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SEX DIFFERENCES IN ASTHMA SYMPTOM 1 PROFILES AND CONTROL IN THE AMERICAN LUNG ASSOCIATION ASTHMA CLINICAL RESEARCH CENTERS

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Abstract

Objective—Important differences between men and women with asthma have been demonstrated, with women describing more symptoms and worse asthma-related quality of life (QOL) despite having similar or better pulmonary function. While current guidelines focus heavily on assessing asthma control, they lack information about whether sex-specific approaches to asthma assessment should be considered. We sought to determine if sex differences in asthma control or symptom profiles exist in the well-characterized population of participants in the American Lung Association Asthma Clinical Research Centers (ALA-ACRC) trials.

Methods—We reviewed baseline data from four trials published by the ALA-ACRC to evaluate individual item responses to three standardized asthma questionnaires: the Juniper Asthma Control Questionnaire (ACQ), the multi-attribute Asthma Symptom Utility Index (ASUI), and Juniper Mini Asthma Quality of Life Questionnaire (mini-AQLQ).

Results—In the poorly-controlled population, women reported similar overall asthma control (mean ACQ 1.9 vs. 1.8; p=0.54), but were more likely to report specific symptoms such as nocturnal awakenings, activity limitations, and shortness of breath on individual item responses. Women reported worse asthma-related QOL on the mini-AQLQ (mean 4.5 vs. 4.9; p<0.001) and more asthma-related symptoms with a lower mean score on the ASUI (0.73 vs. 0.77; p=<0.0001) and were more likely to report feeling bothered by particular symptoms such as coughing, or environmental triggers.

Conclusions—In participants with poorly-controlled asthma, women had outwardly similar asthma control, but had unique symptom profiles on detailed item analyses which were evident on evaluation of three standardized asthma questionnaires.

INTRODUCTION

Population studies reveal sex-related differences in asthma that change with age. In children and early adolescents, asthma is more common in boys [1–3]. After puberty, asthma becomes more common and more severe in women. Women with asthma describe more symptoms and worse quality of life (QOL) than men despite having comparable or better pulmonary function [4–7]. Similarly, women with asthma report greater healthcare utilization [4–6] and more frequent use of short acting beta-agonists (SABA) [5–7] than men. While the reasons for these observed sex-related differences in asthma morbidity and disease expression have not been fully explained, differences in perception of air flow obstruction [5,8], increased

bronchial hyper-responsiveness in women as a result of increased susceptibility to tobacco smoke [9–10], and hormonal influences [11–13] have all been proposed as potential hypotheses.

Sex specific treatment approaches to asthma care have been developed, and have shown benefit to women when compared to standard nonspecific approaches [14–15]. Despite these findings, current asthma guidelines [16] lack information about whether sex-specific approaches to asthma assessment should be considered. Using detailed evaluation of previously validated questionnaires, we sought to determine if sex differences in asthma control or symptom profiles exist in the population of participants in the American Lung Association Asthma Clinical Research Centers (ALA-ACRC) trials, supporting the need for sex-specific approaches to asthma assessment. Some of the results have been reported previously in the form of an abstract [17]. By examining commonly utilized questionnaires in this manner, the ALA-ACRC data offer a unique approach to the evaluation of the potential influence of sex on the assessment of asthma morbidity and quality of life, and take advantage of a large well characterized population of participants.

METHODS

Study design and participants

The ALA-ACRC is a multi-center network of 20 centers dedicated to improving asthma care through clinical research in diverse populations. We evaluated data collected at enrollment from four published trials [18–21] by the ALA-ACRC to evaluate item responses of men and women to three standardized asthma questionnaires. A detailed description of the design and inclusion/exclusion criteria for each study is provided elsewhere [18–21].

