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ORIGINAL ARTICLE

Anxiety in Heart Failure Patients: Its Association with Depression, Cognition, Personality, and Quality of Life

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Abstract

Heart failure (HF) is a disabling diagnosis with an unfavorable prognosis, which is considered a worldwide public health problem and the first cause of death when compared with other cardiovascular diseases. Research showed that the relationship between psychological disorders and cardiovascular diseases increases the risk and worsens the prognosis of these diseases. Despite being the most present psychological symptoms in this population, anxiety and depression have received less attention in the context of HF. This study aimed to analyze the characteristics of HF patients, to relate their anxiety levels to depression, age, LVEF, cognitive performance, quality of life (QoL), and personality. For that, we assessed 89 patients diagnosed with HF. Results showed that higher levels of anxiety were associated with higher levels of depression, worse cognitive performance, perception of worse QoL, and lower emotional stability. When depression levels were controlled, anxiety continued to affect cognitive performance, emotional stability, and QoL. These results have important implications for clinical practice and for research in the field of psychology, showing the need for development of better approaches and management of these patients in outpatient care.

Resumo

A insuficiência cardíaca (IC) é um diagnóstico incapacitante e de prognóstico desfavorável, considerado um problema de saúde pública mundial e a primeira causa de morte quando comparada às demais doenças cardiovasculares. Estudos mostram que a relação entre transtornos psicológicos e doenças cardiovasculares aumento o risco e o agravamento do prognóstico destas doenças. Apesar de serem os sintomas psicológicos mais presentes nesta população, a ansiedade e a depressão têm recebido pouca atenção no contexto da IC. Este estudo teve como objetivo analisar as características dos pacientes com IC, relacionar os seus níveis de ansiedade com a depressão, idade, FEVE, desempenho cognitivo, qualidade de vida (QV) e personalidade. Para isso, examinamos 89 pacientes diagnosticados com IC. Os resultados mostraram que maiores níveis de ansiedade estão associados a maiores níveis de depressão, pior desempenho cognitivo, pior percepção QV e menor estabilidade emocional. Quando controlamos os efeitos da depressão, a ansiedade continua a afetar o desempenho cognitivo, a estabilidade emocional e a QV. Estes resultados têm importantes implicações para a prática clínica e para a pesquisa no campo da psicologia,

mostrando-nos a necessidade de desenvolver melhores abordagens e manejo destes pacientes em ambiente de ambulatório.

Keywords Heart failure · Anxiety · Depression · Cognitive performance · Quality of life · Personality

Palavra-chave Insuficiência cardíaca · Ansiedade · Depressão · Desempenho cognitivo · Qualidade de vida · Personalidade

Introduction

Heart failure (HF) is considered a clinical syndrome characterized by symptoms, such as dyspnea, edema, and fatigue and by typical signs, including elevated jugular venous pressure, pulmonary crackles, and peripheral edema. HF is caused by an abnormality in structure or function, which results in reduced cardiac output and/or elevated resting or stressing intra-cardiac pressure (Ponikowski et al. 2016). There are four different classifications of HF, according to the New York Heart Association (NYHA): class I, dyspnea on unusual efforts, such as climbing a slope; class II, dyspnea on medium exertion, such as walking in flat environments; class III, dyspnea on minor exertion, such as bathing; and class IV, dyspnea at rest. In order for the patient to receive the correct diagnosis of the class of HF to which he belongs, the physician must measure the percentage of blood leaving the heart each time contracts. The left ventricular ejection fraction (LVEF) has three classifications: HF with reduced ejection fraction (rFEF) or LVEF < 40%; HF with intermediate ejection fraction (ICFEi) or LVEF 40–49%; and HF with preserved ejection fraction (pFEF) or LVEF ≥ 50% (Bagherian-Sararoudi et al. 2013).

HF is a disabling diagnosis with an unfavorable prognosis currently considered a worldwide public health problem and the leading cause of death when compared with other cardiovascular diseases (Bocchi et al. 2009; Felker et al. 2003). Moreover, HF is associated with high rates of morbidity, mortality, and hospitalizations, being responsibly for major social and economic impact (Samartzis et al. 2014).

The clinically HF is characterized as a syndrome that is associated with organic manifestations resulting from processes that progressively damage the heart, generating left ventricular dysfunction (Clausell 2003; Francis 2005). Being these secondary manifestations, there is the triggering of a set of symptoms from the pathophysiological process, such as fatigue and edema, which added to the remaining symptoms of HF, eventually limit the individual's physical and social functions, reducing their average life expectancy and quality of life (QoL; Castro et al. 2006). Several studies showed that the evaluation of QoL becomes important for the prognosis of HF, especially aiming at identifying patients with higher risk of hospitalization and death (Pena et al. 2010). In addition, the perception of worse QoL in HF has been associated with certain personality traits (e.g., worse emotional stability and pleasantness), higher levels of depression, and anxiety (Chauvet-Gelinier and Bonin 2016).

Because HF is a chronic disease, it interferes not only with patient's QoL but also with their personality and cognitive performance. The chronicity of the disease is usually due to physiological changes, which cause stressors to present themselves

and ultimately change the patient's lifestyle and personality. These patients present difficulties in adaptation, memory loss, low self-esteem, lower emotional stability, depressive and anxious symptoms, among others, that affect not only the patients, but also their relatives (Bocchi et al. 2009; Feola et al. 2013; Sadock and Sadock 2007; Ribeiro and Mantovani 2001).

The need for daily life routine change, with the adoption of new behavioral and pharmacological measures and the loss of QoL, can potentiate the presence of psychological symptoms such as anxiety, depression, and stress (Chauvet-Gelinier and Bonin 2016). The patient feels dependent, because often family members end up participating and being more present in their lives, requiring changes to be implemented and performed daily, which can generate the patient's desire to exclude themselves from living in the family and social contexts (Jessup and Brozena 2003; Stewart et al. 1989).

The relationship between psychological disorders and cardiovascular disease has shown that the presence of these disorders increases the risk and worsens the prognosis of these diseases (Cagle et al. 2017; Vargas et al. 2006). In HF patients, anxiety and depression are two of the main manifestations of emotional distress related to disease prognosis and control (Beck and Clark 2012; Santos et al. 2011; Rutledge et al, 2006). Particularly, anxiety symptoms in HF patients seem to be related to an increase of hospitalizations in this population (Vongmany et al. 2016).

However, even recognizing the influence of these psychological disorders in the prognosis of HF, some studies reveal that both disorders, although observed in patients with chronic diseases in general, including heart disease such as HF, are mostly undiagnosed and/or untreated. It is known that in the case of depression, only about 15% of cases are diagnosed (Meneghetti et al. 2017; Cagle et al. 2017).

Among psychological factors, the personality traits have been also related to the development of most physical illnesses, especially chronic and infectious diseases (Brannon and Feist 2001). This is because these personality traits are built throughout human development, thus predicting actions and feelings as well as the social interaction. Therefore, it is important to emphasize the role of social context in influencing personality and consequently in the cardiovascular health of these patients (Steptoe and Molloy 2007).

Anxiety in HF

As noted earlier, anxiety is a common comorbidity when dealing with HF, being present between 18 and 45% of the outpatients. This percentage exceeds the values found in the general population, as well as in patients with other heart disease or cancer (Castro et al. 2006; Reidinger et al. 2002).

Anxiety disorders are emotional, repetitive, and/or persistent states with psychological and physiological components becoming pathological when disproportionate to the triggering situation or when there is no specific object to which it addresses itself (Delfini et al. 2009). In this way, it can influence the patient's response in relation to their medical diagnosis, causing negative effects regarding the acceptance during the proposed treatment, as well as in cases that require surgical procedures, where its effects even negatively interfere with the postoperative recovery, exacerbating the sensation of pain in some cases (Fontana and Fontana 2005

In addition, the way the disease sets in and the patient's perception of the disease process differs from patient to patient. For this reason, the work of disease education with these patients is also important (Beck and Clark 2012; Santos et al. 2011). Note that in this process, each patient will have a particular reaction. Some may adapt more easily, while others may have latent symptoms of anxiety, depressed mood, fear, and resistance to adherence to medical and psychological treatment, and may lead to more severe symptoms with secondary symptoms (Ribeiro and Mantovani 2001). For the patient to overcome situations like these, it is necessary to develop adaptative responses and improve cognitive and behavioral patterns and resilience through psychoeducation and cognitive restructuring, as well as behavioral changes in the face of the disease (Beck and Clark 2012; Sullivan et al. 2002).

Therefore, it is concluded that HF is a disease that generates deep biopsychosocial changes in the life of the patients, and due the high co-existence with anxiety, it is important to identify anxious symptoms and develop more effective medical and psychological interventions that contribute to the improvement of the psychological state of the patient and their families, as well as to a better prognosis of HF (Moryś et al. 2016; Ogilvie et al. 2015).

However, there are few studies about anxiety in HF patients, specially relating anxiety as a precursor of depression in HF patients, aiming at preventive and non-corrective treatment as it is currently occurring (Beck and Clark 2012; Joyce-Moniz and Barros 2005; Sadock and Sadock 2007). It is worth highlighting the importance of developing studies relating anxiety with HF, because although there is great variability in the presence of anxious symptomatology in HF patients, research shows a strong impact of the association between anxiety, depression, and physical well-being of these patients (Vargas et al. 2006).

Bearing this in mind, the present work aimed to contribute to the deepening of knowledge about the role of anxiety in these patients with HF. The following specific objectives were defined (a) to analyze the clinical characteristics of HF patients (viz., NYHA and LVEF), (b) to characterize the presence of anxiety in HF patients, (c) to analyze the relationship between anxiety and a set of critical HF variables (viz., age, LVEF, cognitive impairment, depression, QoL, and personality), and (d) to compare participants with and without anxiety with respect to the same variables.

In this context, we hypothesized that (1) HF patients with high anxiety would have worse quality of life; (2) HF patients with high anxiety would have worse cognitive impairment; (3) HF patients with high anxiety would have reduced indices regarding personality indicators; (4) HF patients with high anxiety would be older; and (5) HF patients with high anxiety would have high NYHA and LVEF.

Method

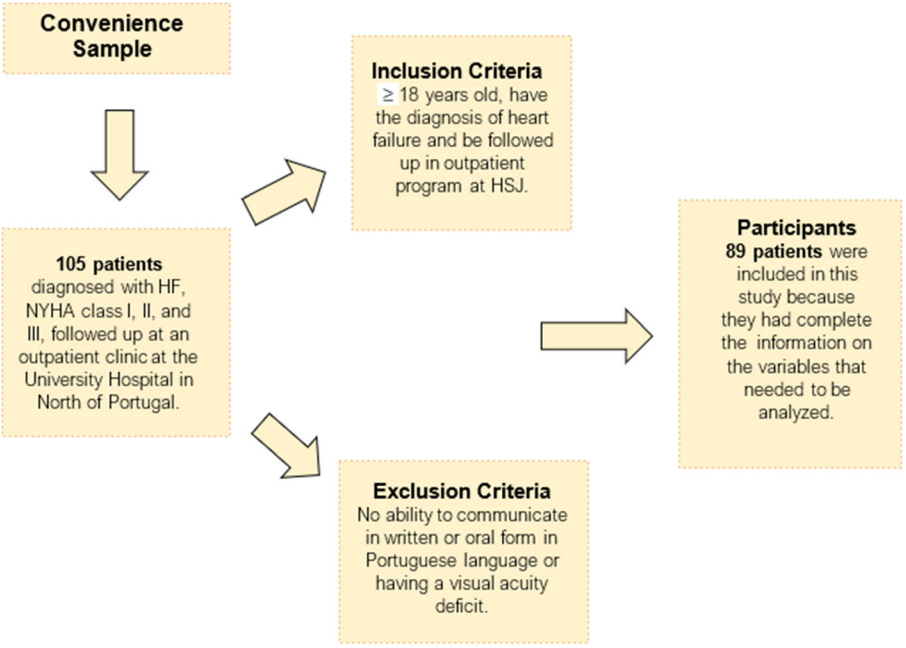
Participants

This study is part of the baseline assessment of a larger longitudinal research project called "Symbiotic technology for societal efficiency gains: Deus ex Machina" (co-funded by NORTE 2020 and FEDER, NORTE-01-0145-FEDER-00026), which has as main objective the development of non-invasive telemonitoring solutions for HF patients.

In this context, a sample of 105 patients diagnosed with HF was recruited from an outpatient clinic at a University Hospital in North of Portugal. The patients were randomly selected from the daily appointments lists.

Inclusion criteria were having a clinical validate diagnosis of HF (NYHA class I, II, and III), according to the European Society of Cardiology (ESC); being 18 years or older; and being followed up at this external consultation. Patients with NYHA IV class, not able to communicate (written or oral) in Portuguese language or with a marked visual acuity deficit, were excluded.

From 105 patients initially recruited, 16 were excluded because of missing data in its researcher protocols. Thus, a total of 89 patients were included in the final analysis, since they had complete information on the variables in the analyses of this study. The protocol was applied by one of the psychologists of the researcher team.



Procedures

As mentioned earlier, this study was part of a larger ongoing project that was approved by the Hospital Health Ethics Committee. All participants were recruited as part of the hospital's external HF consultation on the day they had scheduled appointments. They were informed of the development of the study by the attending physician, consultation nurse, or other research team member, by written informed consent. After consent, the participants were sent to a room for this purpose, where the evaluation protocol was administered, which lasted an average of one hour and an hour and half. The multidisciplinary assessment protocol included measuring instruments of cardiology, psychology, psychiatry, and nutrition. Cardiology variables were collected by the

consultation cardiologists, while psychology/psychiatry and nutrition variables were collected by psychologists and nutritionists of the research team. To thank the participants for their collaboration, at the end of the evaluation, a voucher of 10 euros was provided. The following describes only the materials used for the present study.

