

Effect of Psychological Distress Factors on the Perceived Health Status, Emergency Visits, Rehospitalization, and Mortality in Adults with Heart Failure

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ABSTRACT

Objective: The diagnosis of heart failure is associated with many comorbid psychological distress factors such as depression, anxiety, and hostility that significantly affect patients health outcomes and prognosis. This study aims to investigate if the combined effect of comorbid psychological distress factors is a predictor of the cardiac emergency visits, re-hospitalization, and mortality and among adult heart failure patients.

Design: Correlation- longitudinal design was used.

Materials and Methods: A sample of 419 of patients with heart failure were recruited. Data collected in relation to Depression, anxiety, and hostility. Event-free survival was defined as the time to the first event. Cox proportional hazards hierarchical regressions were constructed to determine the predictors of free survival in heart failure patients.

Results: The analysis showed that in first block, comorbidity and New York Heart Association class were the only significant variables, while in the second block, none of the variables was significant except depression, comorbidity and New York Heart Association. In the final model, the interaction between depression, anxiety, and hostility was not significant.

Conclusion: The combined effect of depression, anxiety, and hostility were not significant predictor of free survival among patients with heart failure. Nevertheless, depression was the only factor that predicts free survival among patients with heart failure.

KEY WORDS

heart failure, depression, anxiety, hostility, perceived health status

INTRODUCTION

Heart failure is a complex, progressive clinical condition that arises from any structural or functional cardiac disorder that affects the capability of cardiac ventricles to fill with or eject blood. In the United States, heart failure is considered a major public health problem that affects about 6.2 million patients, and nearly 379,000 patients in 2018 died of heart failure as a primary or secondary cause¹⁾. The estimated direct and indirect cost of heart failure in the United States for 2012 was a combined \$30.7 billion²⁾. This shows that heart failure is a significant problem that need urgent and multidisciplinary interventions due to its bio-psychosocial nature. Factors such depression and anxiety are among those psychological problems that have been found to influence patients healthcare outcomes³⁾.

Stress is the final product of psychological and environmental factors interaction, where results are shown on physical and mental health along with cardiac disease⁴⁾. Among patients with cardiac disease, many complications on health outcomes were related to and caused by stress⁴⁻⁵⁾. For example, stress resulted in decrease blood supply for the

coronary arteries and the heart it-self, and thus predicting more cardiac disease severity^{4,6)}. On the other hand, it was found that being a patient with cardiac disease with lower level of stress is a predictor for positive prognosis⁷⁾. Another example of how stress negatively affects health, stress is an effort, a burden, and exhaustion for the immune system, leading to more vulnerability to diseases and thereby exacerbation of cardiac disease⁸⁾. Moreover, stress was significantly associated with an increased mortality rate among heart failure and cardiac disease patients⁹⁾.

Patients with heart failure suffer from several psychological distress factors such depression, anxiety, and hostility that significantly affect patients' prognosis as well as patients physical and mental health^{8,11)}. Depression is common psychiatric disorder among patient with heart failure; around 20% of outpatients who have heart failure have major depressive symptoms, and up to 48% of them experience clinically significant depressive symptoms³⁾. Patient with heart failure who also depressed have double hospitalization and mortality rate compared to those who are not depressed¹²⁾. Depression lead to hypercortisolemia, impaired platelets function, and reduced heart rate variability which affect cardiac conditions negatively^{13,14)}. Anxiety is a negative emotional

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state that characterized by the following symptoms: excessive worry, restlessness, irritability, muscle tension, and sleep disturbances¹¹. Long term and severe anxiety aggravate cardiac diseases and cause more cardiac relapses¹⁵. These relapses may appear as reduced heart rate variability and baroreflex cardiac control, cardiac arrhythmias, and sudden death¹⁵. Commonly, patient with heart failure complain of anxiety; they have 60% higher level of anxiety when compared to healthy elders, and 40% of them suffer from anxiety related disorders¹⁵. Additionally, patients with heart failure tend to have higher level of anxiety compared to patients with other cardiac disease patient¹⁶.