The analyses included one trial of participants with well-controlled asthma (the Leukotriene or Corticosteroid or Corticosteroid-Salmeterol [LOCCS] trial [20]) and three trials of participants with poorly-controlled asthma (Effectiveness of Low Dose Theophylline as Add-On Therapy In Treatment of Asthma [LODO][18], Study of Acid Reflux and Asthma [SARA][19], and the Trial of Asthma Patient Education [TAPE][21]) as determined by criteria for study enrollment. Eligibility criteria for each trial are included in the online supplement (Appendix). Participants 17 years of age or older were included.

Demographic and clinical assessments

Data were obtained from the baseline assessments of participants prior to the initiation of study interventions. Demographic and clinical data including targeted co-morbid conditions were evaluated.

Sex-specific item analysis of standard asthma questionnaires

Asthma control was assessed with the seven-question Juniper Asthma Control Questionnaire (ACQ) [22] (range, 0 to 6, with lower scores indicating less severe asthma and 0.5 units considered a minimal clinically important difference [MID] [23], with scores ≥1.5 defined as poor control). Asthma symptoms were evaluated with the multi-attribute Asthma Symptom Utility Index (ASUI) [24] (range, 0 to 1, with higher scores indicating less severe asthma and 0.09 considered a MID [25]). Asthma-related QOL was assessed with the Juniper Mini Asthma Quality of Life Questionnaire (mini-AQLQ) [26] (range, 1 to 7, with higher scores indicating better QOL and 0.5 considered the MID) [19]. We examined overall scores and individual item responses for sex-related differences in controlled versus poorly-controlled asthmatics.

Statistical analysis

Data from participants enrolled in more than one trial were included only from the latest trial in which the participant enrolled. Analyses were stratified by control status (controlled vs. poorly-controlled) as defined by the criteria required for trial eligibility [18–21]. For continuous variables, analyses were adjusted for trial, and as specified, other characteristics using linear regression models; non-adjusted analyses were based on Wilcoxon Rank Sum Tests. For categorical variables, unadjusted analyses were performed using Chi-square and Fisher's Exact Tests; analyses including covariate adjustments were performed with logistic regression models. For analysis of specific questionnaire items, responses were categorized by presence or absence of the symptom. Analyses were performed in SAS version 9.2 (SAS Institute).

RESULTS

Demographic and clinical characteristics

We reviewed baseline data of 1612 participants (287 well-controlled asthmatics from LOCCS and 1325 poorly-controlled asthmatics from LODO [n=412], TAPE [n=514], and SARA [n=399] respectively). Ages ranged from 17–85, and the majority (70%) was women. Participants were stratified by asthma control and further compared by sex using baseline demographic and clinical characteristics (Tables 1A and 1B).

Among poorly-controlled participants, men were diagnosed with asthma at an earlier age (16.4 ± 16.9 vs. 19.4 ± 16.6 years; $p<0.001$), and had a lower BMI (28.7 ± 6.1 vs. 31.4 ± 8.7 kg/m2; $p<0.001$). Men reported more frequent use of SABA and had a lower mean % predicted post-bronchodilator forced expiratory volume in one second (FEV1) (85.2 ± 15.5 vs. 89.1 ± 15.0; $p<0.01$) but no difference in bronchial hyper-responsiveness as defined by methacholine challenge. Women were more likely to report concomitant gastroesophageal reflux disease (GERD) (26% vs. 20%; $p=0.03$), eczema (17% vs. 12%; $p=0.04$), and sinusitis (44% vs. 29%; $p<0.001$), and were more likely to report allergy-exacerbated asthma symptoms (83% vs. 77%; $p=0.01$) or treatment for an exacerbation in the last year (46% vs. 36%; $p<0.001$).

For controlled subjects, there were few differences noted between men and women. Men had a lower mean % predicted pre-bronchodilator FEV1 (89.4 ± 9.4 vs. 92.4 ± 10.7; $p<0.01$), and women were more likely to report concomitant sinusitis (36% vs. 18%; $p=0.001$).

