the patients with “one airway disease.” The major determinants of impaired HRQOL are female sex, higher BMI, and older age as a reflection of the duration of the disease. Further investigation with larger populations is needed in order to determine the extent to which asthma and rhinitis comorbidities are associated in HRQOL.

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■ **AF Kalpaklıoğlu**

Pak sokak No 3/100 Portakal Çiçeği Vadisi Çankaya  
Ankara 06690, Turkey  
E-mail: afusunk@yahoo.com