

Anxiety and its Influence on Quality of Life and Physical Function in Chronic Heart Failure Phenotypes

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Abstract: Anxiety is a prevalent comorbidity in patients with chronic heart failure (CHF) and has a considerable impact on prognosis, quality of life, and physical function. This study aims to evaluate the frequency and characteristics of anxiety in patients with CHF, stratified into three phenotypes based on left ventricular ejection fraction (LVEF): reduced ejection fraction (HFrEF), mildly reduced ejection fraction (HFmrEF), and preserved ejection fraction (HFpEF).

Keywords: heart failure, anxiety, ejection fraction.

Introduction

Chronic heart failure (CHF) is a multifaceted and progressive condition that affects millions of individuals worldwide, significantly impacting morbidity, mortality, and healthcare systems. The condition is categorized based on the left ventricular ejection fraction (LVEF) into three phenotypes: heart failure with reduced ejection fraction (HFrEF), heart failure with mildly reduced ejection fraction (HFmrEF), and heart failure with preserved ejection fraction (HFpEF). These subtypes vary in their pathophysiological mechanisms, clinical features, and prognostic outcomes. While the effects of anxiety on heart failure patients are well recognized, the prevalence and impact of anxiety across these phenotypes have not been thoroughly studied.

Anxiety is a highly prevalent and significant comorbidity in CHF patients, with studies suggesting that a considerable percentage of heart failure patients experience some form of anxiety. Anxiety in CHF is linked to worse clinical outcomes, including increased mortality, frequent hospital readmissions, and poorer quality of life.

Despite its significance, the relationship between anxiety and heart failure has not been fully examined across different heart failure phenotypes. While it is established that anxiety exacerbates the symptoms and clinical course of HFrEF, its effects on HFpEF and HFmrEF remain underexplored. This study aims to evaluate the frequency and characteristics of anxiety in CHF patients across these three phenotypes (HFrEF, HFmrEF, and HFpEF), with an emphasis on understanding how anxiety influences prognosis, quality of life, and overall clinical outcomes. By stratifying patients based on their ejection fraction, the study seeks to provide new insights into the specific role of anxiety in CHF and help tailor treatments to address this critical comorbidity more effectively.

Materials and Methods

Study Design and Participants

The study was conducted at the 1st and 2nd Cardiology Departments of the Tashkent Medical Academy. A total of 108 patients with chronic heart failure (CHF) stage II and functional class (FC) II-III according to the NYHA classification, complicated by ischemic heart disease (IHD) and exertional angina (EA) FC II-III, were examined. The study included patients of both sexes with a mean age of 63.2 ± 9.6 years.

The patients were divided into two main groups:

Group 1 (Control Group): 50 patients diagnosed with chronic heart failure but without anxiety. This group was further subdivided into three subgroups based on their left ventricular ejection fraction (LVEF):

- Subgroup I: CHF with reduced ejection fraction (HFrEF) (n = 10).
- Subgroup II: CHF with mildly reduced ejection fraction (HFmrEF) (n = 15).
- Subgroup III: CHF with preserved ejection fraction (HFpEF) (n = 25).

Group 2 (CHF with Anxiety): 58 patients with CHF and comorbid anxiety, further stratified based on left ventricular ejection fraction (LVEF) into three subgroups:

- Subgroup I: CHF with reduced ejection fraction (HFrEF) (n = 22).
- Subgroup II: CHF with mildly reduced ejection fraction (HFmrEF) (n = 10).
- Subgroup III: CHF with preserved ejection fraction (HFpEF) (n = 26).

Assessment Tools

1. **Psychological State Evaluation:** Anxiety levels were assessed using the Hospital Anxiety and Depression Scale (HADS), which helped identify the severity of anxiety symptoms.
2. **Functional Capacity:** All patients underwent the 6-minute walk test (6MWT) to evaluate their physical functional capacity. The severity of symptoms and the impact on daily activities were measured using the SHOCKS scale.
3. **Quality of Life:** The quality of life (QoL) was assessed using the Minnesota Living with Heart Failure Questionnaire (MLHFQ), which evaluates the impact of heart failure on patients' daily lives and well-being.