Item responses to asthma questionnaires

In the poorly-controlled population, women reported similar overall asthma control (mean ACQ 1.9 vs. 1.8; $p=0.54$), but were more likely to report frequent nocturnal awakenings, more limitations in activities, and more shortness of breath related to their asthma (Table 2) than men on individual item responses. Women also reported worse asthma-related QOL on the mini-AQLQ (mean 4.5 vs. 4.9; $p<0.001$ respectively) (Table 3) where they were more likely to report feeling bothered by symptoms such as coughing (72% vs. 60%; $p<0.001$), or environmental triggers for asthma such as dust (85% vs. 73%; $p<0.001$), cigarette smoke (81% vs. 68%; $p<0.001$), and weather and air pollution (66% vs. 47%; $p<0.0001$), and were more likely to report limitations with activities. They were also more likely to report difficulty sleeping related to their asthma (57% vs. 48%; $p=0.01$). After adjusting for the increased frequency of co-morbid conditions in women, differences in reported shortness of breath noted on the ACQ and reports of interference with sleep or social activities on the mini-AQLQ were no longer significant. However, the rest of the item responses evaluated were unaffected.

Among participants with poorly-controlled asthma, women reported more asthma-related symptoms with a lower mean score on the ASUI (0.73 vs. 0.77; p=<0.0001) (Table 4). Compared to men, women were more likely to report feeling bothered by coughing (80% vs. 67%; p<0.001), were more likely to describe symptoms such as coughing, wheezing, and shortness of breath as moderate or severe (p<0.001, p=0.03, and p<0.01 respectively), and were more likely to report nocturnal asthma symptoms (62% vs. 50%; p<0.001). After adjusting for the increased frequency of co-morbid conditions in women, severity of wheezing and shortness of breath were no longer significant but the other item responses were not affected.

Similar analyses in the controlled population revealed few differences between men and women. The mean score on the ACQ was similar for men and women (0.7 vs. 0.7; p=0.53) and there were no significant differences noted on sex-specific analyses of the individual item responses (data not shown). Men and women also reported similar asthma-related QOL on the mini-AQLQ with mean scores of 5.9 and 5.7 (p=0.09) respectively. For the individual item responses, women were more likely to report feeling bothered by cigarette smoke (69% vs. 49%; p<0.01) or by weather and air pollution (36% vs. 21%; p=0.02), but there were otherwise no differences noted (data not shown). For the ASUI, women reported more overall asthma-related symptoms with a lower mean score of 0.87 vs. 0.90 (p=0.04), and were more likely to report being bothered by cough (46% vs. 33%; p=0.04). Otherwise, there were no significant differences noted. When adjusted for the presence of co-morbid conditions, there was no effect on the differences noted for individual item responses noted on the AQLQ, but there was no longer a statistical difference noted between men and women who reported coughing in the preceding two weeks on the ASUI (p=0.06).

DISCUSSION

The ALA-ACRC trials provide data on a group of well-characterized participants with asthma. The current analysis focuses on sex-related differences in a subgroup of participants 17 years of age or older enrolled in four clinical trials. Results showed that in participants with poorly-controlled asthma, women had outwardly similar asthma control as measured by the mean score on the seven-question ACQ, but reported more asthma symptoms and poorer asthma-related QOL, compared to men despite having better pulmonary function and similar baseline asthma medications. Interestingly, men reported more frequent use of SABA despite reporting less frequent asthma symptoms, suggesting that men may tend to under-report their asthma symptoms. Although the mean differences noted between poorly-controlled men and women on the ASUI and mini-AQLQ were statistically significant, they did not achieve the MID which has previously been described as important[19,25], initially suggesting that there were no important sex differences in asthma symptoms or QOL. However, our data suggest there are sex-related differences for a subset of asthma symptoms that may be disguised when looking at overall scores. The subset of symptoms for which there were notable significant differences included nocturnal awakenings and limitation in activities, which are likely to influence QOL and resultant responses on QOL assessments. These sex-related differences in asthma symptom expression became much less evident in the setting of well-controlled disease.