Instruments

Sociodemographic Data

The sociodemographic data were collected through clinical interview, namely, gender, age, marital status, education, employment status (e.g., active worker, retired, unemployed or otherwise), occupation, and net monthly household income.

Clinical Variables

From the patient's hospital registry, two clinical variables were extracted: NYHA, which has four classes (I, II, III and IV) that categorize which class of HF the patient is inserted, and LVEF, which refers to the percentage measurement of blood leaving the heart when it contracts.

Anxiety

To assess the participant's anxiety level, the GAD-7 (Generalized Anxiety Disorder; Spitzer et al. 2006) validated for Portugal by Sousa et al. (2015) was used. The scale is made up of 7 items that assess the presence of anxiety symptoms (e.g., worry, difficulty relaxing) in the last 14 days. The answer is given on a scale ranging from 0 to 3, referring to the frequency of symptoms (0 = never, 1 = on several days, 2 = on more than half days, and 3 = on almost every day). The total score ranges from 0 to 21, with higher scores indicating greater severity of anxious symptomatology. Values equal to or greater than 5 points are considered as indicators of anxiety disorders (Sousa et al. 2015). The internal consistency measured by Cronbach's alpha in this sample was 0.93.

Depression

The level of depression was assessed by the PHQ-9 (Patient Health Questionnaire; Kroenke et al. 2001) validated for Portugal by Torres et al. (2016). The PHQ-9 consists of 9 items that assess the presence of symptoms of depression in the last 14 days (e.g., depressed mood, anhedonia). The answer is given on the same scale as GAD-7. The final result ranges from 0 to 27 points, and a higher score indicates greater severity of depressive symptoms. Indicators of depressive symptoms are considered to exist if the end result is 10 points (Torres et al. 2016). In this study, the internal consistency of the instrument as measured by Cronbach's alpha was 0.84.

Cognitive Impairment

The Montreal Cognitive Assessment (MoCA) (Nasreddine et al. 2005) translated and validated for Portugal by Freitas et al. (2014) was used to evaluate the cognitive

impairment. MoCA is a brief instrument for screening cognitive impairment, and the total ranges from 0 to 30 points. In the Portuguese version, a score below 22 points indicates the presence of mild cognitive impairment and a score below 17 points is considered an indicator of cognitive deficit associated with dementia syndrome. More recently, Freitas et al. (2014) also defined normative data for the Portuguese population, according to age and education. The internal consistency measured by Cronbach's alpha was 0.77.

Quality of Life

To assess participant's QoL, the EQ-5D (EuroQoL Group 1990) translated and validated for Portugal by Ferreira et al. (2013) was used. The scale is composed of 5 dimensions that assess mobility, personal care, usual activities, pain/malaise and anxiety/depression, in three associated severity levels (1 = no problems, 2 = some problems, and 3 = extreme problems). The internal consistency, measured by Cronbach's alpha, in this study was 0.43.

Personality Traits

The TIPI–Personality Inventory (Gosling et al. 2003) was translated and validated for Portugal by Nunes et al. (2018) and used to assess the personality traits. The scale is composed of 10 items that evaluate five personality traits: extroversion, pleasantness, conscientiousness, emotional stability, and openness to experience. The answer is given on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), with higher values indicating the strongest presence of a given trait[1].

Statistical Analysis

For the characterization of the participants, descriptive analyzes were used. Subsequently, Pearson correlations were used to verify the association between anxiety and the other variables considered in the study, namely, depression, age, LVEF value, cognitive functioning, QoL, and personality. Finally, participants were divided into two groups: with and without anxiety indicators, according to the cutoff point of 5 proposed by Sousa et al. (2015). Therefore, all participants who scored 5 or more points on the anxiety scale were included in the anxiety group ($M = 10.48$), and all participants who scored less than 5 points on the anxiety scale were included in the group without anxiety ($M = 1.55$).

To compare these groups in relation to depression, age, LVEF value, cognitive impairment, QoL, and personality (extroversion, pleasantness, conscientiousness, emotional stability and openness to new experiences) ANOVAs were performed. Next, covariance analyzes (ANCOVAs) were performed with the same dependent variables, but introducing depression levels as a covariate. Thus, two analyzes were performed to examine differences between groups with and without controlling depression and then controlling depression. This

[1] Given that the factors consist of two items, Cronbach's alpha was not calculated. However, the original article demonstrated the good reliability and validity of the instrument (Nunes et al. 2018)

second group of analyses was conducted to control the variability of depression levels in the analyses by isolating the role of anxiety.

