CHEST

Original Research

CYSTIC FIBROSIS

The Association Between Depression, Lung Function, and Health-Related Quality of Life Among Adults With Cystic Fibrosis*

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Background: **More than 40% of people born with cystic fibrosis (CF) now reach adulthood. Greater attention is being focused on improving their health-related quality of life (HRQoL). While markers of disease severity such as lung function are only modestly associated with HRQoL, in other chronic illnesses depression is an important correlate. The objective of this study was to evaluate the relationships among lung function (*ie*, FEV_1 percent predicted), depressive symptoms, and HRQoL among adults with CF.**

Methods: **Seventy-six adults with CF completed a mail-based survey. The Beck Depression Inventory and the Cystic Fibrosis Questionnaire were used to assess depressive symptoms and HRQoL, respectively. Values for FEV_1 percent predicted were abstracted from the medical record.**

Results: **Thirty percent of participants screened positive for depressive symptoms. Depressive symptoms and lung function were inversely correlated (rho = −0.25; $p < .05$). Correlations between depressive symptoms and HRQoL were maintained after stratifying by lung function. In the absence of depressive symptoms, those patients with good lung function (*ie*, FEV_1, > 70% predicted) reported better physical HRQoL than those with poor lung function. Participants with both depressive symptoms and poor lung function reported significantly worse HRQoL on all domains than participants without depressive symptoms regardless of lung function status.**

Conclusions: **Depressive symptoms are prevalent among adults with CF and are associated with poorer HRQoL even after controlling for lung function. These results suggest that screening for and treating depression is important and may potentially improve HRQoL among patients with CF.**

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Key words: adults; cystic fibrosis; depression; health-related quality of life; lung function; psychosocial; pulmonary function test

Abbreviations: BDI = Beck Depression Inventory; CF = cystic fibrosis; CFQ = Cystic Fibrosis Questionnaire; HRQoL = health-related quality of life

Advances in the diagnosis and treatment of cystic fibrosis (CF) have led to a substantial increase in survival rates with a growing percentage of individuals with CF surviving into adulthood. In 2005, the median survival age for individuals with CF in the United States was 36.5 years, and > 40% of patients were ≥ 18 years.[1] With increased survival, more

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research and clinical attention is turning toward evaluating and improving the health-related quality of life (HRQoL) of adults with CF. Little is known about the factors that contribute to HRQoL in CF patients. Indicators of disease severity (*eg*, lung function, body mass index, exercise performance, and pulmonary exacerbations) are only modestly related to HRQoL scores,[2–6] indicating that additional factors are important. Staab et al[4] found that treatment burden (*ie*, the number of hours per day spent in therapy), health perceptions, and coping style explained a significant amount of variance in HRQoL beyond disease severity. However, little is known about the role other factors such as depression may play.

Previous studies have suggested that depressive symptoms are common in adults with CF. One study[7] found that 46% of adults screened positive for depressive symptoms, with 12% having symptoms in the moderate-to-severe range. Another study[8] found that while mean scores were within normal limits, 12% of adults with CF scored outside the normal range on a battery of depression and anxiety measures. Although there is no standardized definition for depression, in the 2005 CF patient registry, 16% of adults were noted to have depressive symptoms.[1] The extent to which depressive symptoms contribute to HRQoL in adults with CF is not known. A substantial body of literature across other chronic illnesses, including asthma, COPD, congestive heart failure, epilepsy, and diabetes, has suggested that depressive symptoms are associated with HRQoL[9–14] and even predict HRQoL,[15,16] independent of disease severity. Treating depression can improve depressive symptoms, health-related functioning, and HRQoL.[17] Thus, the objective of this study was to evaluate the relationships among disease severity (*ie*, lung function), depressive symptoms, and HRQoL in adults with CF. We hypothesized that the presence of depressive symptoms would be associated with significantly worse HRQoL even after controlling for disease severity.