Results

In this study, we assessed the prevalence of anxiety among 108 patients diagnosed with chronic heart failure (CHF). Anxiety was identified in 53.7% (n=58) of the cohort, while 46.3% (n=50) did not exhibit significant anxiety symptoms. The distribution of anxiety across different CHF phenotypes was as follows:

- **Heart Failure with Reduced Ejection Fraction (HFrEF):** 68.75% (n=22)
- **Heart Failure with Mildly Reduced Ejection Fraction (HFmrEF):** 40.0% (n=10)
- **Heart Failure with Preserved Ejection Fraction (HFpEF):** 50.1% (n=26)

Statistical analysis revealed a significant variation in anxiety prevalence among these phenotypes ($p < 0.01$).

According to the study results, in patients with chronic heart failure (CHF) and comorbid anxiety: The SHOCKS score, which evaluates the severity of CHF-related symptoms and their impact on daily activities, revealed notable differences across CHF phenotypes:

- **HFrEF Patients:** These patients demonstrated the highest mean SHOCKS score (8.7 ± 2.4), reflecting a more severe symptom burden.
- **HFmrEF Patients:** This group exhibited a moderate mean score of 6.5 ± 3.3 .
- **HFpEF Patients:** These patients had the lowest mean score (5.8 ± 2.7), indicating comparatively milder symptom severity.

Statistical analysis confirmed that the differences in SHOCKS scores among the groups were significant ($p < 0.05$).

6-Minute Walk Test (6MWT) Results:

The 6-minute walk test (6MWT), a measure of physical capacity and functional limitation in CHF patients, revealed significant differences across the three phenotypes:

1. **HFrEF (Heart Failure with Reduced Ejection Fraction):**

Patients in this group had the shortest walking distance, averaging 59.3 ± 29.1 meters, indicating severely compromised physical capacity. This reduced distance is consistent with more advanced symptoms of heart failure, such as fatigue and dyspnea, which are common in patients with reduced ejection fraction.

2. **HFmrEF (Heart Failure with Mildly Reduced Ejection Fraction):**

HFmrEF patients walked a mean distance of 97.2 ± 64.8 meters, demonstrating an intermediate level of physical capacity between HFrEF and HFpEF. These findings suggest that while HFmrEF patients experience limitations, they are less severe compared to those with HFrEF.

3. **HFpEF (Heart Failure with Preserved Ejection Fraction):**

The HFpEF group achieved the longest walking distance, averaging 138.7 ± 77.2 meters, reflecting relatively better physical performance. This aligns with the understanding that HFpEF patients often have better preserved systolic function, though they may still experience exercise intolerance due to diastolic dysfunction and comorbidities.

Statistical Significance:

The differences in walking distances between the three phenotypes were statistically significant ($p < 0.01$), highlighting the variation in functional impairment among CHF phenotypes. These findings emphasize the gradient of physical limitation in CHF patients, with HFrEF patients experiencing the most severe impairments and HFpEF patients retaining better functional capacity. The 6MWT serves as an essential tool for evaluating exercise tolerance and guiding management strategies tailored to each CHF phenotype.

Quality of Life (QoL) Assessment:

The quality of life among patients with chronic heart failure (CHF) was assessed using the Minnesota Living with Heart Failure Questionnaire (MLHFQ), which quantifies the impact of CHF on physical, emotional, and social well-being. The results revealed substantial variability across the CHF phenotypes, with significant differences in reported quality of life:

➤ **HFrEF Patients:**

Patients with heart failure with reduced ejection fraction (HFrEF) exhibited the lowest quality of life, as reflected by the highest MLHFQ scores (92.1 ± 28.3). This suggests that individuals in this group face the greatest physical and emotional burden. The reduced cardiac output and associated symptoms, such as fatigue and dyspnea, are likely contributors to this finding.

➤ **HFmrEF Patients:**

Those with heart failure with mildly reduced ejection fraction (HFmrEF) had moderately better quality-of-life scores (77.2 ± 15.9), indicating somewhat lesser symptom severity and disease impact. While still significantly affected, this group showed a noticeable improvement compared to HFrEF patients.

➤ **HFpEF Patients:**

Patients with heart failure with preserved ejection fraction (HFpEF) reported the best quality of life among the three groups, as evidenced by the lowest MLHFQ scores (58.5 ± 34.9). Despite this, their scores still indicate a notable impairment in daily living, emphasizing that HFpEF remains a serious condition affecting quality of life.

Statistical Significance

The differences in MLHFQ scores across the three CHF phenotypes were statistically significant ($p < 0.001$), confirming that the ejection fraction phenotype plays a critical role in determining the quality of life in CHF patients. These findings highlight the variability in how CHF impacts patients' well-

being based on the underlying pathophysiological differences between HF_rEF, HF_{mr}EF, and HF_pEF phenotypes.