Results

Descriptive Analysis

On average, according to Table 1, participants were 56.4 years old (*SD*= 12.96), ranging from 24 and 81 years old. A total of 28 participants were female (31.5%) and 61 males (68.5%). Participants had an average of 8 years of education (*M* = 8.22 and *SD* = 4.03), ranging from 1 to 18 years. It was possible to verify that 32.6% (*n* = 29) of the patients have primary education, 11.2% (*n* = 10) have completed 6th grade, 28.1% (*n* = 25) have completed 9th grade, 18% (*n* = 16) have education secondary school, and 10.1% (*n* = 9) have completed university.

A total of 65 participants were married or cohabiting (73.0%), 15 separated (16.9%), 7 single (7.9%), and 2 widowers (2.2%). On average, the household consisted of 2 people, ranging from 0 e 4 (*SD* = 0.55). Regarding household monthly income, 14.6% of participants earned more than 600 euros/month and 43.8% more than 1000 euros/month.

Regarding the clinical characteristics of the participants of this study, according to Table 2, on average, this group had LVEF of 36.67 (*SD* = 13.74), and 48 participants (54.2%) had reduced LVEF (< 40%), 24 participants (26.9%), intermediate LVEF (40–50%) and 17 participants (18.9%) with preserved LVEF (≥ 50%) with a recorded value closer to the consultation. Regarding NYHA class, 29 participants (32.6%) are in class I, 48 (53.9%) in class II, and 12 participants (13.5%) in class III.

Regarding anxiety, according to Table 3, participants in the average score of 6.47 (*SD* = 5.47) range from 0 and 21 points. Using the cutoff point proposed by Sousa et al. (2015), on the 5 points, it was found that 55% of participants had an average of 5.70 (*SD* = 5.02) points, ranging from 0 and 18 points. According to the cutoff point proposed by Torres et al. (2016) on the 5 points, it was found that 46% of participants had indicators of depression. Regarding cognitive impairment, the participants presented an average score of 21.68 (*SD* = 4.61) points, ranging from 6 and 30. Using the cutoff proposed by Freitas et al. (2014), it was observed that 34% presented indicators of mild cognitive impairment and 12% presented indicators of cognitive deficit associated with dementia syndrome.

Regarding quality of life, HF patients had an average of 2.81 (*SD* = 0.22). Considering that the value 3 is the maximum of the instrument, indicating the presence of extreme problems, it is possible to infer that these patients perceive their quality of life as poor.

With regard to personality dimensions, an overall average of 4.36 (*SD* = 1.57) was found in the extroversion dimension. In the pleasantness dimension, the participants in the global group obtained an average of 5.93 (*SD* = 1.20). Regarding the conscientiousness dimension, an average score of 5.59 (*SD* = 1.24) could be observed. In the emotional stability dimension, the participants in the global group obtained an average of 3.44 (*SD* = 1.31). Finally, in the openness to new experiences dimension, participants obtained an overall average of 5.16 (SD = 1.47).

Table 1 Sociodemographic characterization of participants ($N = 89$)

	N	%
Education level		
Primary education	29	32.6
Complete 6th grade	10	11.2
Complete 9th grade	25	28.1
High school	16	18.0
Full college student	9	10.1
Marital status		
Single	7	7.9
Married/cohabiting	65	73.0
Widower	2	2.2
Separated/divorced	15	16.9
Family income		
Less than 600 euros/month	13	14.6
Between 600 and 999 euros/month	26	29.2
Between 1000 and 1999 euros/month	36	40.4
Between 2000 and 2999 euros/month	9	10.1
Between 3000 and 4999 euros/month	4	4.5
5000 euros or more per month	1	1.1

Analysis of the Association Between Variables

Table 4 presents data regarding the association between variables. Anxiety was positively correlated with depression ($r = 0.63$, $p < .001$) and negatively correlated with cognitive performance ($r = -0.29$, $p < .001$), QoL ($r = -0.30$, $p < .001$), and emotional stability ($r = -0.38$, $p < .001$). These results indicate that higher anxiety levels are associated with higher levels of depression, poor cognitive performance, perception of poor QoL and lower emotional stability. Similarly, depression was also found to have negative correlations with cognitive performance ($r = -0.23$, $p < .05$), QoL ($r = -0.42$, $p < .001$) and emotional stability ($r = -0.38$). , $p < .001$). These values indicate that

Table 2 Characterization of participants regarding LVEF and NYHA class

	N	%
LVEF *M (SD)*	36.57 (13.74)	
Min. Max	7–65	
LVEF < 40%	48	54.2
LVEF 40–49%	24	26.9
LVEF ≥ 50%	17	18.9
NYHA class		
Class I	29	32.6
Class II	48	53.9
Class III	12	13.5

Table 3 Distribution of participant characteristics for a global sample, with and without anxiety indicators

