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Mindfulness, Anxiety Symptoms, and Quality of Life in Heart Failure

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Background: An estimated 6.5 million American adults live with heart failure (HF). Elevated anxiety symptoms may worsen HF symptoms and contribute to decreases in overall quality of life (QOL). Mindfulness has been associated with better psychological health with lower levels of anxiety symptoms. Mindfulness may be a modifiable target for reducing anxiety symptoms and increasing QOL in patients with HF. **Objective:** The objective of this study is to examine the relationships among anxiety symptoms, dispositional mindfulness, and QOL in patients with symptomatic HF. **Methods:** In this cross-sectional study, we conducted a secondary analysis of baseline data from 70 participants. We performed descriptive statistics, bivariate Pearson correlations, and multiple linear regression. **Results:** The sample included 70 individuals with a mean age of 65 ± 10.5 years, 89% male, mean left ejection fraction of 45.7 ± 13.6, mean total QOL of 36.9 ± 21.7, mean total mindfulness of 82.2 ± 12.8, and mean anxiety of 4.8 ± 2.9. In multiple regression analyses, total mindfulness was significantly associated with lower anxiety (β = –0.491, $P < .01$), greater observational mindfulness was significantly associated with lower anxiety (β = –0.377, $P < .01$), and greater nonreactivity to inner experience was significantly associated with lower anxiety (β = –0.320, $P < .05$). Lower anxiety was associated with greater total QOL (β = 0.488, $P < .01$), greater physical QOL (β = 0.381, $P < .01$), and greater emotional QOL (β = 0.639, $P < .01$). **Conclusions:** Mindfulness may be a way of improving both anxiety symptoms and QOL in this population.

KEY WORDS: anxiety, heart failure, mindfulness, quality of life

An estimated 6.5 million American adults live with heart failure (HF), which is associated with reduced quality of life (QOL) and is one of the most common causes of hospital readmission and mortality.[1,2] The HF is often the end stage of cardiovascular disorders that result in myocardial hypertrophy and left ventricular dysfunction, leading to elevated intracardiac pressure and/or reduced cardiac output.[3] This can produce a clinical syndrome characterized by symptoms of dyspnea and fatigue, and signs including peripheral edema.[4–6] Incidence of HF is increasing in the aging US population, and older adults given a diagnosis of HF have a 5-year mortality of almost 50%.[7] The HF is a costly burden to the US healthcare system with projected costs to increase from $24.7 billion (2010) to $77.7 billion (2030).[8]

According to international HF guidelines, one of the main objectives of treatment is improvement in QOL.[4] Despite recent advances in medical therapy, patients with HF commonly have impaired QOL, which is related to increased rehospitalization and mortality.[9,10] Approximately 40% of patients with HF experience elevated symptoms of anxiety,[11] a negative emotional state resulting from a perceived inability to predict or control a threatening situation. Elevated anxiety symptoms may worsen HF symptoms, contribute significantly to decreases in overall QOL, and increase frequency of hospital readmission.[12,13] Anxiety is also related to higher mortality rates among patients with HF.[5,14]

Anxiety symptoms are linked to pathophysiologic mechanisms that facilitate poorer cardiovascular outcomes, such as dysregulation of the autonomic nervous system, decreased heart rate variability, low parasympathetic activity, high sympathetic activity, high serum glucose, altered lipid metabolism, and increased blood pressure. Dysregulation of the autonomic nervous system

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is a robust predictor of progression of HF, mortality, and sudden cardiac death.[15]

The HF self-management can be overwhelming for patients, requiring complicated routines to maintain physiological stability, including adherence to a complex medication regimen, physical activity, a low-salt diet, and daily weighing.[6,16] Anxiety symptoms can lead to poorer HF self-management behaviors.[17] Moreover, symptoms of HF often overlap with anxiety symptoms, such as dyspnea and chest pain, which can lead to symptom confusion and increased rehospitalizations.[14,18] Over time, patients with HF with a longer disease duration have higher anxiety symptoms than those with a shorter disease duration.[4,13,19] Thus, decreasing anxiety symptoms may be a means of improving QOL and overall HF outcomes.