Anger and hostility are the major attributes of type A behavior¹⁷. Type A behavior describes people who always get 'stressed out' and their behavior characterized by ambition, aggression, impatience, acceleration of activities ('on the run'), irritability, hostility, and anger¹⁷. Controversial report found to connect type A personality with cardiac disease^{18,19}. However, anger and hostility drives unhealthy practices such as smoking, obesity, and alcoholism²⁰. In addition, anger and hostility stimulate the sympathetic system resulted in higher heart rate, higher blood pressure, hypercortisolemia, elevated levels of circulating catecholamines, and increased platelet reactivity²¹. Therefore, anger and hostility worsen cardiac condition and cause more relapses. To our knowledge, there is no published study that addressed the effect of these psychological distress factors combined (depression, anxiety, and hostility) on the health outcomes among heart failure patients. Therefore, the purpose of this study is to investigate if the psychological distress factors are predictors of the perceived health status, emergency department visits, rehospitalization, and mortality among adult heart failure patients.

METHODS

Design, sample, and setting

Correlation-longitudinal design was used to investigate if the psychological distress factors are predictors of the perceived health status, emergency department visits, rehospitalization, and mortality among adult heart failure patients. The data were collected from heart failure patients who were seen in cardiology clinics located in Kentucky, Georgia, Indiana, Ohio, and Australia. A total of 3,413 patients with heart failure formed the accessible database from which a sample of 419 was drawn who had documented diagnosis of heart failure and complete the study questionnaires of depression, anxiety, and hostility. The demographic (age, gender, ethnicity, marital status and education level) and clinical variables (left ventricle ejection fraction and NYHA class) of the sample when it compared to the full database were similar. The database was accessed through Research and Interventions for Cardiovascular Health program at University of Kentucky. Inclusion criteria for the original database were all patients who had confirmed diagnosis of heart failure with impaired or preserved left ventricular systolic function. Patients were excluded if they had valvular heart disease, were referred for heart transplantation, had a history of cerebrovascular accident or myocardial infarction in the past 6 months, had co-existing terminal illness, or were taking antidepressant medication or receiving psychological intervention at the time of recruitment. Data on event-free survival were collected over 12 months.

Measures

Depressive symptoms.

Beck Depression Inventory-II (BDI-II)²² was used to measure depressive symptoms in this study. BDI is a 21-item, self-reported measure of depression that indicate the severity of depressive symptoms through Likert scale ranging from 0 (absence of symptoms) to 3 (severe symptoms). The total summary score can range from 0 to 63; a higher score reflects more severe depressive symptoms. Good internal consistency, stability, construct and concurrent validity of the BDI-II have been supported.

Anxiety and hostility.

Brief Symptom Inventory (BSI) anxiety and hostility subscales

were used to measure anxiety and hostility in this study. Each subscale consists of 6 items ranges from 0 (not at all) to 4 (extremely). The total score can be calculated by summing the items score and taking the mean. Thus, the possible range of scores for the anxiety scale is 0 to 4 with higher scores and indicative of higher levels of anxiety or hostility. BSI has demonstrated internal consistency, stability, construct and concurrent validity²³. In this study, the Cronbach's alphas of anxiety and hostility scales were 0.82 and 0.76 respectively.

Outcomes

Perceived health status.

The perceived health status was collected with one item asking the patients "how is your health in general?" The responses ranged from 1 (excellent) to 5 (poor). Although this question considered a general and subjective in nature, it has been found that it can be a good predictor of patient future health outcomes and mortality²⁴.

Event-free Survival. Event-free survival was defined as the time to the first event (first event of emergency department visits, rehospitalization, or death from cardiac cause) from the enrollment date. Data were collected by telephone interviews with the patients or a family member and hospitals medical record for an average of 399 days after enrollment.

Demographic and clinical variables

Data on demographic variables and clinical characteristics were collected by reviewing medical records and interviewing patients. These variables included age, gender, marital status, ethnicity, left ventricle ejection fraction (LVEF), New York Heart Association (NYHA) class, and comorbidity burden. LVEF was used to reflect cardiac function and it was measured by either echocardiography or left ventricular angiography. NYHA indicates the functional impairment of heart failure patients that is caused by the symptoms and is rated by the physician. Comorbidity burden was assessed using the Charlson Comorbidity Index, which measure the number and the seriousness of comorbidities that may cause mortality.

