

QUALITY OF LIFE

Impact of Anxiety and Depression on Disease Control and Quality of Life in Asthma Patients

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Introduction. Patients with asthma also tend to have anxiety and depression. These comorbidities may affect asthma control and quality of life. The objective of this study was to assess the impact of anxiety and depression on asthma control and quality of life. **Patients and methods.** Cross-sectional study of asthma outpatients was conducted at two hospitals in the Basque Country (northern Spain). Data collected included sociodemographic variables, asthma symptoms, treatment, number of exacerbations, level of control, quality of life, presence of psychological morbidities, and level of physical activity. Spirometry was performed in accordance with the recommendations of the Spanish Society of Pneumology and Thoracic Surgery. **Results.** Among 354 asthmatics, 77% had poor or partial control of their condition, 31% had anxiety alone, 2% had depression alone, and 10% had anxiety plus depression. Poor asthma control was associated with anxiety plus depression (odds ratio (OR): 3.61; 95% confidence interval (CI): 1.05–12.41) as well as with female patients (OR: 1.85; 95% CI: 1.11–3.10). Anxiety had an independent effect on reduced quality of life across all domains; anxiety plus depression had an even greater effect. **Conclusion.** Among patients with asthma, anxiety and depression adversely affect asthma control and quality of life, raising the possibility that treating these psychological comorbidities could improve asthma control and quality of life.

Keywords anxiety, asthma, control, control and gender, depression, quality of life

INTRODUCTION

Although clinical trials provide strong evidence that asthma control can be achieved in most patients (1), epidemiological studies and clinical practice paint a different picture. Data from the European Community Respiratory Health Survey II (ECRHS-II) indicate that only 15% of asthma patients who used inhaled corticosteroids during the previous year had their asthma well controlled (2). The prevalence of poor asthma control is high in Spain as well. In the Control and Handling of Asthma in Spain (CHAS) study, conducted in a primary care setting, 64% of patients had poor control (3). In the Measuring Asthma GINA (Global Initiative for Asthma) Control (MAGIC) study, conducted among pneumology, allergology, and primary care patients, only 13% of patients had well-controlled asthma (4).

Most asthma guidelines agree on the parameters that should be used to classify the level of asthma control. Both the GINA (5) and the Spanish Guidelines for Asthma Management (GEMA) (6) provide working protocols for the assessment of control. GEMA also provides two validated symptom questionnaires. Yet physicians often consider factors other than the stage of asthma and level of control when they make decisions regarding treatment, suggesting that tools that measure only disease control

may not be sufficient (7). Indeed, Diette et al. demonstrated that physicians sometimes intensify asthma treatment based on additional information, such as age and comorbidities, even in patients who demonstrate adequate disease control (8).

Patients with chronic diseases generally have a higher prevalence of emotional and psychological disorders (9). Among patients with asthma, the prevalence of anxiety and depression is significantly higher than in individuals who do not have asthma (10), ranging from 16% to 52% higher for anxiety and 14% to 41% higher for depression (11). Anxiety, depression, and other psychological and emotional states may influence asthma control or the perception of it. Anxiety and depression are also independent factors associated with poor asthma control (12).

Asthma control is usually described in terms of symptoms, signs, and parameters of pulmonary function. These objective measures can be complemented with information about the patient's perception of his or her disease, collected by validated quality of life questionnaires.

Although the benefits of regular physical activity on health are well accepted, the relationships between recommended levels of physical activity and health-related quality of life have not been described adequately. The objective of this study was to assess the impact of anxiety and depression on disease control and quality of life among patients with asthma.

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PATIENTS AND METHODS

In this cross-sectional study, we recruited consecutive outpatients with asthma who attended the pneumology units of the Hospital Galdakao-Usansolo and the Hospital San Eloy in Bizkaia, Spain, between December 2006 and December 2007. These hospitals belong to the network of public hospitals of the Basque Health Care Service, which provides free unrestricted care to nearly 100% of the population in the Basque Country (northern Spain). Inclusion criteria were the following: being diagnosed and monitored by a pneumologist for at least 1 year and being between the ages of 17 and 70 years. Patients were excluded if they had comorbidities that could limit their physical activity or had a history of smoking.