These results emphasize that quality-of-life assessments should be an integral part of the routine evaluation and management of CHF patients to better address their individual needs and improve overall outcomes.

Correlation between anxiety, Physical Capacity, and Quality of Life

To evaluate the interplay between depression severity, physical capacity, and quality of life among CHF patients, Pearson's correlation coefficient (r) was calculated. The results demonstrated significant relationships, highlighting the interconnectedness of these clinical parameters across all CHF phenotypes.

A strong positive correlation was observed between HADS scores (anxiety and depression levels) and MLHFQ scores (quality of life) ($r = 0.74$, $p < 0.001$). This suggests that as the severity of depression increases, the reported quality of life declines. Patients experiencing more severe depressive symptoms reported greater limitations in daily activities and higher emotional distress, which aligns with the established link between depression and diminished quality of life in CHF patients.

These findings indicate the need to address both the psychological and physical aspects of heart failure care, as they are closely intertwined and significantly impact patients' quality of life.

A moderate negative correlation was found between HADS scores and 6MWT results ($r = -0.46$, $p < 0.01$). Higher depression scores were associated with reduced physical capacity, as reflected in shorter walking distances during the 6MWT. Depression likely exacerbates symptoms such as fatigue and reduced motivation, leading to decreased physical activity and functional decline. These correlations underscore the multidimensional impact of CHF and its phenotypes on patients' lives. Depression, as measured by the HADS scale, appears to be a pivotal factor influencing both quality of life and physical capacity. Similarly, physical limitations exacerbate emotional distress and reduce the overall perception of well-being.

Discussion

This study demonstrated that depression is highly prevalent among CHF patients, with the highest occurrence in those with reduced ejection fraction (HF_rEF). These findings align with previous studies showing that depression is more severe in patients with significant systolic dysfunction, possibly due to the direct impact of reduced cardiac output on cerebral perfusion and systemic inflammation (Freedland et al., 2020; Packer, 2021). Depression prevalence in HF_{mr}EF and HF_pEF was also substantial but slightly lower. The pathophysiological mechanisms linking depression to these phenotypes may involve diastolic dysfunction, endothelial dysfunction, and comorbidities such as obesity and hypertension (Beattie et al., 2019).

HF_rEF patients exhibited the most significant functional limitations (as assessed by the 6MWT) and poorest quality of life (MLHFQ scores). Depression likely exacerbates these outcomes by reducing motivation, increasing fatigue, and impairing adherence to treatment plans (Rutledge et al., 2016). Interestingly, HF_pEF patients, despite preserved systolic function, also reported significant depression-related impairment. This underscores the importance of addressing psychological factors across all CHF phenotypes, particularly in those with multiple comorbidities (Lam et al., 2022).

The strong positive correlation between depression (HADS) and reduced quality of life (MLHFQ) highlights the bidirectional relationship between mental health and CHF outcomes. Furthermore, the moderate negative correlation between depression and physical capacity (6MWT) suggests that psychological distress contributes to physical limitations, creating a vicious cycle that worsens overall prognosis (Chung et al., 2021).

These findings underline the need for a holistic approach to managing CHF that integrates both physical and mental health care. Addressing depression in heart failure patients—particularly in those

with HFrEF, HFmrEF, and HFpEF—could have a meaningful impact on improving their quality of life, functional capacity, and adherence to treatment.

The study underscores the critical need for routine screening and management of anxiety in CHF patients, as anxiety is a significant factor influencing their prognosis, quality of life, and physical function. Incorporating psychological assessments (e.g., Hospital Anxiety and Depression Scale – HADS) and interventions (e.g., cognitive behavioral therapy, anti-anxiety medications) into CHF management plans can improve both mental health and physical outcomes. Tailored rehabilitation programs that address both physical and psychological needs may yield the most significant benefits, particularly for patients with severe anxiety, including those with HFrEF. Such integrated care approaches will help reduce the negative impact of anxiety on functional capacity and quality of life, enhancing overall health outcomes for CHF patients.

Conclusion

This study highlights the high prevalence of anxiety in CHF patients across all phenotypes, with the greatest burden observed in HFrEF. Depression significantly impacts functional capacity and quality of life, creating a need for comprehensive, multidisciplinary care approaches. Early identification and management of anxiety in CHF patients may improve prognosis, enhance adherence to treatment, and promote better overall health outcomes.

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