Statistical Analysis

Data were analyzed with SPSS software, version 25.0 (SPSS Inc., Chicago, IL). A linear regression model was constructed for the three indicators (depression, anxiety, and hostility) of perceived health status. Hierarchical multiple regression analysis was conducted to determine the predictors of perceived health status among heart failure patients. This approach was used because entry of variables is based on theoretical and clinical consideration rather than automated techniques, which help to produce more reliable results. In the first step, the socio-demographic variables (age, gender, ethnicity, marital status and education level) were entered to the regression model, and then the clinical variables (left ventricle ejection fraction, comorbidity burden, and NYHA class) were entered as a second step. After that, the psychological distress factors (depression, anxiety, and hostility) were entered to the regression model as a final step to determine the additive effect of these variables. The assumptions of linear regression were tested and no violation occurred. A P-value of 0.05 was considered statistically significant.

Cox proportional hazards regression was used to determine significant predictors of emergency department visits, rehospitalization mortality among the psychological distress factors. In this predictive analysis, the independent variables were entered hierarchically. The socio-demographic data were entered first; clinical data were entered next. Last, the psychological distress factors were entered. The occurrence of the event was entered as the dependent variable with 1 = occurrence of the event and 0 = no occurrence of the event, where the event is cardiac death, hospitalization or emergency visit.

RESULTS

Patients' characteristics are summarized in table 1. Four hundred and nineteen heart failure patients participated in this investigation. More than half of the sample were male (69%), married or cohabitated (58%), and in class I/II. The mean age of the patients 61 ± 11.6 years old. Most of the patients were with a mean left ventricular ejection fraction of 35%. The mean score of perceived health status is 3.49 ± 0.90.

Table 1: Sample baseline characteristics (N = 419)

Characteristic		N (%) OR MEAN \pm SD
Age		61 \pm 11.6
Gender	Male	288 (69)
	Female	113 (31)
Ethnicity	Caucasian	326 (78)
	Other	93 (22)
Marital status	Married / cohabited	244 (58)
	Single/Divorced/ Widowed	175 (42)
Left ventricular ejection fraction (%)		35.1 \pm 14.1
Education level	Less than high school	80 (19)
	High school	110 (26)
	At least some college	229 (55)
NYHA class	I & II	224 (53.5)
	III & IV	195 (46.5)
Perceived Health Status	Excellent	6 (1.4)
	Very good	52 (12.4)
	Good	142 (33.9)
	Fair	167 (39.9)
	Poor	52 (12.4)
Depression		10 \pm 8.4
Anxiety		0.61 \pm 0.70
Hostility		0.49 \pm 0.59

Table 2: Hierarchical multiple linear regression of variables associated with perceived health status in heart failure patients (N = 419)

Predictor variables	Step F	Step P value	Adjusted R ²	R ² change	Standardized β^*	β - P value
Step 1: Demographic variables	4.17	0.001	0.037	0.048		
Age					-0.038	0.394
Gender					-0.131	0.004
Ethnicity					-0.004	0.926
Marital status					0.105	0.017
Education level					-0.070	0.094
Step 2: Clinical variables	13.12	< 0.001	0.188	0.156		
NYHA class					0.180	< 0.001
Comorbidity burden					0.180	< 0.001
Left ventricular ejection fraction					0.002	0.971
Step 3: Psychological distress factors	16.5	< 0.001	0.29	0.105		
Depression					0.338	< 0.001
Anxiety					0.074	0.234
Hostility					-0.070	0.212

* β shown for step 3

Most of heart failure patients in the study evaluated their health status as good (33.9%) or fair (39.9%). The mean score of depression, anxiety, and hostility were 10 \pm 8.4, 0.61 \pm 0.70, 0.49 \pm 0.59, respectively. The events occurred 118 times, in 28% of the sample. In this sample, 7 (2%) patients were died, 103 (23%) were hospitalized, and 15 (3%) were visit emergency for cardiac reason.

Perceived Health Status

The multivariable hierarchal regression analysis revealed that gender (standardized β = -0.101; P = 0.045 at step one), education level (standardized β = -0.115; P = 0.017 at step one), and marital status (standardized β = 0.143; P = 0.005 at step one) were the only socio-demographic variables that account for a significant amount of variability (R² = 0.04) in perceived health status. Only NYHA class (standardized β = 0.270; P < 0.001 at step two) and comorbidity burden (standardized β = 0.227; P < 0.001 at step two) from the clinical data account for a significant amount of variability in perceived health status.

In step two, age (standardized β = -0.134; P = 0.003 at step two) became significant. However, educational level became insignificant in this step. In the third step, the psychological distress factors were added to the model. This addition explained 29% of the variance in perceived health perception. Depression (standardized β = 0.338; P < 0.001 at step three) was the only significant predictors of perceived health perception among the psychological distress factors that were entered in the last step (Table 2).