Patients were not assessed by the doctors at the time of their consultation. Instead, an outside researcher was hired, who designed a questionnaire covering sociodemographic, family, and occupational data, as well as information on body mass index (BMI), atopy, daytime and night time symptoms, ongoing treatment, and exacerbations (Table 1.). Patients also completed three other instruments:

- The Asthma Quality of Life Questionnaire (AQLQ), which is composed of 32 items in four domains (symptoms, physical activity limitation, emotional function, and exposure to environmental stimuli). Questions are answered on a 7-point scale, with a score of 1 corresponding to maximal impairment of quality of life and a score of 7 corresponding to no impairment (13). The Spanish version of the AQLQ has been validated and proven to be reliable, showing good sensitivity to changes (14).
- The Hospital Anxiety and Depression Scale (HADS) is an instrument that has subscales for anxiety and depression (15). HADS scores were used to classify patients into four categories: anxiety only, depression only, anxiety plus depression, and neither anxiety nor depression. This instrument's validity and reliability have been confirmed in another study (16) and it has also been adapted for a Spanish population and validated in a study (17).
- The self-administered version of the long form of the International Physical Activity Questionnaire (IPAQ) (18). The IPAQ assesses four domains of physical activity: work-related, transport-related, leisure-related, and domestic and gardening (yard) activities. The result of each domain is converted into metabolic equivalents (METs), which were used to construct estimates of weekly physical activity. This questionnaire has also shown good reliability indices (18, 19).

Spirometry was performed at baseline to record an accurate forced expiratory volume in 1 second (FEV₁). Spirometry was performed in accordance with the recommendations of the American Thoracic Society (ATS) (20).

In accordance with the Spanish GEMA (6), we categorized the level of asthma control as good, partial, or poor, taking into account diurnal and nocturnal symptoms, activity limitations, need for short-acting beta agonists,

TABLE 1.—Summary statistics of patients' sociodemographic and clinical variables.

	Frequency <i>N</i> (%)
Gender	
Male	164 (46)
Female	190 (54)
Age	
Age ^a	44.25 (16,77)
<32	115 (32)
32–55	123 (35)
>55	116 (33)
BMI ^b	
<30	250 (75)
≥30	85 (25)
Level of education	
None or primary education	166 (46)
Secondary education	127 (36)
University	61 (17)
Employment status	
Employed	168 (55)
Unemployed	187 (45)
Atopy	
Yes	246 (70)
No	10 (3)
Not stated	97 (27)
FEV ₁ (%)	
<60	18 (5)
60–80	36 (10)
>80	300 (85)
Duration of the disease ^c	10 (5–15)
Degree of asthma severity	
Mild persistent asthma	187 (53)
Moderate persistent asthma	30 (8)
Severe persistent asthma	137 (39)
Psychological morbidity	
Neither anxiety nor depression	202 (57)
Only anxiety	109 (31)
Only depression	6 (2)
Anxiety and depression	34 (10)
Level of control	
Good	83 (33)
Partial	165 (47)
Poor	106 (30)
Physical activity (MET-min/week) ^a	
Total	3757.01 (±4436.46)
Walking	1790.87 (±1923.16)
Moderate exercise	1276.92 (±2637.87)
Vigorous exercise	689.22 (±2785.45)
AQLQ ^a	
Physical activity limitation (ALF)	5.44 (±1.16)
S	5.77 (±1.22)
EF	6.01 (±1.28)
EES	4.72 (±1.56)
Overall AQLQ score (Total)	5.57 (±1.07)

Notes: BMI, body mass index; FEV₁(%), forced expiratory volume at 1 second in percentage; AQLQ, Asthma Quality of Life Questionnaire; S, symptom; EF, emotional function; EES, exposure to environmental stimuli; MET, metabolic equivalent; HADS, Hospital Anxiety and Depression Scale.

^aResults shown as mean (standard deviation). ^bMissing: 19 values. ^cResults shown as median (interquartile range). MET; Anxiety: HADS-anxiety score > 7; Depression: HADS-depression score > 7.

pulmonary function, exacerbations, and score on the Asthma Control Questionnaire (ACQ). The ACQ is a 7-item questionnaire with scores ranging from 0 (well controlled) to 6 (extremely poorly controlled) (21). Good control is defined as the patient showing all of the following measures: daytime symptoms two or fewer days a week, no

limitation in activities, no nocturnal symptoms or awakenings, need to take rescue medication two or fewer days a week, FEV₁ greater than 80% predicted, no exacerbations, and ACQ scores equal to or less than 0.75. Partial control is defined as the patient showing any of the following measures in a given week: daytime symptoms more than 2 days a week, any limitation in activities, nocturnal symptoms or awakenings, need to take rescue medication more than 2 days a week, FEV₁ lower than 80% predicted, one or more exacerbations during the last year, and ACQ scores equal to or higher than 1.75. Poor control is defined as the patient not showing good or partial control. The questionnaire showed good reliability indices and it was used in our study in its (translated and culturally adapted) Spanish version (22).

Asthma severity was classified according to the need for treatment as established by GEMA. Patients receiving the first level of treatment were classified as having intermittent asthma, second level of treatment as mild persistent asthma, third or fourth level as moderate persistent asthma, and fifth or sixth level as severe persistent asthma.

The study was approved by the Ethics Committees of both hospitals. All patients signed informed consent forms before beginning the study.

Statistical Analysis

An exploratory analysis of the data was initially conducted using frequencies and percentages for asthma prevalence, asthma control, and sex; means and standard deviations for age; and medians and interquartile range for duration of asthma.

Univariate analysis was performed to identify factors associated with good control of asthma and for each subscale of the AQLQ. Wilcoxon and Kruskal–Wallis non-parametric tests for independent samples were used for continuous variables. The chi-square test was used to assess associations between qualitative factors.

In the multivariate analysis, we developed generalized linear models to identify factors associated with quality of life. The percentage of the variability of the model explained by such factors was identified using R^2 . For the construction of the final predictive model for level of asthma control, we used multivariate logistic regression.

All analyses were conducted using SAS statistical package version 9.1. Statistical significance was set at $p < .05$.

RESULTS

A total of 354 eligible patients with asthma were recruited for the study. The sample was homogeneous in terms of sex and age groups. Most patients (75%) had a BMI below 30 and atopy was detected in 70% of patients. However, this information was not found in the medical history of 27% of the patients. More than half of the participants had mild persistent asthma, while only 23% had good control of their disease. Anxiety and depression were reported by 33% of participants—31% had anxiety alone, 2% had depression alone, and 10% had anxiety plus depression.

In the univariate analysis of level of asthma control (Table 2), we did not find any statistically significant

differences as a function of age, employment status, disease duration, BMI, or physical activity. We did, however, find significantly poorer asthma control in women, patients with FEV₁ <80%, and those with anxiety or anxiety plus depression. Patients with poorer asthma control had poorer quality of life as measured by the AQLQ.

TABLE 2.—Univariate analysis of level of asthma control according to the patients' sociodemographic and clinical variables

	Level of asthma control		P-value
	Good control (n = 83) N (%)	Partial or poor control (n = 271) N (%)	
Gender			.004
Men	50 (60)	114 (42)	
Women	33 (40)	157 (58)	
Age (years)			.34
<32	31 (37)	84 (31)	
32–55	30 (36)	93 (34)	
>55	22 (26)	94 (35)	
BMI			.55
<30	60 (78)	190 (74)	
>30	17 (22)	68 (26)	
Employment status			.34
Unemployed	28 (40)	111 (47)	
Employed	42 (60)	126 (53)	
Duration of the disease ^b	11 (6–15)	10 (5–15)	.68
Degree of asthma severity			<.001
Mild persistent asthma	105 (39)	82 (99)	
Moderate persistent asthma	29 (11)	1 (1)	
Severe persistent asthma	137 (50)	0 (0)	
FEV ₁ (%)			<.001
<60	0 (0)	15 (6)	
60–80	0 (0)	36 (13)	
>80	82 (100)	218 (81)	
Psychological morbidity			.03
Neither anxiety nor depression	58 (70)	144 (54)	
Only anxiety	20 (24)	89 (33)	
Only depression	2 (2)	4 (1)	
Anxiety and depression	3 (4)	31 (12)	
AQLQ ^c			<.001
Physical activity limitation (ALF)	6.16 (0.8)	5.22 (1.16)	
S	6.55 (0.49)	5.52 (1.26)	
EF	6.64 (0.55)	5.82 (1.37)	
EES	5.33 (1.49)	4.52 (1.53)	
Overall AQLQ score (total)	6.28 (0.55)	5.35 (1.09)	
Physical activity (MET-min/week):total score	4124.29 (5101.84)	4262.28 (6393.32)	.73

Notes: BMI, Body Mass Index; FEV₁(%), Forced expiratory volume at 1 second in percentage; AQLQ, Asthma Quality of Life Questionnaire; S, symptoms; EF, emotional function; EES, exposure to environmental stimuli; MET, metabolic equivalent; HADS, Hospital Anxiety and Depression Scale.

^aMissing: 19 values. ^bResults shown as median (interquartile range). ^cResults shown as mean (standard deviation). MET; Anxiety: HADS-anxiety score > 7. Depression: HADS-depression score > 7. P-values in italics are statistically significant.

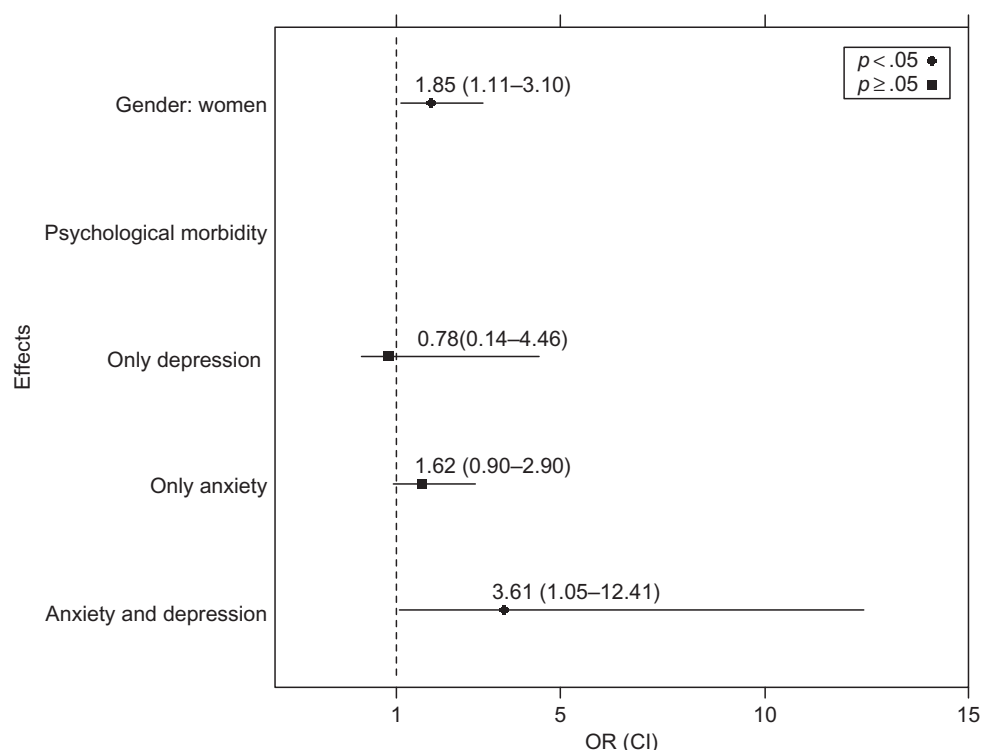


FIGURE 1.—Multivariate analysis of poor level of control.

The multivariate analysis of asthma control (Figure 1) identified two predictors of poor asthma control: anxiety plus depression and female patients. Women are more likely to have poor control levels, almost in twice as high a proportion as that of men (odds ratio (OR): 1.85; 95% confidence interval (CI): 1.11–3.10). In addition, patients with anxiety and depression are more likely to have poor control levels than those without these disorders (OR: 3.61; 95% CI: 1.05–12.41).

In the univariate analysis of quality of life (Table 3), we also found statistically significant differences as a function of age and psychological state, with lower quality of life in the emotional function domain of the AQLQ in people aged between 32 and 55 years old compared to those older than 55, and in the exposure to environmental stimuli domain in subjects older than 32 years old compared to those under age 32. For FEV₁, no significant differences were observed in all AQLQ domains, although exposure to environmental stimuli was on the threshold of significance ($p = .05$). Subjects with BMIs >30 had a poorer quality of life in the physical activity limitation domain, exposure to environmental stimuli domain, and overall AQLQ score. Women had poorer quality of life in all AQLQ domains except emotional function. Patients with anxiety had poorer quality of life across all domains; the addition of depression further worsened quality of life. Finally, poor asthma control was significantly associated with poorer quality of life across all domains.

Multivariate analysis of quality of life (Table 4) also indicated that men had a lower quality of life in the exposure to environmental stimuli domain, while individuals older than 32 years had lower quality of life only in the

emotional function domain. Scores in all quality of life domains were lower in patients with anxiety and were even lower in patients with anxiety and depression. Obesity influenced quality of life in the symptoms domain and overall AQLQ scores. Compared to patients with good asthma control, quality of life was significantly lower across all domains in patients with partial asthma control, and even lower in those with poor control. Physical activity did not appear to have an impact on quality of life.

DISCUSSION

Our results showed a high percentage of patients (77%) with poor or partial asthma control. Patients with anxiety and depression, those with FEV₁ values below 80%, and women were all more likely to have poor asthma control. Quality of life was lower across all domains in patients with anxiety, and even more so in patients with anxiety plus depression. Furthermore, in all groups quality of life decreased as the level of asthma control declined. However, physical activity did not appear to have an impact on quality of life.

Lack of a “gold standard” definition for asthma makes it difficult to provide a clear definition for asthma control. To date, the main tool for assessing asthma control, apart from the FEV₁, has been the measurement of clinical symptoms at routine follow-up visits. Several symptom questionnaires have been developed, validated, and culturally adapted to measure asthma control, such as the ACQ (21) and the Asthma Control Test (ACT) (23).

TABLE 3.—Univariate analysis of AQLQ questionnaire domains as function of sociodemographic and clinical variables.

	AQLQ domains									
	ALF		S		EF		EES		Total	
	$\bar{x}$ (SD)	P-value	$\bar{x}$ (SD)	P-value	$\bar{x}$ (SD)	P-value	$\bar{x}$ (SD)	P-value	$\bar{x}$ (SD)	P-value
Gender		<.001		.005		.33		.001		<.001
Men	5.78 (0.99)		5.95 (1.04)		6.08 (1.21)		5.01 (1.53)		5.81 (0.94)	
Women	5.15 (1.22)		5.60 (1.33)		5.95 (1.34)		4.47 (1.54)		5.36 (1.13)	
Age		.23		.06		.02		<.001		.29
<32 ^a	5.59 (1.13)		5.70 (1.31)		5.90 (1.28)		5.29 (1.27) ^{b,c}		5.65 (1.3)	
32–55 ^b	5.36 (1.20)		5.62 (1.30)		5.85 (1.41) ^c		4.66 (1.59) ^a		5.45 (1.15)	
>55 ^d	5.37 (1.12)		5.97 (0.97)		6.28 (1.07) ^b		4.20 (1.59) ^a		5.61 (0.89)	
BMI		.04		.08		.72		.01		.02
<30	5.5 (1.14)		5.83 (1.19)		6.02 (1.31)		4.83 (1.54)		5.64 (1.07)	
≥30	5.2 (1.20)		5.54 (1.32)		5.94 (1.24)		4.32 (1.54)		5.32 (1.08)	
FEV ₁ (%)		.18		.74		.71		.05		.41
<60	4.94 (1.03)		5.54 (1.33)		5.86 (1.13)		4.21 (1.22)		5.22 (0.85)	
60–80	5.39 (1.08)		5.83 (1.02)		6.16 (1.05)		4.24 (1.69)		5.53 (0.95)	
>80	5.49 (1.16)		5.77 (1.23)		6.01 (1.30)		4.80 (1.54)		5.59 (1.09)	
Psychomorbidity		<.001		<.001		<.001		<.001		<.001
Neither anxiety nor depression ^a	5.80 (0.94) ^{c,d}		6.12 (0.85) ^{c,d}		6.36 (0.90) ^{c,d}		5.10 (1.47) ^{c,d}		5.92 (0.77) ^{c,d}	
Anxiety only ^b	5.59 (0.83)		6.06 (0.63)		6.63 (0.43) ^d		4.54 (1.38)		5.80 (0.32)	
Depression only ^c	5.07 (1.20) ^{a,d}		5.32 (1.42) ^{a,d}		5.61 (1.42) ^a		4.33 (1.56) ^a		5.18 (1.18) ^a	
Anxiety and depression ^d	4.45 (1.35) ^{c,a}		4.94 (1.63) ^{a,d}		5.05 (1.91) ^{b,a}		3.71 (1.39) ^a		4.66 (1.37) ^a	
Level of asthma control		<.001		<.001		<.001		<.001		<.001
Good ^a	6.16 (0.80) ^{all}		6.56 (0.49) ^{all}		6.64 (0.56) ^{all}		5.34 (1.49) ^{a,c}		6.28 (0.56) ^{all}	
Partial ^b	5.60 (0.99) ^{all}		5.99 (0.84) ^{all}		6.18 (1.11) ^{all}		4.87 (1.47) ^c		5.76 (0.81) ^{all}	
Poor ^c	4.67 (1.77) ^{all}		4.80 (1.47) ^{all}		5.26 (1.26) ^{all}		3.99 (1.48) ^{a,b}		4.72 (1.19) ^{all}	
Physical activity (MET-min/ week); Total score ^e	0.04	.47	−0.02	.74	−0.002	.73	0.09	.10	0.002	.73

Notes: $\bar{x}$ (SD), mean (standard deviation); ALF, physical activity limitation; S, symptoms; EF, emotional function; EES, exposure to environmental stimulus; total, overall AQLQ score; BMI, body mass index; FEV₁(%), forced expiratory volume at 1 second in percentage; MET, metabolic equivalent.

^{a,b,c,d,all}Show statistical differences between the groups after using the Scheffé post-hoc test; Anxiety, HADS-anxiety score > 7; Depression, HADS-depression score > 7.

^ePearson correlation coefficient. P-values in italics are statistically significant.

Studies analyzing level of asthma control have yielded different results. In the Asthma Insights and Reality in Europe (AIRE) study (24), asthma control was suboptimal for most patients. Interestingly, the perception of asthma control did not align with the severity of reported symptoms, with approximately 50% of patients who reported severe persistent symptoms saying that their condition was totally or partially under control. Another European study that included 378 asthmatics monitored by pneumologists found that 50% of patients were unable to get their asthma under control despite the fact that 94% were taking preventive medications (25). Similarly, in the Real-World Evaluation of Asthma Control and Treatment (REACT) study (26), 55% of patients did not have their asthma under control. Across the study, patients with poor control used more health services, despite evidence that they were receiving treatments in line with currently accepted guidelines. In ECRHS-II, 85% of asthmatics were unable to get their disease totally under control even with the use of inhaled corticosteroids (2). The rate of control in our study fell within the range of these prior studies, with 77% of patients having poor asthma control.

The persistence of poor asthma control across many studies, even in patients who are being treated according to guidelines (27), suggests that factors other than medical care influence control of the disease. Comorbidities such

as allergic rhinitis (28) and obesity (2) clearly play important roles in the control and progression of asthma in young patients. The contribution of mental health pathologies such as anxiety and depression has received less attention, even though the prevalence of these conditions is higher in asthmatics than in the general population (29). It is possible that anxiety and depression affect asthma control by reducing adherence to maintenance medication and increasing or decreasing the use of rescue medication due to poor interpretation of asthma symptoms. It is also possible that asthma symptoms may increase the level of anxiety and depression in susceptible patients.

Anxiety and Depression Prevalence in Asthma Patients and Their Relationship with Asthma

The prevalence of anxiety and depression in the asthmatic population has not yet been adequately established. In asthmatics between the ages of 11 and 17 years, Katon et al. observed that the prevalence of anxiety and depression was almost double that in controls (OR: 1.92; 95% CI: 1.13–3.28) (10). In an adult population, Lavoie et al. observed that 8% had depression, 12% had anxiety, and 11% had both anxiety and depression (11). In our study, 31% of patients had anxiety, 2% had depression, and 10% had both anxiety and depression. The trend appears to be

TABLE 4.—Multivariable analysis of AQLQ questionnaire domains.

	AQLQ domains									
	ALF		S		EES		EF		Total	
	Beta (SE)	P-value	Beta (SE)	P-value	Beta (SE)	P-value	Beta (SE)	P-value	Beta (SE)	P-value
Intercept	6.28 (0.15)	<.001	6.73 (0.15)	<.001	6.85 (0.18)	<.001	5.91 (0.22)	<.001	6.49 (0.14)	<.001
Gender										
Men	0.24 (0.11)	.02	−0.08 (0.11)	.48	−0.24 (0.13)	.05	0.16 (0.16)	.32	0.03 (0.10)	.72
Women	Reference		Reference		Reference		Reference		Reference	
Age										
<32	Reference		Reference		Reference		Reference		Reference	
32–55	−0.11 (0.37)	.37	−0.03 (0.13)	.83	0.009 (0.15)	.95	−0.47 (0.19)	.01	−0.11 (0.11)	.34
>55	−0.004 (0.13)	.98	0.39 (0.14)	.004	0.48 (0.16)	.002	−0.93 (0.20)	<.001	0.10 (0.12)	.39
BMI										
<30	Reference		Reference		Reference		Reference		Reference	
≥30	−0.21 (0.12)	.07	−0.25 (0.12)	.04	−0.08 (0.14)	.54	−0.28 (0.18)	.11	−0.22 (0.11)	.03
FEV ₁ (%)										
<60	−0.23 (0.27)	.39	0.21 (0.27)	.43	0.31 (0.31)	.32	−0.14 (0.39)	.73	0.03 (0.24)	.89
60–80	0.35 (0.18)	.06	0.63 (0.19)	<.001	0.63 (0.21)	.003	−0.04 (0.27)	.88	0.45 (0.16)	.006
>80	Reference		Reference		Reference		Reference		Reference	
Psychomorbidity										
Neither anxiety nor depression	Reference		Reference		Reference		Reference		Reference	
Only depression	0.007 (0.39)	.98	0.17 (0.40)	.67	0.41 (0.45)	.37	−0.12 (0.58)	.83	0.12 (0.34)	.73
Only anxiety	−0.54 (0.112)	<.001	−0.54 (0.12)	<.001	−0.58 (0.14)	<.001	−0.69 (0.17)	<.001	−0.56 (0.10)	<.001
Anxiety and depression	−0.91 (0.18)	<.001	−0.73 (0.19)	<.001	−0.88 (0.22)	<.001	−1.07 (0.27)	<.001	−0.86 (0.16)	<.001
Level of asthma control										
Good	Reference		Reference		Reference		Reference		Reference	
Partial	−0.53 (0.13)	<.001	−0.63 (0.14)	<.001	−0.55 (0.15)	.0004	−0.39 (0.20)	.049	−0.55 (0.12)	<.001
Poor	−1.39 (0.15)	<.001	−1.89 (0.16)	<.001	−1.60 (0.18)	<.001	−1.04 (0.23)	<.001	−1.56 (0.14)	<.001
Physical activity (MET-min/week): Total score ^a	0.009 (0.001)	.32	0.001 (0.001)	.27	0.001 (0.001)	.15	0.002 (0.001)	.11	0.001 (0.001)	.13
Model R square	38.77%		44.28%		33.51%		26.41%		45.41%	

Notes: Beta (SE), beta estimate (standard error); ALF, physical activity limitation; S, symptom; EF, emotional function; EES, exposure to environmental stimulus; total, overall AQLQ score; BMI, body mass index; FEV₁ (%), forced expiratory volume at 1 second in percentage; MET, metabolic equivalent; GLM, general linear model.

Anxiety, HADS-anxiety score > 7; Depression, HADS-depression score > 7; Reference, Variable categories considered as reference values in the developed GLMs.

^aValues are expressed for 100 MET unit-min/week of increase. P-values in italics are statistically significant.

that anxiety is more common among patients with asthma and that depression appears more frequently with anxiety than it appears alone.

Other investigators have explored the impact of psychological comorbidities on asthma. In a study by Ten Brinke and colleagues, asthmatics with psychological comorbidities were more likely than those without such comorbidities to make frequent visits to their primary care doctors (OR: 5.9) or the emergency department (OR: 5.3), to have exacerbations of asthma (OR: 12.4), and to require hospitalization (OR: 4.8) (30). In the study by Lavoie et al. (11), significantly poorer control of asthma was observed mainly among patients with depression.

The results of our study are similar to those of Di Marco et al. (12), who found that poor asthma control was associated not only with anxiety (OR: 3.76), depression (OR: 2.69), and FEV₁ (OR: 6.5), but also with age >65 years (OR: 2.69), which we did not observe. The differences could be accounted for by the fact that Di Marco et al. used only the ACT to assess the level of control, while we also included parameters of pulmonary function and number of exacerbations—criteria established by the GEMA guidelines (6).

Quality of Life and Mental Health Comorbidities

Maintaining a satisfactory quality of life is a key objective in the care of patients with asthma or any chronic disease. How asthma influences quality of life depends on many factors, one of which is control of the disease. To date, few studies have focused on the impact of psychological morbidities on the quality of life of asthmatics and not all the studies carried out in this area have taken into account potentially confounding variables that can also influence quality of life. Our study shows that asthmatics with anxiety have a significantly poorer quality of life in all domains, while the combination of anxiety and depression has an even greater effect. Depression alone did not appear to depress quality of life, though this may be due to the small number of patients suffering from depression alone in our sample. Our results are different from those of other authors, who observed that depression is associated with significantly lower scores on quality of life and that depression was the most important predictor of a low AQLQ score (31, 32). On the other hand, some authors have shown that even when asthma is well controlled, anxiety has an impact on all quality of life domains (33).

Our study has several strengths: first, when classifying severity of asthma, we considered the treatment level. Moreover, we categorized psychomorbidity into four categories: neither anxiety nor depression, anxiety, depression, and anxiety plus depression. In addition, we employed a large enough sample size and we used multiple validated measures.

Several limitations must also be noted. Due to the study design (a cross-sectional study) we cannot be certain whether the relationships found between variables are due to the level of asthma control or, alternatively, are the result of the disease. We assessed anxiety and depression with a single questionnaire, the Hospital Depression and Anxiety Scale (HADS), rather than with a more complete psychological examination. However, this scale has been used successfully elsewhere and its results have been shown to be similar to those of a clinical interview (9). Other authors have confirmed that the results of the HADS correlate well with the Depression in the Medically Ill questionnaire (34), the Beck Depression Inventory II (35), and the Anxiety Sensitivity Index (36). The simplicity of the HADS leads us to believe that it could prove to be a useful tool in the management of asthma.

In addition, symptoms of anxiety can alter the results of the ACQ. It is possible that patients may be receiving a suboptimal treatment as most have mild persistent asthma that is poorly controlled. It would also have been interesting to show the results stratified by atopy levels, but it was not possible to collect this information in 27% of the patients in the study. The same goes for FVC and MEF 25–75% VC, which could not be included in the study.

CONCLUSION

The results of our study show a high prevalence of poorly controlled asthma among patients attending appointments with pneumology specialists, with a higher risk of poor control among patients with anxiety and depression, those with FEV₁ values <80%, and women. Further, we observed that quality of life worsened with poorer levels of control and that quality of life was lower in all domains in patients with anxiety; the impact was even greater among patients with anxiety and depression. Future studies examining whether treating patients for anxiety and depression would improve asthma control and quality of life would be valuable.

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gathering, analysis and interpretation of data, or critical revision of the manuscript for important intellectual content. Finally, all authors approve the final version for submission.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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