Mindfulness, described as the capacity to nonjudgmentally attend to mental and physical processes during everyday activities,[20] can possess both "statelike" and "traitlike" qualities and is considered to be influenced by both genetic and environmental influences.[21,22] State mindfulness refers to active engagement in meditation practice as opposed to dispositional (trait) mindfulness experienced passively during ordinary tasks.[23,24] Dispositional mindfulness is known as a multifaceted concept with 5 facets: (1) observing, (2) describing, (3) acting with awareness, (4) nonjudging of inner experience, and (5) nonreactivity to inner experience.[25] Enhancing state mindfulness through meditation practice increases dispositional mindfulness.[23] Those with high trait mindfulness have higher dispositional mindfulness.[23] Dispositional mindfulness is associated with better psychosocial health and lower levels of stress and anxiety symptoms.[23,26,27]

In a study of 286 adults without HF, facets of dispositional mindfulness, including describing and nonreacting, were related to fewer anxiety symptoms.[26] Less is known about the relationship between the 5 facets of mindfulness and health outcomes in patients with HF. The aim of this study is to examine the relationships among anxiety symptoms, the 5 facets of dispositional mindfulness, and QOL in patients with symptomatic HF. Knowledge gained from this study may be used to advance the science of mind-body therapies for HF self-care by development of mindfulness-based interventions to reduce anxiety symptoms and improve QOL in patients with HF.

Methods

Design

In this cross-sectional study, we conducted a secondary analysis of baseline data from n = 70 participants. The aim of the parent study was to compare 2 mild-to-moderate group exercises and treatment as usual for improvements in physical function and depressive symptoms in patients with HF.[28]

Procedures

Approval was obtained from the VA San Diego Healthcare System and University of California at San Diego Institutional Review Board. Informed consent was obtained from all participants in the study. At baseline, physical, cardiac, and psychosocial functioning (mindfulness, QOL, anxiety) were assessed.

Participants

Participants included in the present secondary data analysis were given a diagnosis of American Heart Association/American College of Cardiology Classification stage C symptomatic HF (both heart failure with preserved ejection fraction and heart failure with reserved ejection fraction) for at least 3 months, were clinically stable (without hospitalization for a 3-month period), were on stable doses of neurohormonal blocking agents and diuretics for at least a 3-month period, had not had cardiac surgeries for at least 6 months, were not currently enrolled in an exercise program, and were older than 40 years. Exclusion criteria included presence of psychosis and bipolar disorder, significant cerebral neurologic impairment, and active suicidality.

Measures

Ejection fractions were derived from echocardiography, which was performed by blinded assessors at the University of California at San Diego Medical Center. Images were digitized to obtain endocardial contours and left ventricular cavity areas at end systole from the apical 4- and 2-chamber views. This method is a reliable method of assessing left ventricular function and predicting mortality in patients with HF.[29] Ejection fractions were derived from biplane apical (4- and 2-chamber) views with the use of modified Simpson's rule algorithm.[30]

Anxiety symptoms were assessed using the Hospital Anxiety and Depression Scale,[31] a reliable and valid measure of anxiety and depressive symptoms in individuals with chronic medical conditions.[32–34] It is a 14-item scale, where all items are rated on a 4-point Likert scale, and scores are computed by summing the scores of each subscale. Scores range from 0 to 21, where higher scores indicate more anxiety symptoms. Scores ranging from 8 to 10 are considered suggestive of heightened anxiety, whereas a score greater than 10 is considered a cut point for an anxiety disorder.[35]

The QOL was assessed using the Minnesota Living with Heart Failure Questionnaire (MLHFQ),[36] one of the most widely used questionnaires for assessing HF–related QOL in individuals with HF.[33,37] The MLHFQ is a 21-item questionnaire rated on a 6-point Likert scale with scores ranging from 0 to 105. It provides

scores for physical and emotional QOL, as well as a total QOL.[36] Higher scores indicate poorer QOL. The MLHFQ has high test-retest reliability (r = 0.87) and internal consistency (Cronbach α = .92).

Mindfulness was assessed using the Five Facets of Mindfulness Questionnaire, a 39-item self-report measure of an individual's tendency to be mindful in daily life.[25] The Five Facets of Mindfulness Questionnaire is a widely used measure of dispositional mindfulness.[38] It measures 5 facets, including observing, describing, acting with awareness, nonjudging, and nonreacting. Scores of each facet range from 0 to 40, with the exception of the nonreactivity facet, which ranges from 7 to 35. Higher scores indicate greater mindfulness.

Data Analyses

Analyses were performed using SPSS version 24 (IBM Corporation Armonk, NY). We performed descriptive statistics, including measures of central tendency. Bivariate Pearson correlations were used to examine the relationships about anxiety symptoms, QOL, mindfulness, and covariates (age, ejection fraction), as well as to assess potential multicollinearity. Multiple linear regression modeling was used to examine the relationships of anxiety symptoms to QOL and mindfulness, adjusting for age and ejection fraction. Post hoc power analyses indicated a power of 0.91 to detect a medium effect size (f^2 = 0.2) with an α of .05 in a multivariate analysis with 4 predictors (age, ejection fraction, QOL, anxiety; age, ejection fraction, mindfulness, anxiety). Pairwise deletion was used to remove missing data. Missing data ranged from 9% to 14%. Bootstrapping was applied to all analyses to ensure that missing data did not alter the results.