	Total (n = 89)			Without anxiety (n = 40)			With anxiety (n = 49)		
	M	*SD*	*Min-max.*	*M*	*SD*	*Min-max.*	*M*	*SD*	*Min-max.*
Age	56.36	12.96	24–81	53.18	12.44	24–75	58.96	12.91	28–81
FEVE	36.57	13.74	7–65	36.25	13.42	7–65	36.84	14.12	10–65
Anxiety	6.47	5.47	0–21	1.55	1.17	0–4	10.48	4.14	5–21
Depression	5.70	5.02	0–18	3.15	3.27	0–12	7.79	5.25	0–18
Cognitive deficit	21.68	4.61	6–30	23.30	4.31	12–30	20.36	4.46	6–30
Quality of Life	2.81	0.22	1.80–3	2.86	0.15	2.40–3	2.77	0.26	1.80–3
Extroversion	4.36	1.57	1–7	4.32	1.60	1.5–7	4.39	1.55	1–7
Pleasantness	5.93	1.20	1.5–7	6.15	1.14	3–7	5.75	1.23	1.5–7
Conscientiousness	5.59	1.24	2.5–7	5.56	1.26	3–7	5.62	1.25	2.5–7
Emotional stability	3.44	1.31	1–7	3.83	1.24	1–6	3.13	1.30	1–7
Openness	5.16	1.47	1–7	5.16	1.64	1–7	5.16	1.34	2–7

higher levels of depressive symptoms are associated with poor cognitive performance, poorer QoL perception, and lower emotional stability.

Age correlates negatively with cognitive performance ($r = -0.40$, $p < .001$) and QoL ($r = -0.29$, $p < .001$), indicating that older age is associated with poorer cognitive performance and poorer perception of QoL. Age also presents positive correlations with extroversion ($r = 0.23$, $p < .05$) and conscientiousness ($r = 0.28$, $p < .01$), showing that older age is associated with higher levels of expression of these dimensions of age. personality.

Table 4 Bivariate correlations among all study variables

	1	2	3	4	5	6	7	8	9	10	11
1. Anxiety	--										
2. Depression	.63**	--									
3. Age	.20	.09	--								
4. FEVE	.01	.09	−.01	--							
5. Cognitive deficit	−.29**	−.23*	−.40**	−.04	--						
6. Quality of Life	−.30**	−.42**	−.29**	.00	.30**	--					
7. Extroversion	−.07	−.16	.23*	.03	−.10	.03	--				
8. Pleasantness	−.19	−.12	−.01	.15	.13	.07	.01	--			
9. Conscientiousness	−.05	−.03	.28**	.21*	−.09	−.18	.03	.28**	--		
10. Emotional stability	−.38**	−.38**	−.08	−.08	.22*	.32**	−.02	.22*	−.09	--	
11. Openness	−.00	−.18	−.04	−.15	.25*	.16	.37**	.19	.01	−.01	--

* $p < .05$. ** $p < .01$. *** $p < .001$

LVEF showed only a positive association with the conscientiousness personality measure ($r = 0.21$, $p < .05$), indicating that a higher percentage of LVEF is associated with higher levels of conscientiousness.

In addition to the associations already identified, cognitive performance in cognitive deficit showed positive correlations with QoL ($r = 0.30$, $p < .01$), emotional stability ($r = 0.22$, $p < .05$), and openness to new experiences ($r = 0.25$, $p < .05$), indicating that better levels of cognitive performance are associated with a perception of better QoL, greater emotional stability and greater openness to new experiences. A better perception of QoL also appears associated with greater emotional stability ($r = 0.32$, $p < .01$).

Finally, analyzing the association between personality dimensions, higher levels of extroversion are associated with higher levels of openness to new experiences ($r = 0.37$, $p < .001$). In addition, higher levels of pleasantness have positive correlations with conscientiousness ($r = 0.28$, $p < .01$) and emotional stability ($r = 0.22$, $p < .05$).

Comparison Between Participants With and Without Significant Anxiety Indicators

Table 5 summarizes the results of the ANOVAs and the conducted ANCOVAs.

Regarding the depression variable, the results showed significant differences between participants with and without anxiety indicators, $F(1, 89) = 23.73$, $p < .001$, $\eta_p^2 = .21$. Specifically, the averages obtained by participants without anxiety indicators were lower than the averages obtained by participants with anxiety indicators ($M = 3.15$ vs. $M = 7.79$, respectively).

There were also differences in age between participants with and without anxiety indicators, $F(1, 89) = 4.56$, $p = .036$, $\eta_p^2 = .05$. Specifically, participants with anxiety indicators were found to be older than those without anxiety indicators ($M = 58.96$ vs. $M = 53.18$, respectively).

Regarding cognitive performance, participants with anxiety indicators had worse cognitive performance, $F(1, 89) = 9.78$, $p = .002$, $\eta_p^2 = .10$, than participants without anxiety ($M = 20.36$ vs. $M = 23.30$, respectively).

Table 5 Comparison between participants with and without anxiety indicators

	Without control			With control		
	F	*P*	$\eta_p 2$	*F*	*p*	$\eta_p 2$
Depression	23.72	< .001	0.21	--	--	--
Age	4.56	0.04	0.05	2.26	0.11	0.05
FEVE	0.04	0.84	< .001	0.37	0.69	.01
Cognitive deficit	9.78	.002	0.10	5.32	.01	0.11
Quality of Life	3.61	0.06	0.04	9.43	< .001	0.18
Extroversion	0.05	0.83	.001	1.72	0.18	0.04
Pleasantness	2.39	0.12	0.03	1.29	0.28	0.03
Conscientiousness	0.05	0.82	.001	0.14	0.87	.003
Emotional stability	6.69	0.01	0.07	7.75	0.01	0.15
Openness	< .001	.99	< .001	1.95	0.15	0.04

In addition, participants with anxiety indicators have significantly lower levels of emotional stability compared with participants without anxiety indicators, F (1, 89) = 6.69, p = .011, η_p^2 = .07. Participants without anxiety indicators had a higher average than participants with anxiety indicators (M = 3.83 vs. M = 3.13, respectively).

Controlling for the effect of depression, significant differences between participants with and without anxiety indicators remained only for emotional stability, F (1, 89) = 7.75, p = .001, η_p^2 = .15, and cognitive functioning, F (1.89) = 5.32, p = .007, η_p^2 = .11. Specifically, participants with anxiety indicators were found to have lower emotional stability and poor cognitive performance than participants without anxiety indicators. Moreover, it was also observed that QoL showed significant differences between the two groups, only when controlling for the effect of depression, F (1, 89) = 9.43, $p <$ .001, η_p^2 = .18. Thus participants without anxiety indicators had a higher average compared with participants with anxiety indicators (M = 2.86 vs. M = 2.77, respectively). In short, when controlling the effects of depression, it was noted that anxiety affected patients in variables of great importance.

Discussion

This study aimed to analyze the characteristics of HF patients; to relate their anxiety levels to depression, age, LVEF, cognitive performance, QoL, and personality; and to examine the differences between groups with and without anxiety indicators controlling and not controlling depression. Overall, the results showed that about half of the sample had anxiety indicators. Moreover, we found that anxiety levels were associated with critical HF variables (viz., depression, cognitive performance, QoL, and emotional stability). These results are consistent with the literature showing that about 40% of HF patients show high anxiety rates (Konstam et al. 2005), stressing the importance of addressing this disorder in HF (Meneghetti et al. 2017).

Anxiety in HF

Overall, our results showed that anxiety correlates with depression and, as previously reported, has shown the prevalence of comorbidity between these two variables (Carneiro et al. 2009; Meyer et al. 2013; Moryś et al. 2016). Anxiety and depression are known to have been neglected by health professionals, who have mostly focused on recognizing and dealing with symptoms as well as the effects of HF on patients' lives (Delfini et al. 2009; Konstam et al. 2005). In addition, anxiety and depression in HF appear to be associated with other symptoms (Pena et al. 2010; Sokoreli et al. 2016). Namely, some studies show the adverse effects of anxiety on QoL, perception of well-being, emotional factors, and cognitive performance (Gomes et al. 2007; Reidinger et al. 2002; Samartzis et al. 2014; Vongmany et al. 2016). These indicators end up exacerbating the symptoms of HF, and as untreated, burden this already vulnerable population. Also in the present study, there was a negative correlation of anxiety with cognitive performance, QoL, and emotional stability.

We also observed that higher levels of depression were associated with poor cognitive performance, poorer QoL, lower emotional stability, and critically higher levels of anxiety. Similar results have already been published in the literature (Chauvet-

Gelinier and Bonin 2016; Moser et al. 2016; Ogilvie et al. 2015; Sullivan et al. 2002). This association between anxiety and depression was one of the main reasons why comparisons between patients with and without anxiety were conducted first without controlling for depression and then controlling for this variable. In fact, the results confirmed that effectively patients with higher anxiety levels also had higher levels of depression than patients without anxiety indicators.

Regarding age, these results were also in agreement with other studies that show that older age is associated with higher prevalence of HF, worse cognitive performance, and worse QoL perception (Cagle et al. 2017; Gaviria et al. 2011). According to the literature, patients with higher anxiety indices were older than patients with lower anxiety indices (MacMahon and Lip 2002; Yohannes et al. 2009). However, it should be noted that this difference disappeared when depression was controlled, showing the importance of this last variable in the association between age and anxiety. These results are important because among many possible explanations, older patients are known to have greater immune impairment associated with anxiety or depressive events than younger patients (Castro et al. 2006; Kiecolt-Glaser et al. 2002). In addition, it is known that the impact of age on depression may vary with changes occurring at social, psychological and biological levels. Therefore, age may interact with depression, and this interaction may increase morbidity and mortality risks among older people (Kiecolt-Glaser et al. 2002; Putman-Casdorph and McCrone 2009).

Regarding cognitive functioning, there was a significant association between this variable and anxiety, and participants with anxiety indicators had worse cognitive performance than participants without these indicators. This effect remained even after controlling for depression. These results alert to the relationship between cognitive impairment and anxiety in these patients. This relationship is problematic because psychological factors may exacerbate cognitive symptoms, which indirectly may constitute a barrier to self-care, which is a critical aspect in HF management. Thus, they may have difficulty maintaining their basic health care (Cameron et al. 2015; Yohannes et al. 2009). Precisely, it is known that if there is the presence of cognitive dysfunction, there will be impairment in the care of the patient's daily life activities (Feola et al. 2013; Gaviria et al. 2011), thus affecting their sociability, openness to new experiences, adherence to treatment, and their QoL (Cameron et al. 2015; Steptoe and Molloy 2007).

We also observed that after controlling for depression, patients with anxiety reported worse QoL than patients without anxiety. According to Moser et al. (2016), depression, in addition to anxiety, is also associated with worse health-related QoL in patients with HF, as both psychological disorders interfere with the patient's ability to cope with daily activities, thus impairing their health. QoL However, it is important to note that age-associated anxiety and depression have in QoL. It has been reported that patients in older age groups with more comorbidities have worse QoL than younger patients (Cagle et al. 2017; Reidinger et al. 2002).

Limitations and Future Indications

Although this work is an important contribution to the understanding of psychological disorders in HF, in particular anxiety, some limitations of the study

should be considered in the interpretation of the results. First, the conducted study is cross-sectional in nature and the conducted analyses correlated. Thus, any causality assumption between the variables is compromised. In the future, it will be important to conduct longitudinal studies to determine whether anxiety is a predictor of other HF symptoms, such as depression, or their outcome. Second, due to the size of the sample and its unequal distribution with respect to HF class and other variables (e.g., education, income or marital status), it was not possible to examine their association with anxiety. Future studies should include larger samples with an equal number of participants in the different categories of categorical variables allowing for statistical comparisons.

Clinical Implications

These results reinforce and support the importance of addressing anxiety in HF, given its association with relevant factors in the treatment and prognosis of the disease. Anxiety seems to affect HF patients as much as depression, despite being usually neglected by professionals working in this area of heart disease. In this study original data is presented on how necessary and important it is to shed light on the knowledge of new studies on the impact of anxiety on patients with HF. Because even controlling for depression, the participants in this study still have significant differences in anxiety, quality of life, emotional stability and cognitive performance. Therefore it seems important to disclose and reinforce how significant the role of psychological treatment is in the management and control of HF, especially in order to mitigate the effects of anxiety and depression in this population. In addition, this study contributes to reinforce the need to develop more effective strategies for preventing anxiety. These strategies may reduce possible complications associated with HF and, in the long run, adverse outcomes, including hospitalizations. The application of effective psychotherapeutic techniques, as well as models of psychotherapeutic intervention, such as cognitive behavioral therapy, has been indicated in this context. The objective of this model is to perform treatment in order to reduce anxiety and depressive symptoms through brief psychotherapy and the application of psychotherapeutic techniques that allow, through practical activities, the awareness of the problem and the search for practical solutions, teaching the patient to cope with cognitive and behavioral symptoms.

Conclusion

In short, this paper stressed the importance of anxiety as a psychological factor affecting the HF population. It seems important to us that further research in the area of chronic diseases, especially heart disease, should be developed so that we can act preventively with these patients. Since, according to previous studies and results presented here, psychological factors tend to be neglected, thus aggravating the health conditions of these populations. This study has important implications for clinical practice and research in the field of psychology, namely, with information that can contribute to the improvement of psychological intervention in patients with HF.

Furthermore, it reinforces the need for future studies, namely with the development of psychotherapeutic interventions aimed at improving coping techniques, restructuring and resignification of psychological symptoms, as well as the promotion of psychoeducational interventions in these disorders, with a view to improving QoL of these patients.

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Declarations

Consent to Participate Additional informed consent was obtained from all individual participants for whom identifying information is included in this article.

Conflict of Interest The authors declare that they have no potential conflict of interest.

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