Emergency Department Visits, Rehospitalization, and Mortality

In the final cox regression model (χ^2 = 32.84, df = 12, P = 0.001) one of the three psychological distress factor, depression, was significant predictor of the time to the first event of emergency department visits, rehospitalization, or mortality controlling for the demographic and clinical variables. Patients with heart failure who had lower level of depression exhibited longer event-free survival controlling for the demographic and clinical variables. However, anxiety and hostility

Table 3: Cox proportional hazard regression of variables associated with emergency department visits, rehospitalization and mortality among heart failure patients (N = 419)

Predictor Variables	P	Exp.(B)	95% CI
Demographic variables			
Age	0.42	1.01	0.99 – 1.03
Gender (female)	0.08	0.66	0.42 – 1.04
Ethnicity (other)	0.06	1.54	0.98 – 2.39
Marital status (single/divorced/widowed)	0.98	0.99	0.67 – 1.48
Education level (less than high school)	0.92	1.02	0.60 – 1.74
Education level (some college)	0.85	1.04	0.67 – 1.63
Clinical variables			
NYHA class	0.90	1.03	0.68 – 1.54
Comorbidity burden	0.22	1.07	0.96 – 1.18
Left ventricular ejection fraction	0.03	0.99	0.97 – 0.99
Psychological distress factors			
Depression	0.001	1.05	1.02 – 1.08
Anxiety	0.62	1.11	0.75 – 1.63
Hostility	0.10	0.69	0.45 – 1.08

*Model ($\chi^2 = 37.20$, df. = 12, P = 0.002)

failed to predict the time of the first event of emergency department visits, rehospitalization, and mortality controlling for the demographic and clinical variables. Thus, the effective predictors of outcomes were depression among psychological distress factors (Table 3).

DISCUSSION

The primary goal of this study was to investigate if the psychological distress factors (depression, anxiety and hostility) are predictors of perceived health status, emergency department visits, rehospitalization, and mortality among adult heart failure patients. Heart failure is associated with many of the psychological distress factors that significantly affect patients' prognosis as well as patients' physical and mental health such depression, anxiety, and hostility²⁵⁻²⁶. The study findings showed that depression was a significant predictor of perceived health status. However, anxiety and hostility were not supported by this study as predictors of perceived health status. This such findings could be explained in terms of the significant role of depression on psychological negative behaviors such as lack of adherences and self-care processes²⁹. This has confirmed also previous findings that depression is a significant predictor of perceived health status³⁰.

On the other hand, this finding do not agree with other studies that anxiety and hostility are considered as significant factors and do correlate to with perceived health among patients with heart failure⁹⁻¹¹. These controversial reports do sustain the notion that patients with heart failure are more likely to be influenced with depression than general psychological status such as anxiety and hostility. Depression is more severe form of psychological problems than do hostility and anxiety than could be more personalized and depends on personal capabilities and coping pattern of person³⁰. Coping patterns are considered significant factors where patients with depressive feeling might be able to use due to disease related process²⁸. This study also supports the findings of other investigators who reported that depression is strongly correlated or predict rehospitalization and mortality among cardiac patients²⁹. However, it clashes with their findings which showed that anxiety and hostility significant predict rehospitalization and mortality among heart failure patients.

Limitations

The study is limited by its design and convenience sampling. However, the design was appropriate to the parent study from which the data was extracted. Furthermore, the convenience sampling problem

was overcome by multisite sampling which improved result generalization.

CONCLUSIONS

This study found that patients with heart failure are suffering depression and anxiety that affect negatively their quality of life and health promotion practices. Depression was a significant predictor of perceived health behaviors while anxiety and hostility were not. The study has implication to health care professional working with patients with heart failure. There is a need to integrate and improve psychological counseling for patients with heart failure. Nurses and physicians working with patients with heart failure have to aware of overlapping physical symptoms of depression and heart-related ones. There is also need to improve protocols of treatment of patients with heart failure to incorporate home-follow visits addressing issues related to psychological distress and effective management of these stressors. Studies needed further to explore how do patients with heart failure manage their life stressors and their ability to balance and differentiate between physical symptoms related to psychological disorders such as depression and anxiety and those originated from heart.

CONFLICT OF INTEREST

The authors declare not conflict of interest related to publication of this manuscript.

ETHICAL APPROVAL

This study approved by the IRB Research and Interventions for Cardiovascular Health program at University of Kentucky

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