Materials and Methods

This was a cross-sectional study that was conducted from April 2002 to November 2003. Adults ≥ 18 years of age were eligible to be included if they had a confirmed diagnosis of CF, had been seen in the clinic previously, and were scheduled for an outpatient appointment. A recruiter telephoned the patient, explained the study, assessed eligibility, and obtained verbal consent to mail the study materials. Participants completed the questionnaires at home and mailed back the consent form and questionnaires. If the questionnaire was not returned, the recruiter telephoned to remind them to do so and to answer questions. If the questionnaires were still not returned, study materials were mailed once more, with no additional phone contact. Participants were compensated for their participation with a payment of $20. The study protocol was approved by the Western Institutional Review Board.

Lung function results (*ie*, FEV_1 percent predicted) obtained closest to the date of survey completion were abstracted from the participants' medical record. Forty-five percent of participants had undergone a lung function test within ± 4 weeks of completing the survey, and almost all participants (97%) had undergone the test within ± 6 months. An FEV_1 of ≥ 70% predicted indicated mild illness, an FEV_1 of ≥ 40 to 69% predicted indicated moderate illness, and an FEV_1 of < 40% indicated severe illness.[1] FEV_1 percent predicted has previously been shown[18,19] to be a predictor of 2-year and 5-year survival.

Depressive symptoms were assessed using the Beck Depression Inventory (BDI).[20] The BDI is one of the most widely accepted clinical instruments for assessing severity of depression. Scores can range from 0 to 63, with higher scores indicating greater depressive symptomatology. Scores of 0 to 9 are considered to be asymptomatic, with scores of 10 to 18 and 19+, respectively, indicating mild and moderate-to-severe levels of depressive symptoms. Participants with scores in the moderate-to-severe range, suggesting clinically significant levels of depressive symptoms, were called by the first author and were offered assistance to obtain further assessment and treatment.

HRQoL was assessed using the Cystic Fibrosis Questionnaire (CFQ) teen/adult version.[21] The measure consists of the following 12 subscales: physical (*eg*, ability to perform physical activities); role (*eg*, work/school limitations); vitality (*eg*, tired/energetic); emotional state (*eg*, sad/lonely); social/marginalization (*eg*, "have to stay home more than wanted"); body image (*eg*, perception of physical appearance); eating disturbance (*eg*, "force self to eat"); treatment burden (*eg*, ease of incorporating regimen into life); perception of health (*eg*, "lead a normal life"); weight ("trouble gaining weight"); respiratory (*eg*, wheezing/coughing); and digestion (*eg*, gas/diarrhea). Scores range from 0 to 100, with higher scores indicating better HRQoL. All subscales have been shown to have adequate internal consistency and test-retest reliability, and have demonstrated good convergent and predictive validity.[6,21] The Cronbach α for the subscales ranged from 0.62 to 0.96 for this sample.

Descriptive statistics employed means (SD), medians, and proportions. All CFQ subscales were negatively skewed with a high proportion of participants scoring at the upper limit. Because no transformation normalized the distributions, nonparametric statistics were used. Spearman rho was used to test the associations among depressive symptoms, lung function, and HRQoL. To examine whether disease severity was an effect modifier of the relationship between depressive symptoms and HRQoL, we stratified by FEV_1 percent predicted severity categories. Similarly, we stratified by the presence or absence of depressive symptoms to examine whether it modified the relationship between lung function and HRQoL. To further test for the effect modification of lung function and depressive symptoms on HRQoL, we divided participants into the following four groups: group 1, good lung function (FEV_1, ≥ 70% predicted)/low depression (BDI score, < 10); group 2, good lung function/high depression (BDI score, ≥ 10); group 3, poor lung function (FEV_1, < 70% predicted)/low depression; and group 4, poor lung function/high depression. The Kruskal-Wallis test with Bonferroni correction (due to multiple comparisons) was employed for the initial bivariate analyses. *Post hoc* exploratory analyses were conducted to examine group differences using the Mann-Whitney *U* test. Results were reanalyzed using different cut points for lung function (median score) and other published recommendations for BDI cut points[20,22,23] as well as removing somatic complaint items.[24] The results were the same regardless of the