Previous studies have demonstrated differences between the sexes in asthma symptoms and control [4–7,27]. Survey data has shown that women report worse asthma control and greater healthcare utilization [6] despite noting more frequent use of controller medications [27]. In addition, women frequently report worse asthma-related quality of life despite demonstrating better pulmonary function [4–5,7,28]. In a cluster analysis of the Severe Asthma Research Program, Moore and colleagues described five distinct asthma phenotypes [29] including a group of primarily women with frequent co-morbid conditions and symptoms

out of proportion to documented airflow obstruction. This phenotype bears a striking resemblance to the adult women with poorly-controlled asthma in the current study.

The data presented here extend the current understanding of the differences between adult men and women with asthma; we present an objectively characterized group of asthmatics, using a combination of standardized asthma control questionnaires and pulmonary function testing to hone in on those factors that may be contributing to poor asthma control in women, and how they differ from men. Accordingly, this study is the first to examine sex-specific responses to standardized questionnaires in a detailed fashion.

Few have attempted to assess sex-specific differences in asthma symptom profiles and asthma control on standard questionnaires. Lee and colleagues [4] assessed sex-related differences in severe asthmatics, and noted that when women reported more control problems on the Asthma Therapy Assessment Questionnaire (ATAQ) [30] they were more likely to report nocturnal awakenings and missed activities despite having better pulmonary function. In a survey of a managed care population, sex differences were noted in item responses to the mini-AQLQ, with women noting more asthma symptoms and specific triggers such as cigarette smoke, weather, and air pollution [6]. Wijnhoven and colleagues [7] noted some sex-specific differences in item responses to the Quality of Life in Respiratory Illness Questionnaire [31] in a survey of patients with asthma in some age groups, but not others.

There are several possible explanations for the sex-specific differences noted in item responses to the questionnaires in this study. Women with poorly-controlled asthma reported more GERD and sinusitis, and were more likely to associate their asthma symptoms with allergies. These findings are similar to other studies [4,6] where women with asthma were more likely to report allergic co-morbidities or sinusitis, and seemed to be more susceptible to environmental triggers [27] than men. These conditions could potentially worsen asthma control, or perhaps more importantly, result in symptoms which mimic asthma and potentially influence the response on the questionnaires evaluated here. In the adjusted analysis, the presence of these factors altered the significance of a few, but not most, responses, suggesting that some differences may be related to their presence, while others may be inherent differences between men and women. Others have suggested that women may have increased bronchial hyper-responsiveness as a result of an increased susceptibility to tobacco smoke [9–10], perhaps contributing to this increased sensitivity to environmental triggers. However, we did not find a sex-related difference in the provocative concentration of methacholine (PC_{20}) at baseline in our patients.

Another possible explanation may be an increased awareness of dyspnea or an increased tendency to manifest symptoms in women. It has been shown that inspiratory muscle strength is significantly greater in men than women with asthma, and is inversely related to dyspnea [8]. Similarly, in healthy female nonsmokers, women demonstrate a lower cough reflex threshold associated with a greater urge to cough and a greater sense of dyspnea when compared to males [32]. Finally, it is possible that factors such as pre-menstrual worsening of asthma [33–35] or increased anxiety and depression in women with asthma [36] which were not easily accounted for in this analysis could explain some of the sex-related differences we identified.

These findings support the fact that men and women experience asthma differently. As asthma care providers, this information can be used to begin developing sex-specific evaluation and treatment plans which target these differences. There are two major clinical implications of our results. Men may have poorer perception of their disease severity than women, as expressed by poorer pulmonary function and less impairment on standardized

asthma questionnaires. This would imply that men need to be carefully screened with testing including lung function to accurately assess impairment. Women may have more severe disease in terms of asthma-related symptoms and impact on QOL despite having more preserved pulmonary function, and co-morbidities such as sinusitis may be particularly important in women. One size does not fit all for asthma assessment, and patients may benefit from sex-specific interventions. Clark and colleagues [14–15] have shown that female-specific asthma management improves asthma-related QOL and results in decreased use of rescue inhalers when compared to usual care.

A few limitations to our study must be noted. First, the cross-sectional study design provided only a single evaluation of each participant's asthma control. Despite the use of standardized questionnaires, many findings were based on self-report and are subject to recall bias. Finally, the original ALA-ACRC studies were not designed to specifically address the question at hand.

CONCLUSION

Our findings suggest that using the overall score alone on currently available asthma questionnaires may not detect sex-specific differences in asthma symptoms, allowing asthma care providers to miss potential opportunities to develop targeted asthma care plans which may improve asthma control for their patients. In addition to utilizing these tools as a global assessment of asthma control, practitioners should be attentive to the potential differences in symptoms which men and women may experience and their potential impact on asthma-related QOL and functional limitation. While future research explores the need for more focused evaluation tools, providers should examine individual item responses with attention to particular sex-specific patterns which may signal areas of sub-optimal control.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ABBREVIATIONS

ACQ	Asthma control questionnaire
ALA-ACRC	American Lung Association Asthma Clinical Research Centers
ASUI	Asthma symptom utility index
ATAQ	Asthma therapy assessment questionnaire
BMI	Body mass index
FEV_1	Forced expiratory volume in one second
GERD	gastroesophageal reflux disease
LOCCS	Leukotriene or Corticosteroid or Corticosteroid-Salmeterol trial
LODO	Effectiveness of Low Dose Theophylline as Add-On Therapy In Treatment of Asthma
MID	minimal clinically important difference
mini-AQLQ	mini asthma quality of life questionnaire
PC_{20}	provocative concentration of methacholine
QOL	quality of life
SABA	short-acting beta-agonist
SARA	Study of Acid Reflux and Asthma
TAPE	Trial of Asthma Patient Education

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Table 1

A: Demographic and baseline clinical characteristics of well-controlled asthma population					
	Women N=181(63%)		**Men N=106(37%)**		**P-value**
Demographic and clinical characteristics					
	N	**Mean(SD)**	**N**	**Mean(SD)**	
Age in years	181	35.7(13.2)	106	33.6(11.2)	0.36
Race	**N**	**%**	**N**	**%**	
White	126	70	71	67	0.17
Black	44	24	22	21	
Other	11	6	13	12	
Hispanic					
Yes	14	8	10	9	0.62
No	167	92	96	91	
Smoking status					
Current	12	7	7	7	0.69
Former	40	22	19	18	
Never	129	71	80	75	
	N	**Mean(SD)**	**N**	**Mean(SD)**	
BMI (kg/m^2)	181	28.7(7.6)	106	27.7(5.7)	0.85
Other self-reported conditions	**N**	**%**	**N**	**%**	
GERD	46	25	22	21	0.37
Eczema	27	15	12	11	0.39
Chronic sinusitis	65	36	19	18	0.001
Food allergies	49	27	21	20	0.17
Allergic rhinitis	110	61	62	58	0.70
Asthma characteristics					
Asthma exacerbation in prior year	60	33	27	25	0.17
Allergies reported trigger for asthma	149	82	90	85	0.57
	N	**Mean(SD)**	**N**	**Mean(SD)**	
Age of asthma diagnosis in years	177	17.0 (15.0)	104	15.1 (15.1)	0.18
Pulmonary function					

A: Demographic and baseline clinical characteristics of well-controlled asthma population

	Women N=181(63%)		Men N=106(37%)		P-value
Pre-bronchodilator FEV_1 % predicted	181	92.4 (10.7)	106	89.4 (9.4)	<0.01
Post-bronchodilator FEV_1 % predicted	180	97.6 (11.4)	103	95.9 (11.2)	0.13
% change FEV_1	180	5.6 (5.9)	103	7.4 (6.8)	0.06
Pre-bronchodilator FVC% predicted	181	100.3 (12.5)	106	99.8 (12.8)	0.81
Post-bronchodilator FVC% predicted	180	101.6 (14.2)	103	100.2 (13.7)	0.62
% change FVC	180	1.3 (9.1)	103	0.6 (5.6)	0.47
PC_{20} methacholine (mg/dL)	35	3.7 (3.6)	23	3.7 (4.2)	0.82
Chronic asthma medications	**N**	**%**	**N**	**%**	
Inhaled SABA	120	66	71	67	0.91
ICS	38	21	27	25	0.38
LABA	13	7	4	4	0.31
LABA/ICS	68	38	28	26	0.05
Leukotriene modifiers	30	17	10	9	0.09
Inhaled anticholinergics	4	2	0	0	0.30
Cromolyn sodium or nedocromil	5	3	1	1	0.42
Oral beta-agonists	1	1	0	0	>.99
Methylxanthines	1	1	0	0	>.99
Oral corticosteroids	0	0	1	1	0.37
Herbal or natural supplements	32	18	9	8	0.03

B: Demographic and baseline clinical characteristics of poorly-controlled asthma population

	Women N=953(72%)		Men N=372 (28%)		P-value*
Demographic and clinical characteristics					
	N	**Mean(SD)**	**N**	**Mean(SD)**	
Age in years	953	40.9(13.8)	372	39.6(14.2)	0.09
Race	**N**	**%**	**N**	**%**	
White	563	59	217	58	0.62
Black	316	33	120	32	
Other	74	8	35	9	

B: Demographic and baseline clinical characteristics of poorly-controlled asthma population

	Women N=953(72%)		Men N=372 (28%)		P-value*
Hispanic					
Yes	81	9	29	8	0.68
No	872	92	343	92	
Smoking status					
Current	51	5	20	5	0.18
Former	336	35	151	41	
Never	566	59	201	54	
	N	**Mean(SD)**	**N**	**Mean(SD)**	
BMI (kg/m^2)	951	31.4(8.7)	371	28.7(6.1)	<.0001
Other self-reported conditions	**N**	**%**	**N**	**%**	
GERD	248	26	76	20	0.03
Eczema	111	17	31	12	0.04
Chronic sinusitis	422	44	107	29	<.0001
Food allergies	138	21	54	20	0.73
Allergic rhinitis	626	66	230	62	0.19
Asthma characteristics					
Asthma exacerbation in prior year	440	46	134	36	<0.001
Allergies reported trigger for asthma	791	83	286	77	0.01
	N	**Mean(SD)**	**N**	**Mean(SD)**	
Age of asthma diagnosis in years	933	19.1(16.6)	365	16.4(16.9)	<0.001
Pulmonary function					
Pre-bronchodilator FEV_1 % predicted	953	82.5(15.4)	371	78.0(16.3)	<.0001
Post-bronchodilator FEV_1 % predicted	948	89.1(15.0)	370	85.2(15.5)	<.0001
% change FEV_1	948	9.0(11.2)	370	10.4(14.3)	<0.01
Pre-bronchodilator FVC% predicted	952	89.9(14.5)	371	90.5(15.9)	0.35
Post-bronchodilator FVC% predicted	948	93.5(14.7)	370	95.0()14.5	0.03
% change FVC	948	4.5(9.5)	370	5.9(11.7)	0.01
PC_{20} methacholine (mg/dL)	128	3.3(4.3)	47	3.3(4.1)	0.82
Chronic asthma medications	**N**	**%**	**N**	**%**	
Inhaled SABA	779	82	323	87	0.03

B: Demographic and baseline clinical characteristics of poorly-controlled asthma population

	Women N=953(72%)		Men N=372 (28%)		P-value*
ICS	265	28	112	30	0.40
LABA	90	9	36	10	0.90
LABA/ICS	550	58	201	54	0.24
Leukotriene modifiers	109	11	32	9	0.14
Inhaled anticholinergics	26	3	7	2	0.37
Cromolyn sodium or nedocromil	5	1	4	1	0.28
Oral beta-agonists	4	<1	1	<1	>0.99
Methylxanthines	3	<1	3	1	0.36
Oral corticosteroids	17	2	2	1	0.12
Herbal or natural supplements	86	13	28	11	0.25

SD = standard deviation; BMI = body mass index; GERD = gastroesophageal reflux disease; FEV_1 = forced expiratory volume in one second; FVC = forced vital capacity; PC_{20} = provocative concentration of methacholine; SABA = short-acting beta-agonist; ICS = inhaled corticosteroid; LABA = long-acting beta-agonist

Table 2

Juniper Asthma Control Questionnaire (ACQ) responses for poorly-controlled subjects

	Women N=952 (72%)			Men N=372 (28%)				
	Mean	**SD**	**95% CI**	**Mean**	**SD**	**95% CI**	**p**	**p***
ACQ7	1.9	0.8	1.9,2.0	1.8	0.8	1.8,1.9	.54	0.36
Woken by asthma past week?	1.5	1.3	1.4,1.6	1.3	1.2	1.1,1.4	<0.01	0.02
How bad were symptoms?	1.9	1.1	1.9,2.0	1.8	1.1	1.7,1.9	0.08	0.11
How limited in activities?	1.8	1.2	1.7,1.9	1.5	1.2	1.4,1.6	0.001	0.02
How much shortness of breath did you experience?	2.5	1.1	2.4,2.5	2.3	1.1	2.1,2.4	0.03	0.07
How much time did you wheeze?	2.0	1.3	1.9,2.1	1.9	1.2	1.8,2.0	0.89	0.68
How many puffs of short-acting bronchodilator each day?	1.5	1.0	1.5,1.6	1.5	1.1	1.4,1.6	0.91	0.75

Individual item responses were analyzed by sex of respondent, and describe the preceding seven days.

ACQ7 = seven question asthma control questionnaire; SD = standard deviation; CI = 95% confidence interval; FEV_1= forced expiratory volume in one second;

p = p-value adjusted for trial, age, race and body mass index.

p* = p-value adjusted for trial, age, race, body mass index, gastroesophageal reflux disease, eczema, sinusitis, and rhinitis.

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Table 3

Mini Asthma Quality of Life Questionnaire (AQLQ) in poorly controlled subjects.

		Women		Men			
		Mean(SD)	**Median**	**Mean(SD)**	**Median**	**p**	**p***
AQLQ Score		4.5(1.2)	4.5	4.9(1.1)	5.0	<.0001	0.001
		Women	%	Men	%		
Feel short of breath as a result of your asthma?	No time	148	16%	76	20%	0.08	0.20
	Any time	804	84%	296	80%		
Feel bothered by or have to avoid dust in the environment?	No time	139	15%	100	27%	<0.0001	<0.0001
	Any time	813	85%	272	73%		
Feel frustrated as a result of your asthma?	No time	340	36%	147	40%	0.44	0.94
	Any time	612	64%	225	60%		
Feel bothered by coughing?	No time	264	28%	149	40%	<0.001	0.01
	Any time	688	72%	223	60%		
Feel afraid of not having your asthma medication?	No time	431	45%	151	41%	0.09	0.04
	Any time	521	55%	221	59%		
Experience a feeling of chest tightness or chest heaviness?	No time	245	26%	113	30%	0.11	0.86
	Any time	707	74%	259	70%		
Feel bothered by or have to avoid cigarette smoke in the environment?	No time	180	19%	118	32%	<0.0001	<0.001
	Any time	772	81%	254	68%		
Have difficulty getting a good night's sleep as a	No time	406	43%	193	52%	0.01	0.10

		Women		Men			
		Mean(SD)	Median	Mean(SD)	Median	p	p*
result of your asthma?							
	Any time	546	57%	179	48%		
Feel concerned about having asthma?	No time	343	36%	140	38%	0.98	0.58
	Any time	609	64%	232	62%		
Experience a wheeze in your chest?	No time	276	29%	119	32%	0.62	0.68
	Any time	676	71%	253	68%		
Feel bothered by or have to avoid going outside because of weather or air pollution?	No time	327	34%	198	53%	<0.0001	<0.001
	Any time	625	66%	174	47%		
Limitations with strenuous activities?	No time	235	25%	139	37%	<0.001	<0.01
	Any time	717	75%	233	63%		
Limitations with moderate activities?	No time	400	42%	228	61%	<.0001	<0.001
	Any time	552	58%	144	39%		
Limitations with social activities?	No time	644	68%	282	76%	0.04	0.06
	Any time	308	32%	90	24%		
Limitations with workrelated activities?	No time	631	66%	270	73%	0.17	0.46
	Any time	321	34%	102	27%		

Individual item responses were analyzed by sex of respondent, and describe the preceding two weeks.

p=p-value adjusted for age, race, and body mass index.

p*= p-value adjusted for trial, age, race, body mass index, gastroesophageal reflux disease, eczema, sinusitis, and rhinitis. SD = standard deviation

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Table 4

Asthma symptom utility index (ASUI) in poorly-controlled subjects

		Women (n= 953, 72%)		**Men (n= 372, 28%)**			
		Mean(SD)	**Median**	**Mean(SD)**	**Median**	**P**	**p***
ASUI Score		0.73(0.16)	0.75	0.77(0.14)	0.80	<.0001	<0.01
		Women	%	Men	%		
How many days were you bothered by coughing?	Not at all	189	20%	121	33%	<.0001	<0.001
	Others	764	80%	251	67%		
On average, how severe was your cough?	Mild	452	59%	181	72%	<0.001	0.01
	Moderate	277	36%	61	24%		
	Severe	35	5%	9	4%		
How many days were you bothered by wheezing?	Not at all	210	22%	72	19%	0.11	0.33
	others	743	78%	300	81%		
On average, how severe was your wheezing?	Mild	497	67%	226	75%	0.03	0.08
	Moderate	230	31%	70	23%		
	Severe	16	2%	4	1%		
How many days were you bothered by shortness of breath?	Not at all	79	8%	38	10%	0.47	0.83
	others	874	92%	334	90%		
On average, how severe was your shortness of breath?	Mild	522	60%	235	70%	<0.01	0.12

		Women (n= 953, 72%)		Men (n= 372, 28%)			
		Mean(SD)	**Median**	**Mean(SD)**	**Median**	**P**	**p***
	Moderate	326	37%	94	28%		
	Severe	26	3%	5	2%		
How many days were you awakened at night by your asthma?	Not at all	364	38%	186	50%	<0.001	0.001
	Others	589	62%	186	50%		
On average, how much of a problem was being awakened at night?	Mild	368	62%	127	68%	0.12	0.10
	Moderate	199	34%	54	29%		
	Severe	22	4%	5	3%		
How many days were you bothered by side effects of asthma medications?	Not at all	756	79%	318	85%	<0.01	<0.01
	Others	197	21%	54	15%		
On average, how severe were the side effects?	Mild	140	71%	36	67%	0.78	0.56
	Moderate	53	27%	18	33%		
	Severe	4	2%	0	0%		

Individual item responses were analyzed by sex of respondent, and describe the preceding two weeks.

p= pvalue adjusted for trial, age, race, and body mass index.

p* = p-value adjusted for trial, age, race, body mass index, gastroesophageal reflux disease, eczema, sinusitis, and rhinitis SD = standard deviation.