Factors Associated with Depressive Symptoms in Uncontrolled Asthmatics

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Abstract

Rationale: Recent epidemiological data indicate that approximately 6.7% of U.S. adults suffer from depression in any given year. The purpose of the study is to identify factors associated with depressive symptoms in a large diverse group of patients with poorly controlled asthma. The factors include quality of life, lung function, asthma knowledge, attitudes, self-efficacy, symptoms and control of disease.

Methods: Baseline characteristics of a cohort of 599 subjects with asthma recruited from twenty Asthma Clinical Research Centers across the U.S. were examined. The Center for Epidemiologic Studies Depression Scale (CES-D) was used to stratify subjects into those with depressive symptoms (CES-D score >= 16) and those without depressive symptoms (CES-D <16). Bivariate statistics were used to compare the two groups; additionally, logistic regression was used to determine factors that have the greatest association with depressive symptoms.

Results: Subjects with depressive symptoms had significantly lower quality of life (QOL) scores and less knowledge about their disease than subjects with no depression; however, lung function (FEV1 %) and asthma control were not significantly associated with depressive symptoms in the logistic regression analysis. Subjects, who were non-white, had lower household income, high school diploma or less and those who were unemployed or disabled had significantly higher scores for depressive symptoms.

Conclusion: Subjects with depressive symptoms have significantly less knowledge of their disease and poorer quality of life compared to those without depressive symptoms. Evaluating depressive symptoms in subjects with asthma will provide a more complete picture of their overall condition. The role of asthma education on depressive symptoms in this population needs to be

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further investigated. The effect on quality of life of treating depression in asthma patients also needs to be studied.

Keywords

Approximately 6.7% of the US population experiences depression in any given year.[1] Depression is cited as an indicator of poor outcomes in several chronic diseases including asthma.[2] Asthma has a long history of being linked to psychosomatic pathology. Indeed, as late as 1950, asthma was considered one of the "holy seven" psychosomatic illnesses described by Alexander.[3] While research over the past century has shown that asthma is an inflammatory disease of the airway, there exists a mind-body link that needs to be explored. Recent studies on depression suggest that patients with uncontrolled asthma often struggle with the psychological stressors that impact their disease.[4, 5,31–33] The co-prevalence of depression and asthma varies greatly, reported prevalence estimates range from 7.6% to 55%.[6–9] Variation in study population and depression measures used in these reports may explain some of this variation. Depression has been shown to be associated and to negatively impact quality of life of patients with many chronic diseases including asthma.[10] In addition to the reduction in quality of life, depression has been associated with worse outcomes including increased health care utilization, decreased asthma control, increased asthma severity, increased rates of hospitalization, and increased mortality.[33–37]. The association of asthma and wheezing with major depressive episodes have been identified in 57 countries.[33] This study is novel in identifying the association between depression and asthma knowledge. The patient's knowledge of their disease significantly impacts management and outcomes. Lack of asthma knowledge needs to be identified to determine effective methods for asthma education. Identifying factors associated with depressive symptoms in uncontrolled asthma will enable clinicians to recognize the impact of depressive symptoms on their patients living with asthma and help guide future prospective studies evaluating strategies that evaluate and treat this group of patients. To evaluate factors that are potentially associated with the presence of depressive symptoms in asthma (i.e., quality of life, lung function, asthma knowledge, attitudes, self-efficacy, symptoms and control of disease), we performed a secondary analysis of data collected from in a large, multi-center randomized clinical trial investigating the role asthma education and placebo effects on asthma control, the Trial of Asthma Patient Education (TAPE).. All of the subjects in the original TAPE study had uncontrolled asthma as it was an inclusion criteria in this study evaluating interventions.

Methods

Patient Population

Details of the Trial of Asthma Patient Education (TAPE) have been previously published.[11] The study had approval by institutional review boards and all subjects provided their informed consent to participate. Subjects under 18 years old had parents/guardians provide informed consent. In summary, this study aimed to evaluate the effects of asthma education and the role of placebo on asthma control. Eligible subjects were non-smokers, 15 years of age or older with inadequately controlled, physician-diagnosed asthma, and taking regular

asthma medication in the preceding year. Other inclusion criteria included post-bronchodilator FEV1 greater than 75% of predicted value and one or more indicators of poor asthma control defined as:

Asthma Control Questionnaire [ACQ] score 1.5; use of inhaled short acting beta2-agonists for asthma symptoms 2 times per week; or, nocturnal awakening 1 time per week.

Subjects were evaluated on several occasions throughout the study and several questionnaires were administered by direct supervision by a study nurse to assess; asthma control (Asthma Control Questionnaire, ACQ), asthma symptoms (Asthma Symptom Utility Index, ASUI), shortness of air (Shortness of Breath Questionnaire, SOBQ), asthma quality of life (Mini Asthma Quality of Life Questionnaire, MiniAQLQ), asthma knowledge (Knowledge Attitude and Self-Efficacy Asthma Questionnaire, KASE) and depressive symptoms (Center for Epidemiological Studies- Depression, CES-D).[12–17]. The KASE evaluated knowledge, attitudes, and self-efficacy. The questions regarding knowledge related to identification of asthma triggers, medications, and recognition and management of exacerbations.

The CES-D is a 20 question self-administered instrument that measures 6 domains over the past week. The instrument domains include; depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbances.[17] Details on the above questionnaires are provided in the online supplement. Spirometry was performed on selected visits.

Baseline data were collected from 601 subjects. Two subjects were eliminated due to incomplete data. Only data collected prior to the interventions in the TAPE trial were used so that these interventions did not present as a confounding factor in this study.

Statistical Design and Analysis

An observational, cross-sectional study design was utilized with subjects observed at a single time point at baseline. Subjects were categorized as having depressive symptoms (CES-D, score 16) or without significant depressive symptoms (CES-D score <16). Demographic data were analyzed using descriptive statistics, and parametric and non-parametric bivariate analyses were used to compare the two groups on demographic and asthma characteristics. Logistic regression analysis was used to determine which person-level and clinical factors have the greatest association with depression. Data from the CED-D, ACQ, ASUI, Mini AQLQ, and KASE were entered in the multivariate regression model. Using logistic regression with a backward elimination approach allowed for modeling the outcome using most relevant predictors while controlling for collinearity among predictors. The criteria for variable removal in this analysis was p >.1.

Results

Of the 599 analyzed, 139 or 23.2% scored greater than or equal to sixteen on the CES-D questionnaire, indicating the presence of depressive symptoms.

Depressive Symptoms and demographics

Baseline characteristics of patient population are presented in Table 1. No significant gender difference in depression status. Subject's age also was not a significant factor for depressive symptoms. Subjects, who were non-white, had lower household income, high school diploma or less and those who were unemployed or disabled had significantly higher scores for depressive symptoms.

Covariates of Depressive Symptoms

Bivariate analyses comparing those with depressive symptoms versus those with no depressive symptoms showed statistically significant lower quality of life scores, knowledge, attitude and self-efficacy scores and higher asthma symptoms than those subjects with no depression (Table 2).

Data were subsequently entered into a multiple logistic model and odds ratios (95% confidence intervals) obtained for those factors that were significantly related to depressive symptoms. The resulting model, adjusting for potential confounders (race, education, socioeconomic status, age and gender) included the following predictors: Quality of Life (QOL) and subscale scores from KASE (Knowledge Score, Attitudes and Self-Efficacy). Results showed that the odds of a worse quality of life and greater knowledge were associated with depressive symptoms. Specifically, quality of life was reduced by 43% and asthma knowledge by 9% in subjects with depressive symptoms.. The self-efficacy score was not significantly associated with depression. (Table 3). Lung function (FEV1 %) and asthma control were not significantly associated with depressive symptoms in the logistic regression analysis.

Discussion

In this study, we investigated variables that are associated with depressive symptoms in a large sample of subjects with poorly controlled asthma participating in a clinical trial. In addition, the effects of depressive symptoms on asthma outcomes were examined. The prevalence of depression in our sample was three times higher than that of the standard population (6.7%)[1] Subjects who were non-white, had lower household income, high school diploma or less and those who were unemployed or disabled had significantly higher scores for depressive symptoms. We demonstrated that asthma subjects with depressive symptoms have significantly less knowledge of their disease and poorer quality of life compared to subjects without depressive symptoms.

While depression has been linked to several chronic diseases, such as, diabetes, congestive heart failure and others, its' impact on patients with asthma is somewhat elusive. We were unable to evaluate the impact of depressive symptoms on asthma control because all subjects included in this study had poor asthma control on recruitment. Uncontrolled asthma was an inclusion criteria for the original TAPE intervention study. Lung function showed no association with depressive symptoms.

In our analysis, asthma-specific quality of life and asthma knowledge survived the predictive logistical model, further highlighting the interplay of quality of life and knowledge of disease and depression. Quality of life as a correlate of depression is not a surprising finding and has been .described previously in numerous other studies.[4, 18–22,35–37.] However, our finding that asthma specific quality of life is a correlate for depressive symptoms is interesting. Our data suggest that screening for depressive symptoms in poorly controlled asthmatics may identify patients with asthma who have a distinct profile. Knowledge of disease and its link to depressive symptoms further supports the need for asthma education in subjects with asthma. This was demonstrated in a small study conducted by Trousman, Zeitz and Taylor in 2010.[23] This study assessed the impact of an educational intervention for asthma. After the seven meetings, subjects were retested and significant improvements were found in asthma control scores and geriatric depression scores. It is possible that depressive symptoms are a barrier for patients to learn about their asthma. It is also possible that those who lack insight about their asthma are likely to cope with their disease and may be at higher risk of depression.[38] Our findings suggest that alternative strategies may be needed for education in patients with asthma especially those with depressive symptoms. If patients gain more knowledge of their asthma it is possible they will feel more empowered and have less depressive symptoms.

Depressive symptoms have been linked to non-adherence to medication regimes.[24–27] It is estimated that less than 50% of patients with asthma are adherent to their prescribed medications.[27] It appears that adherence rates are even lower in the depressed population of asthmatics. Since depression also includes feeling of hopelessness and helplessness it would be logical to assume that nonadherence to medical regimes would follow.[25] The possible relationship of nonadherence to medical regimes associated with depression could further explain poorer asthma QOL in those patients with depressive symptoms.

Our study has several limitations. Our study population may not necessary reflect the general asthma population. Subjects were mostly female, middle class, predominately white, mostly well-educated and currently employed and all had poorly controlled asthma. Although BMI may be a relevant cofounder, we did not have the data on this population to include in the analysis. We identified subjects with asthma who are non-white, with lower socioeconomic status, and lower education had higher rates of depressive symptoms. Goethe demonstrated this in a study focused on a population of asthmatics that were largely Hispanic, poor and living in the urban core. Depressive symptom prevalence was 55% for that study.[9] The cross sectional design of our study prevented us from evaluating the effects of depressive symptoms on asthma over time.

Conclusions

Our findings suggest depressive symptoms in subjects with poorly controlled asthma are common and correlate with poor asthma specific quality of life and asthma knowledge regardless of age and gender..

Our results suggest that evaluation for depressive symptoms in patients with asthma identify those with a distinct phenotype. Patients with asthma and depression are different than

patients without depression in terms of quality of life and asthma knowledge. Evaluating the impact of depressive symptoms on asthma control in a more diverse population would be valuable. Future studies need to explore the effects of improving asthma knowledge on depression and need to evaluate the effects of the treatment of depressive symptoms on asthma outcomes.

Acknowledgements

Abbreviation List

ACQ	Asthma Control Questionnaire
ALA-ACRC	American Lung Association-Asthma Clinical Research Centers
ASUI	Asthma Symptom Utility Index
CES-D	Center for Epidemiological Studies- Depression
FEV1	Forced Expiratory Volume in 1 second
KASE	Knowledge Attitude and Self-Efficacy Asthma Questionnaire
Mini AQLQ	Mini Asthma Quality of Life Questionnaire
SOBQ	Shortness of Breath Questionnaire
TAPE	Trial of Asthma Patient Education

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Table 1.

Baseline demographics of study participants

	All Participants (n= 599)	Subjects with CES-D <16 (n= 460)	Subjects with CES-D 16 (n= 139)
Age (yrs), Mean (SD)	37.9 (11.1)	37.6 (13.1)	38.0 (14.3)
Gender			
Males, n (%)	165 (27.6)	128 (27.8)	37 (26.6)
Females, n (%)	434 (72.4)	332 (72.2)	102 (73.4)
Ethnicity			
Hispanic/Latino	46 (7.7%)	39 (8.5%)	7 (5.0%)
Non-Hispanic/Latino	553 (93.3%)	421 (91.5%)	132 (95.0%)
Race *			
White	361 (60.3%)	293 (63.7%)	68(48.9%)
Black/AA	200 (33.4%)	136 (29.6%)	64 (46.0%)
Asian	8 (1.3%)	5 (1.1%)	3 (2.2%%)
Am Indian/Alaskan Native	3 (0.5%)	3(0.7%)	-
Other	27 (4.5%)	23(5.0%)	4 (2.9%)
Education *			
< HS Grad	49 (8.2%)	31(6.7%)	18(12.9%)
HS Grad	88 (14.7%)	55(12.0%)	33(23.7%)
Some College	258 (43.1%)	199(43.3%)	59(42.4%)
Bachelor's Degree	113 (18.9%	97(21.1%)	16(11.5%)
Some Post Grad	36 (6.0%)	31(6.7%)	5(3.6%)
Post Grad Degree	55 (9.2%)	47(10.2%)	8(5.8%)
Employment *			
Student	99 (16.5%)	76(16.5%)	23(16.5%)
Not Working Outside Home	62 (10.4%)	34(7.4%)	28(20.1%)
Employed FT	293 (48.9)	246(53.5%)	47(33.8%)
Employed PT	69 (11.5%)	56(12.2%)	13(9.4%)
Retired	29 (4.5%)	24(5.2%)	5(3.6%)
Disabled/Unable to Work	25 (4.2%)	11(2.4%)	14(10.1%)
Other	22 (3.7%)	13(2.8%)	9(6.5%)
Household Income *			
<$20,000	127 (21.2%)	62(17.8%)	45(32.4%)
$20,000 - $50,000	183 (30.6%)	145(31.5%)	38(27.3%)
$50,000 - $75,000	67 (11.2%)	59(12.8%)	8(5.8%)
$75,000	66 (11.0%)	55(12.0%)	11(7.9%)
Declined to answer	115 (19.2%)	89(19.3%)	26(18.7%)
Don't know	41(6.8%)	30(6.5%)	11(7.9%)

*Significant difference between groups p<.05

Table 2:

Comparison of QoL, SOB and KASE subscale scores for knowledge, attitude and self-efficacy for subjects with depressive symptoms and those without depressive symptoms.

Questionnaire	Subjects with CES-D 16 n=139 Mean (SD)	Subjects with CES-D< 16 n=460 Mean (SD)	p value
MiniAQLQ	4.3 (1.1)	5.2 (1.0)	<.001
Knowledge Score	7.5 (2.4)	8.7 (2.2)	.001
Attitude Score	82.4 (7.0)	86.3 (6.8)	.001
Self-Efficacy	75.0 (8.5)	77.4 (7.5)	.003
SOBQ score	1.4 (0.9)	0.8 (0.7)	.001

Table 3:

Predictive Logistic Model: Effect of Patient-level Variables on Depression Status

Outcome CES-D	OR	95% CI	P
Mini AQLQ	0.57	(0.46, 0.70)	0.0001
Attitude	0.91	(0.82, 1.01)	0.062
Knowledge	0.96	(0.93, 0.99)	0.011
Self-Efficacy	1.06	(0.69, 1.64)	0.784

*
Model adjusted for race, age, education, socioeconomic status and gender.