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NUTRITIONAL STATUS ASSOCIATED WITH DIFFERENT METHODS OF SCREENING DEPRESSION IN HEART FAILURE PATIENTS

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ABSTRACT

Introduction: Assessment of nutritional status has been used under different conditions. **Objective**: Associate nutritional status with different methods for screening for depression in patients with heart failure. **Method**: Study observational, cross-sectional and prospective study. The diagnosis of nutritional status was carried out through the validated questionnaire *Mini nutritional assessment* (MNA), anthropometry and tetrapolar bioimpedance. The depression was tracked by the *Beck Depression Inventory* (BDI-I) and Questionarie Health Patient-9 (PHQ-9). Data distribution was assessed using the Kolmogorov-Smirnov tests and Shapiro-Wilk, p-value <0.05 was considered significant**. Results:** 76 patients were evaluated, screened by different methods, 51.3% with functional class II (*New York Heart Association*). The prevalence of depression by BDI-I: 67.1% and PHQ-9: 44.7%. Regarding nutritional status, 58% had a risk score and 85% had a obesity. Depression instruments, simultaneously, showed an association between the groups with and without depression for the diagnosis of nutritional risk (BDI-I:p=0.02; PHQ-9:p=0.001); increased waist circumference (BDI-I:p=0.03; PHQ-9:p=0.05). The diagnosis of nutritional risk (OR:3.11; 95%CI [1.17-8.31]) increased the chance to develop depression. **Conclusion**: We conclude that the investigation in the nutritional psychiatry axis in patients with heart failure allowed to know a phenotype with a higher nutritional risk associated with depression and with high rates of obesity.

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INTRODUCTION

The heart failure (HF) is a complex progressive clinical syndrome with implications for nutritional status and mental health (Jacka, 2017). Early state detection nutrition through an effective method can minimize the complications of symptoms peaks of HF and its associated risk factors, including depression. Depressive morbidity in HF must be understood as a complex of diseases involving major depressive disorders (Guideline Brazilian Heart Failure, 2018; Mesquita, 2017). The prevalence of depression is two to four times higher when associated with HF. Depression increases the risk of developing HF by 18% and less than 25% of these patients are diagnosed (Brazilian Heart Failure Guideline, 2018; Celano, 2018). The recognition of depressive symptoms in cardiovascular diseases (CVD) and HF are performed using systematic tracking tools. There are at least 49 stopovers to track depression, but the *Beck Depression Inventory* -I (BDI-I) *is* the most cited in studies performed at HF, however, *Patient* Health Questionnaire (PHQ-9) has recently been mentioned in different studies in this population (Celano, 2018). A recent study with PHQ-9 showed that depression when associated with cardiac conditions cause inflammatory, metabolic and nutritional disorders. Different nutrients or different dietary patterns can influence the health problem depressive symptoms, however, are not yet explored in HF (Jacka, 2017; Marx et al., 2017; