ORIGINAL ARTICLE

Main Contributory Factors on Asthma Control and Health-Related Quality of Life in Elderly Asthmatics

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J Investig Allergol Clin Immunol 2020; Vol. 30(4): 264-271
doi: 10.18176/jiaci.0430

Abstract

Objective: To assess the main factors involved in asthma control and health-related quality of life in elderly asthmatic patients.
Methods: We performed a retrospective case-control study nested in a historical cohort that compared patients who had partly controlled or uncontrolled asthma (Asthma Control Test [ACT] score ≤19) (cases) with patients who had well-controlled asthma (ACT ≥20) (controls). Clinical data were collected from medical records. Outcomes included ACT score and health-related quality of life (Asthma-Specific Quality of Life Questionnaire [AQLQ]). Pulmonary function was determined by spirometry.
Results: We evaluated 209 asthma patients (151 women) aged ≥65 years. Mean age was 73.55 years. Most patients had persistent moderate (47.60%) or severe (47.12%) asthma. A total ACT score ≤19 was obtained in 64 (30.62%) patients. Lack of adherence to treatment and presence of severe exacerbations were risk factors for partly controlled/uncontrolled asthma (OR, 8.33 and 5.29, respectively). In addition, for each additional unit score in the AQLQ, the risk of poor control increased by 1.51. The factors influencing the AQLQ score were asthma control (ACT) and presence of comorbidities such as depression, gastroesophageal reflux disease, and osteoporosis.
Conclusions: Despite receiving antiasthma therapy, almost one-third of elderly patients had uncontrolled asthma, possibly as a result of poor adherence, exacerbations, and reduced health-related quality of life. Nonrespiratory comorbid conditions in older patients do not seem to be associated with worse control of asthma symptoms, although their effect on health-related quality of life could indirectly affect asthma control.

Key words: Elderly asthma. Asthma control. ACT. Comorbidity. Health-related quality of life. AQLQ. Treatment adherence.

Resumen

Objetivo: Evaluar los principales factores que contribuyen al control del asma y la calidad de vida relacionada con la salud en personas asmáticas de edad avanzada.
Métodos: Estudio retrospectivo de casos y controles anidado en una cohorte histórica que comparó pacientes con asma mal o parcialmente controlada (ACT ≤19) (casos) con pacientes que tenían buen control del asma (ACT ≥20) (controles). Los datos relativos a las características clínicas se obtuvieron de las historias clínicas. Los resultados incluyeron los resultados del ACT (test de control de asma) y AQLQ (cuestionario de calidad de vida específica de asma). La función pulmonar se determinó mediante espirometría.
Resultados: Se evaluaron 209 pacientes (151 mujeres) ≥65 años con asma. La edad media fue de 73,55 años. La mayoría de los pacientes tenían asma persistente moderada (47,60%) o grave (47,12%). Se obtuvo una puntuación total de ACT ≤19 en 64 pacientes (30,62%). La falta de adherencia al tratamiento y la presencia de exacerbaciones graves se comportaron como un factor de riesgo para el asma parcialmente o mal controlada (OR 8,33 y OR 5,29, respectivamente). Además, por cada unidad de mayor puntuación en el AQLQ, el riesgo de un control deficiente aumentó 1,51. Los factores que influyeron en el AQLQ fueron el control del asma (ACT) y la presencia de comorbilidades como depresión, ERGE y osteoporosis.
Conclusiones: A pesar de haber recibido tratamiento antiasmático, casi un tercio de los pacientes de edad avanzada tenía asma no controlada. Se debe tener en cuenta factores relacionados con la adherencia al tratamiento, las exacerbaciones y la calidad de vida relacionada con la salud. Las afecciones comórbidas no respiratorias en pacientes de edad avanzada no parecen estar asociadas con un peor control de los síntomas del asma, pero su influencia en la calidad de vida relacionada con la salud podría afectar indirectamente el control del asma.

Palabras clave: Asma en edad avanzada. Control de asma. ACT. Comorbilidad. Calidad de vida relacionada con la salud. AQLQ. Adherencia a tratamiento.

Introduction

Asthma is a complex chronic disease affecting patients of all ages. In the elderly, it is frequently underdiagnosed and undertreated, thus affecting asthma morbidity and mortality rates in this population [1-3]. Treatment is often suboptimal in elderly patients owing to underassessment of asthma control/severity by clinicians [1]. In addition, multiple patient factors may lead to suboptimal disease control, including misunderstanding of asthma as a disease and the treatment regimen, poor adherence, comorbidities, decreased cognitive or physical capabilities, and socioeconomic challenges [3-6]. Although comorbidity and polypharmacy are considered to be major reasons for poorer control of asthma in older adults, no conclusive evidence exists to support these assumptions [7] and little is known about the co-occurrence of multiple chronic diseases with asthma in the elderly.

Comorbidities have an impact on the course of asthma and affect patients' quality of life (QOL) [8,9]. QOL is impaired in elderly people with a diagnosis of asthma [2,9,10]. The impairment may be influenced by age, asthma severity, duration of illness, socioeconomic conditions, somatic comorbidities, and the presence of psychological factors such as anxiety and depression [2,9-15]. In recent years, there has been increased interest in the subjective QOL of patients with bronchial asthma. QOL is a significant indicator for guiding the efforts of professionals caring for patients, especially chronically ill ones. The identification of factors affecting patient-reported QOL—irrespective of their existing condition—is important and useful when attempting to provide multidisciplinary care. However, the patient's perspective about asthma and its treatment in specific populations such as the elderly have received little attention [16].

The aim of our study was to assess the main factors contributing to asthma control and health-related QOL (HRQOL) in elderly persons.

Methods

Study Subjects and Collection of Data

We performed a retrospective case-control study nested in a historical cohort. We compared patients who had partly controlled or uncontrolled asthma (Asthma Control Test [ACT] ≤19) (cases) with patients who had controlled asthma (ACT ≥20) (controls).

We included 209 consecutive patients aged ≥65 years and diagnosed with asthma in the Allergy Department of Hospital Universitario 12 de Octubre, Madrid, Spain. The diagnosis was supported by a compatible clinical history (dyspnea, chest tightness, coughing, and wheezing) and the positive outcome of an objective diagnostic test (on enrolment or based on historical data in the medical record). The tests included spirometry with reversibility testing, defined as at least 12% and a 200-mL increase in forced expiratory volume in 1 second (FEV_1) from baseline, diagnostic methacholine challenge, or historical data of reversibility of FEV_1 after oral corticosteroid trial and/or diffusion test in a patient with persistent FEV_1/forced vital capacity (FVC) <70 and/or FEV_1 <80%. Current smokers were excluded. Patients unable to perform spirometry or with no recent lung function data were not included in the study.

The study protocol was reviewed and approved by the Ethics Committee of Hospital Universitario 12 de Octubre, Madrid (CEIC 14/175).

Assessments

We collected self-reported age at onset of asthma, disease duration, severe asthma exacerbations in the previous year (defined as asthma exacerbations requiring an emergency department visit and/or hospitalization), and comorbidities. Height and weight data were collected from medical records, and body mass index (BMI) was defined as weight divided by height squared, with obesity considered a BMI ≥30.

Treatments received for longstanding asthma (short-acting β_2-agonists, inhaled corticosteroids, long-acting β_2-agonists, combinations, and other treatments) were recorded. The daily dosage of inhaled corticosteroid was expressed as low, medium, or high according to the GINA 2006 classification [17]. Adherence to treatment (self-reported) and inhalation technique (evaluated by the doctor) were collected from the clinical history. Atopy was assessed (at enrolment or based on data from the clinical history) by skin prick testing to a panel of common aeroallergens including pollens, molds, house dust mite, and pet dander. A positive skin prick test was defined as a wheal at least 3 mm larger than the diameter of the negative control. Asthma severity was classified following the GINA 2006 criteria based on frequency of symptoms, night-time awakenings, use of short-acting β_2-agonists, interference with normal activity, and lung function for patients who were not taking long-term control medications on enrolment or determined by the lowest level of treatment required to maintain control in those taking long-term control medication [17].

Pulmonary function was assessed using spirometry as a part of routine medical assessment according to the standardized technique [18]. Parameters of lung function such as FVC, FEV_1, and FEV_1/FVC in 2009 (baseline spirometry) were obtained using a Jaeger Pneumotach device (Viasys Healthcare GmbH). Clinical control status in 2009 was evaluated using the validated Spanish version [19] of the ACT [20], and HRQOL was evaluated using a validated Spanish version [21] of the Asthma-Specific Quality of Life Questionnaire (AQLQ) of Marks et al [22].

Inhaler technique was checked by the doctor/nurse as a part of routine medical check-up.

Assessment Scales

The ACT [20] is designed to measure asthma control without using pulmonary function values. The cut-off points are ≥20 for well-controlled asthma, 16-19 for partly controlled asthma, ≤15 for uncontrolled asthma [17].

The AQLQ of Marks et al [22] is a 20-item self-administered questionnaire, which covers 4 dimensions (breathlessness, mood, social limitation, and worrying) and gives a total score and subscale scores. Patients have to respond to a series of statements describing the way in which asthma (or its treatment) affects them and indicate which option most applies to them over the previous 4 weeks. A score of 10

corresponds to maximum impairment of quality of life and a score of 0 corresponds to no impairment.

Statistical Analysis

Descriptive bivariate and multivariate analyses were conducted in order to identify factors associated with asthma control and asthma-related QOL.

Data are expressed as mean (SD), percentage, and 95%CI, where appropriate. The χ^2 test (with a contingency table), Mann–Whitney test, or *t* test was used to compare 2 groups. The Kruskal-Wallis and ANOVA test were used for more than 2 independent groups with a nonnormal and normal distribution, respectively. Correlations between variables were calculated using the Spearman coefficient or Pearson R^2.

Multivariate analysis was performed using multiple linear regression for the AQLQ (total score and domain scores) as dependent variables. Logistic regression was used when poor control of asthma was analyzed as a dichotomous variable with the independent variables being all those that were statistically significant in the bivariate analysis or whose clinical implication was plausible. The results of the multivariable model were presented as the coefficient, SD, and *P* value. Statistical significance was set at $P<.05$.

The statistical tests were performed using Stata Data Analysis and Statistical Software (Version 10, StataCorp LP).

Results

Characteristics of the Study Population

We successfully evaluated 209 asthmatic patients (149 women and 60 men) aged ≥65 years. In the population studied, asthma was more common in women, mainly with an intrinsic profile (nonallergic) and generally as long-standing disease, with onset in middle age. The mean (SD) age of participants was 73.55 (5.44) years, and 20.57% (n=43) were former smokers (at least 1 year). The mean age at onset of asthma was 46.76 (15.76) years. Mean age at onset of asthma was 43.51 (14.68) years in men and 48.08 (16.05) years in women ($P=.048$). Long-standing asthma with onset before 65 years of age was recorded in 180 patients (87.98%) and late-onset asthma (over 65 years of age) in 25 patients (12.02%). There were more women in the late-onset asthma group ($P=.014$).

According to the GINA 2006 classification, most patients had persistent-moderate asthma (99 patients; 47.37%) or severe asthma (98 patients; 46.89%). During the preceding

Table 1. Demographic, Clinical, and Functional Data

N=209	No. (%) or Mean (SD)		No. (%)
Male/Female	60/149 (28.7/71.3)	Degree of asthma severity	
Age, y	73.55 (5.44)	Intermittent	3 (1.44)
Duration of disease	26.77 (15.38)	Mild-persistent	7 (3.35)
Atopy	70 (33.49)	Moderate-persistent	99 (47.37)
Comorbidity		Severe-persistent	98 (46.89)
Obesity (BMI ≥30)	84 (40.19)	Not known	2 (0.96)
Hypertension	124 (59.33)	Prescribed treatment (%)	
Hypercholesterolemia	57 (27.27)	Inhaled corticosteroids-LABA	189(90.43)
Ischemic cardiomyopathy	21 (10.05)	Leukotriene modifiers	80 (38.28)
Heart arrhythmias	22 (10.53)	Anticholinergics	36 (17.22)
Thyroid disease	28 (13.40)	Inhaled corticosteroid dose	
Other cardiovascular disease[a]	30 (14.35)	Low	35 (17.16)
Glaucoma	21 (10.05)	Medium	71 (34.80)
Arthrosis	148 (70.81)	High	98 (48.04)
Osteoporosis	95 (45.45)	Pulmonary function	
Obstructive sleep apnea	7 (3.35)	FEV_1/FVC (%)	
Other respiratory diseases[b]	35 (16.75)	≥70	135 (64.59)
Rhinitis	139 (66.51)	<70	74 (35.41)
Sinonasal polyposis	50 (23.92)	FEV_1 (%)	
Gastroesophageal reflux	101 (48.33)	<60	9 (4.31)
Depression	61 (29.19)	60-80	54 (25.84)
AERD	23 (11.00)	>80	146 (69.86)
		Severe exacerbations	23 (11.00)

[a]Heart failure, structural heart diseases.
[b]History of tuberculosis, bronchiectasis, or pulmonary embolism.
Abbreviations: AERD, aspirin-exacerbated respiratory disease; BMI, body mass index; LABA, long-acting $ß_2$-agonists.

year, 23 patients (11%) had severe exacerbations requiring at least 1 emergency department visit and/or hospitalization. As for adherence, 92.34% reported taking the treatment prescribed by their doctors. Most patients experienced comorbidities, with a median of 4 coexisting conditions. Acceptable spirometry values were collected in all patients. Most patients (69.68%, 146 patients) had an FEV_1 >80% predicted, 25.84% (54 patients) had an FEV_1 of 60%-80% predicted, and 4.31% (9 patients) had an FEV_1 <60% predicted. In patients with persistent obstruction (defined as FEV_1/FVC <70% and/or FEV_1 <80% according to their clinical history [n= 24]), diffusion test results were normal in 14 (of whom 6 were ex-smokers); the remaining patients had an unequivocal history of long-standing asthma (allergic asthma or aspirin-exacerbated respiratory disease [AERD] with documented variability in FEV_1).

Demographic, clinical, and functional data are summarized in Table 1.

Table 2. Asthma Control and Factors Affecting Asthma Control

	Level of Asthma Control		*P* Value		Level of Asthma Control		*P* Value
	ACT ≤19 (n=64)	ACT ≥20 (n=145)			ACT ≤19 (n=64)	ACT ≥20 (n=145)	
Gender			.001	Atopy			.648
Male	8 (12.50)	52 (35.86)		Atopic asthma	20 (31.25)	50 (34.48)	
Female	56 (87.50)	93 (64.14)		Nonatopic asthma	44 (68.75)	95 (65.52)	
Age, y			.821	FEV_1/FVC, %			.602
<75	36 (56.25)	84 (57.93)		≥70	43 (67.19)	92 (63.45)	
≥75	28 (43.75)	61 (42.07)		<70	21 (32.81)	53 (36.55)	
Duration of disease[a]	27.51 (16.01)	26.45 (15.14)	.572	FEV_1 (%)			.165
Degree of asthma severity			.305	<60	3 (4.69)	6 (4.14)	
Intermittent	0 (0.00)	3 (2.07)		60-80	11 (17.19)	43 (29.66)	
Mild-persistent	2 (3.13)	5 (3.45)		>80	52 (78.13)	96 (66.21)	
Moderate-persistent	26 (40.63)	73 (50.34)		Treatment			
Severe-persistent	36 (56.25)	62 (42.76)		Inhaled corticosteroids-LABA	60 (93.75)	129 (88.97)	.278
Unknown	0 (0.00)	2 (1.38)		Leukotriene modifiers	26 (40.63)	54 (37.24)	.643
Comorbidity				Anticholinergics	18 (28.13)	18 (12.41)	.006
Obesity	26 (40.63)	58 (40.00)	.932	Inhaled corticosteroid dose			.102
Hypertension	41 (64.06)	83 (57.24)	.355	Low	10 (15.87)	25 (17.73)	
Hypercholesterolemia	13 (20.31)	44 (30.34)	.133	Medium	16 (25.40)	55 (39.01)	
Ischemic cardiomyopathy	5 (7.81)	16 (11.03)	.475	High	37 (58.73)	61 (43.26)	
Heart arrythmias	6 (9.38)	16 (11.03)	.719	Severe exacerbations			.000
Thyroid disease	11 (17.19)	17 (11.72)	.285	No	49 (76.56)	137 (94.48)	
Other cardiovascular diseases[a]	14 (21.87)	16 (11,08)	.411	Yes	15 (23.44)	8 (5.52)	
Glaucoma	8 (12.50)	13 (8.97)	.433	Treatment adherence			.021
Arthrosis	47 (73.44)	101 (69.66)	.579	No	9 (14.06)	7 (4.83)	
Osteoporosis	32 (50.00)	63 (4.,45)	.381	Yes	55 (85.94)	138 (95.17)	
Obstructive sleep apnea	2 (3.13)	5 (3.45)	.905	Quality of life questionnaire score[a]			
Other respiratory diseases[b]	8 (12,12)	18 (12.41)	.474	Mood	5.07 (2.49)	2.56 (2.37)	.000
Rhinitis	46 (71.88)	93 (64.14)	.275	Breathlessness	3.93 (2.18)	1.01 (1.32)	.000
Sinonasal polyposis	12 (18.75)	38 (26.21)	.244	Worrying	3.34 (2.13)	1.27 (1.59)	.000
Gastroesophageal reflux	32 (50.00)	69 (47.59)	.748	Social limitation	3.19 (2.60)	0.98 (1.69)	.000
Depression	22 (34.88)	39 (26.90)	.273	Total	3.87 (1.82)	1.44 (1.34)	.000
AERD	4 (6.25)	19 (13.10)	.144				

[a]Mean and standard deviation
[b]History of TBC infection, bronchiectasis, pulmonary embolism.
Abbreviations: ACT, Asthma Control Test; AERD, aspirin-exacerbated respiratory disease; LABA, long-acting ß$_2$-agonist.

Asthma Control and Factors Affecting Asthma Control

A total of 145 patients (69%) had an ACT score ≥20 (well-controlled), 35 patients (16%) had a score of 16-19 (partly controlled), and 29 patients (13%) had a score of ≤15 (uncontrolled). According to the ACT score, we classified patients into 2 groups (cases and controls), where cases had partly controlled/uncontrolled asthma (ACT ≤19, 64 patients, 30.62%) and controls had well-controlled asthma (ACT ≥20, 145 patients, 69.38%). We reported the main variables by level of asthma control (Table 2). When we analyzed comparisons between groups, we did not find any statistically significant differences as a function of age, atopy, disease duration, lung function, asthma severity, AERD, or comorbid conditions. We did find, however, significantly poorer asthma control in women. The percentage of patients reporting severe exacerbations in the year before the visit was lower in patients with controlled asthma than in those with partly/uncontrolled asthma (*P*<.001). The number of comorbidities was not associated with asthma control status (*P*=.448). Patients with AERD did not have more severe asthma according to the GINA 2006 classification (*P*=.380).

Given that adherence was associated with asthma control (*P*=.021), correct adherence was more frequent in the well-controlled group. Anticholinergic treatment was more frequently prescribed in patients with partly/uncontrolled asthma (*P*=.006). No patients were taking specific immunotherapy at the time of the study, although 42 (20.1%) had previously received subcutaneous immunotherapy (when they were young or middle-aged); however, this was not analyzed because of the marked heterogeneity of the treatments. No patients were receiving biologic treatment.

In the AQLQ score (domains and total), patients with partly controlled/uncontrolled disease tended to score higher (ie, greater impairment in quality of life).

In the multivariate analysis of factors affecting asthma control measured using the ACT (Table 3), lack of adherence to treatment and the presence of severe exacerbations behaved as risk factors for partly controlled/uncontrolled asthma (OR, 8.33 and 5.29, respectively). In addition, for each extra unit in the AQLQ (total score or dyspnea subscale), the risk of poor control increased 1.51 and 1.88 times, respectively.

Multiple linear regression was performed using the AQLQ total score and subscales as the dependent variable and selected variables (those with clinical implication or associated with AQLQ in the bivariate analysis) as independent variables. The analysis revealed that worse quality of life (total score) was predicted by depression, gastroesophageal reflux disease, osteoporosis, and asthma control (evaluated using the ACT score) (Table 4).

Table 3. Statistical Analysis of the Predictors of Asthma Control

	OR	*P* Value	95%CI
No treatment adherence	8.33	.002	2.22-30.30
AQLQ Total score	1.58	.024	1.06-2.23
Breathlessness subscale AQLQ score	1.82	.001	1.28-2.59
Severe exacerbations	5.29	.006	1.60-17.52

Abbreviation: AQLQ, Asthma-Specific Quality of Life Questionnaire.

Table 4. Multiple Regression Analysis of AQLQ Total Score in Relation to Selected Variables

Variable	AQLQ Total Score Coefficient	SE	*P* Value
Gender			
Male	ref		.351
Female	.24	.26	
Osteoporosis			.021
No	ref		
Yes	.52	.22	
GERD			.026
No	ref		
Yes	.47	.21	
Depression			.000
No	ref		
Yes	.99	.22	
ACT score			.000
≤19	ref		
≥20	2.28	.22	
Severe exacerbations			.867
No	ref		
Yes	–.05	.33	

Abbreviations: ACT, Asthma Control Test; AQLQ, Asthma-Specific Quality of Life Questionnaire; GERD, gastroesophageal reflux disease.

Discussion

Suboptimal control of asthma has been reported in several studies [23-25]. According to the ACT score, in Spain, uncontrolled asthma could affect up to 57.6% of patients [26]. The LIAISON study, which is one of the largest observational studies on the characteristics and management of asthmatics in Europe and is based on patient-reported outcomes and the Asthma Control Questionnaire (ACQ), confirmed rates of suboptimal control in 56.5% of patients [27].

Studies evaluating asthma control in the elderly are scarce, although they agree that one-third or more of elderly asthmatic patients have uncontrolled asthma. Milanese et al [28] performed a multicenter observational study analyzing a total of 350 patients aged more than 64 years with documented physician-diagnosed asthma in Italy and found that 39% had an ACT score ≤19 [28]. Rates of uncontrolled asthma were similar in Korea [29] and Romania [30] (35.2% and 30.15%, respectively). Our findings also indicate that asthma control was suboptimal in one-third of older outpatients with asthma in a real-life study. This percentage is lower than that observed in other age groups, probably because the patients were receiving ongoing asthma treatment and being followed-up at a tertiary care academic hospital for at least 1 year.

Comorbidities have been associated with poorly controlled asthma [4,30], and it is well known that older patients with

asthma have an increased risk of comorbidities. Particularly frequent comorbidities, such as chronic obstructive pulmonary disease, chronic sinusitis, obesity, and depression are associated with uncontrolled asthma in elderly asthmatic patients [31]. Furthermore, the number of comorbidities and polypharmacy have been linked with asthma control in the elderly [32,33]. However, recent studies demonstrated that in elderly asthmatics under specialist care, nonrespiratory comorbidities do not seem to have a direct negative effect on asthma control according to Global Initiative for Asthma criteria [34] or according to the ACT score [28-30,33]. Our results are similar, since none of the evaluated diseases per se or the number of comorbidities were associated with poor asthma control.

Milanese et al [28] found that the coexistence of chronic obstructive pulmonary disease (COPD) or asthma-COPD overlap syndrome (ACOS) due to the presence of chronic bronchitis and/or lung diffusion impairment had lower mean ACT scores. Persistent airway obstruction and mixed ventilator dysfunction were also associated with poor asthma control in the elderly [30]. In general, diagnosis of asthma in the elderly is particularly challenging as a result of spirometry changes associated with aging and the similar clinical presentation of asthma, COPD, and ACOS [1]. In an attempt to exclude COPD patients, we excluded current smokers and those with persistent fixed airflow obstruction and no normal diffusion test result or an unequivocal asthma history at the initial diagnosis. Therefore, we could not evaluate the influence of this comorbidity on the ACT score, although lung function did not modify the score in our study.

Previous findings showed that both a previous history of asthma exacerbations and poor asthma control can increase the risk of future asthma exacerbations [35,36]. In addition, poorly or partly controlled asthma in elderly patients has been characterized by higher exacerbation rates [28-30], and an ACT score <19 may be a significant predictor of asthma exacerbation in the following 6 months [33]. Our results also revealed an association between severe exacerbations in the previous year and partly controlled/uncontrolled asthma in the previous 4 weeks (OR, 5.29), thus indicating that the ACT control test may be an important parameter for assessing the risk of asthma exacerbations and consumption health care resources in elderly asthmatic patients.

Good adherence is a predictor of asthma control in adults in general [37] and in the elderly in particular [15]. In this respect, we found lack of adherence to be a predictor of poor asthma control (OR, 8.33). However, we based our analysis of adherence on self-reported data, which were probably not an accurate measure, whereas other authors also reported high rates of adherence to asthma treatment in the elderly using more accurate measures of adherence [33].

In our study, asthma control and QOL were directly related. Although comorbidities were not determinants of asthma control, the presence of some comorbidities such as depression, gastroesophageal reflux disease, and osteoporosis were found to be associated with QOL. A significant reduction in QOL associated with comorbidity in asthma has been reported [8,15].

In contrast with data reported by other authors [38], we did not detect a relationship between QOL and exacerbations, probably because of the methodology used: exacerbations were collected during the previous year, whereas the QOL questionnaire of Marks et al [22] analyzes data from the previous 4 weeks.

Furthermore, patient-perceived QOL directly affects the degree of control according to the ACT questionnaire, as reported elsewhere [27]. In our opinion, the information contributed by both questionnaires is complementary, and in patients of this age group it can help with decisions on therapy and in cases where depression is suspected. This is very important, as depression is not only correlated with asthma control and QOL, but is also a predictor of future exacerbations, thus highlighting the need for depression screening and evaluation in the elderly [39].

To the best of the authors' knowledge, this is the first study in elderly persons with asthma to report the main determinants of asthma control and HRQOL in the Spanish population.

Our study is subject to methodological limitations. First, patients were recruited from a tertiary hospital, which is likely to result in a group with relatively severe asthma and frequent comorbidity. Second, patients did not undergo a complete psychological examination, and we did not use a specific geriatric assessment scale to determine depression and functional status. And third, adherence was not evaluated with an objective medication adherence measure or validated test.

In conclusion, most elderly asthmatic patients, even those with severe or moderate persistent asthma, those with comorbidities, and those with long-standing asthma, achieved good control of asthma symptoms and normal lung function, although almost one-third had uncontrolled asthma despite receiving antiasthma therapy. The determinants of uncontrolled asthma were severe exacerbations during the preceding year, lack of adherence, and HRQOL. The presence of nonrespiratory comorbid conditions in older patients does not seem to be associated with worse control of asthma symptoms, although their influence on HRQOL could indirectly affect asthma control.

Therefore, the management of elderly asthmatic patients should include further care for clinical conditions, including depression, and adherence to treatment. The ACT and AQLQ questionnaires are complementary and highly informative.

Funding

The authors declare that no funding was received for the present study.

Conflicts of Interest

AEM has received lecture fees from Chiesi, AstraZeneca, Mundipharma, TEVA, and GSK. The remaining authors declare that they have no conflicts of interest.

Previous Presentation

Partial preliminary results from this study were presented orally at the XXX Spanish Allergy and Clinical Immunology Society Meeting (SEAIC) held in San Sebastian, Spain, 2016.

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Manuscript received February 13, 2019; accepted for publication June 24, 2019.

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