Results

Descriptive

A total of 135 adults with HF were approached by research assistants and screened for eligibility. Of these, 70 individuals enrolled in the study (mean age, 65 ± 10.5 years; 89% male), with mean left ejection fraction of 45.7 ± 13.6, mean total QOL of 36.9 ± 21.7, mean total mindfulness of 82.2 ± 12.8, and mean anxiety of 4.8 ± 2.9. Participant characteristics are shown in Table 1.

Bivariate Analyses

The results of the bivariate analyses are presented in Table 2. Older age was associated with lower QOL (r = –0.26, P < .05) and lower anxiety (r = –0.26, P < .05). The QOL was associated with lower total mindfulness (r = –0.29, P < .05) and with greater anxiety (r = 0.52, P < .01). Greater mindfulness was associated with lower anxiety (r = 0.49, P < .01).

TABLE 1 Sample Demographic and Mental Health Characteristics

Characteristics	N	% or Mean (SD)
Age, y	71	64.9 (10.5)
Biological sex	71	
Male		88.7
Female		11.3
Race/ethnicity	67	
White, non-Hispanic		67.6
Black or African American		16.9
Asian		2.8
American Indian		1.4
Other/unknown		11.3
Ejection fraction	70	45.7 (13.6)
Total QOL	68	36.9 (24.7)
Total mindfulness	64	87.19 (12.8)
Anxiety symptoms	65	4.8 (3.0)

Abbreviation: QOL, quality of life.

Multiple Linear Regression

Multiple linear regression models were estimated to examine the relationship between (1) mindfulness (total mindfulness and the 5 facets of dispositional mindfulness) with anxiety symptoms and (b) anxiety symptoms with QOL (total, emotional, and physical). All models included age and ejection fraction as covariates because ejection fraction is associated with disease severity and age can influence psychological factors such as anxiety and mindfulness, as well as QOL.

After controlling for covariates, total mindfulness was significantly associated with lower anxiety (β = –0.491, P < .01), greater observational mindfulness was significantly associated with lower anxiety (β = –0.377, P < .01), and greater nonreactivity to inner experience was significantly associated with lower anxiety (β = –0.320, P < .05). After controlling for covariates, lower anxiety was associated with greater total QOL (β = 0.488, P < .01), greater physical QOL (β = 0.381, P < .01), and greater emotional QOL (β = 0.639, P < .01). The models are displayed in Tables 3 and 4.

Discussion

Previous research demonstrates that elevated anxiety symptoms are related to worse QOL in adults with chronic conditions, including patients with HF.[39,40] Meanwhile, cultivating mindfulness is observed to lower stress and anxiety symptoms.[27,41,42] However, less is known about the relationships among QOL, anxiety, and dispositional mindfulness in patients with HF. This information is important in the development of future interventions in the population with HF to reduce anxiety and improve QOL. In exploring the characteristics of patients with HF, we found that older age was correlated with lower QOL (see Table 2), which corresponds with research suggesting that HF is associated with a lower functional status and

TABLE 2 Bivariate Correlations

	1	2	3	4
1. Age	—	—	—	—
2. Ejection fraction	0.080	—	—	—
3. Total QOL	−0.261[a]	0.001	—	—
4. Total mindfulness	−0.001	0.004	−0.291[a]	—
5. Anxiety symptoms	−0.255[a]	−0.033	0.522[b]	−0.490[b]

Abbreviation: QOL, quality of life.
[a]$P < .05$.
[b]$P < .01$.

poorer QOL in the elderly population.[43] Interestingly, older age was also associated with lower anxiety symptoms. This may be because, in general, older adults exhibit lower anxiety levels[44] and overall mental health conditions are less prevalent in older age groups.[45]

Our main findings, after adjusting for potential confounding factors (see Table 3), indicate that greater total mindfulness and specific facets of mindfulness, including observational mindfulness and nonreactivity to inner experience, were associated with lower anxiety symptoms. In turn, lower anxiety symptoms were associated with better physical, emotional, and total QOL. This supports the notion that improving psychosocial comorbidity, such as anxiety symptoms, may be a means of improving QOL in patients with HF. Although the direction of the relationships cannot be established in the present investigation, our findings correspond with other studies that found independent associations among anxiety symptoms, QOL, and mindfulness,[23,24,27,46] and it extends this knowledge to individuals living with HF. Future large-scale fully powered studies are needed to determine whether anxiety symptoms mediate between mindfulness and QOL in patients with HF. Thus, interventions may be developed that increase mindfulness to modify anxiety to improve QOL and potentially other HF disease outcomes; importantly, anxiety symptoms may interfere with an individual's ability to independently self-manage HF, which can impact prognosis. Muller-Tasch and colleagues[47] found anxiety to be negatively associated with self-care behaviors in patients with HF. Developing mindfulness to lower anxiety may be a novel approach in improving self-care behavior.

TABLE 3 Multivariate Linear Regressions of Quality of Life

	Model 1 Total QOL Beta, *P*	Model 2 Emotional QOL Beta, *P*	Model 3 Physical QOL Beta, *P*
Age	.20	.06	.53
Ejection fraction	.72	.28	.75
Anxiety	.49[a]	.64[a]	.38[a]
Adjusted R^2	0.26[a]	0.43[a]	0.14[a]

Abbreviation: QOL, quality of life.
[a]$P < .01$.

Results from our study highlight the importance of incorporating mindfulness-mindfulness based interventions into future nursing studies to improve anxiety symptoms and overall QOL for patients with HF. Mindfulness-based interventions include exercises that focus on deep breathing and are effective in reducing anxiety, depression, and stress in various populations, but limited findings exist in HF.[48,49] A recent meta-analysis of randomized controlled trials of mindfulness based intervention in healthcare revealed that mindfulness significantly improved depressive symptoms, anxiety, stress, QOL, and physical functioning among a wide range of chronic conditions in both treatment and prevention.[48]

Authors of other studies specific to HF suggest nonpharmacological interventions (ie, mindfulness based intervention) that increase mindfulness may also be an effective treatment option to improve QOL, reduce psychosocial distress, and improve self-management.[39,50–53] However, there is only 1 study that we are aware of that examined an mindfulness based intervention for anxiety symptoms and QOL in patients with HF.[39] Sullivan and colleagues[39] conducted a cohort study of an 8-week program consisting of mindfulness meditation, coping skills, and support group discussion compared with a usual care control group.[39] This study revealed promising findings of reductions in anxiety symptoms and improved QOL. However, it was a nonrandomized trial, and more studies are needed to examine the impact of mindfulness based interventions on anxiety symptoms and QOL among patients with HF.

Limitations

The study was limited by a small sample size and a cross-sectional design. In addition, we were limited by the measures implemented by the parent study. Factors such as self-management were not assessed but are highly related to anxiety symptoms and can impact QOL. Although small, we had sufficient statistical power to identity a medium effect size in our multivariate models. Many of the participants were recruited from the VA San Diego Healthcare System, and the sample was

TABLE 4 Multivariate Linear Regressions of Mindfulness

	Model 1 Total Mindfulness Beta, *P*	Model 2 Observational Beta, *P*	Model 3 Nonreactivity Beta, *P*
Age	.40	.03	.77
Ejection fraction	.65	.86	.51
Anxiety	−.49[a]	−.38[b]	−.32[b]
Adjusted R^2	0.22[c]	0.13[a]	0.07[b]

[a]$P < .01$.
[b]$P < .05$.
[c]$P < .001$.

What's New and Important

- Reducing anxiety symptoms may be a way of improving QOL and disease outcomes in patients with HF.
- Increasing dispositional mindfulness may improve outcomes in patients with HF through its impact on anxiety symptoms.
- Attention to dispositional mindfulness in clinical settings may improve physiologic and psychosocial outcomes in these patients.

composed of 67.6% white, non-Hispanic adults and 16.9% black, non-Hispanic participants. This is not representative of the national population of adults with HF. There is a need for continued psychosocial research in diverse racial, ethnic, and income backgrounds in individuals with HF. Although our study garnered a relatively diverse population (32.4% that identified as other than non-Hispanic white), our sample size was not powered to include other important covariates or to perform subgroup analyses. Moreover, our study was cross-sectional and not powered to determine mediation effects. In addition, we used only self-report measures. Thus, we were not able to identify individuals with diagnosable mental health conditions, only heightened symptoms.

Conclusion

Identifying and intervening on anxiety symptoms in individuals with HF may improve QOL and overall HF outcomes, both physiologic and psychosocial. Mindfulness may be a way of improving both anxiety symptoms and QOL in this population. However, additional studies are needed to confirm the relationships among mindfulness, anxiety symptoms, and QOL; determine whether anxiety symptoms mediate between mindfulness and QOL; and identify the directionality of the relationships. Possible future interventions may include mindfulness-based stress reduction, mindfulness-based cognitive therapy, meditation, yoga, or awareness training.[54–56]

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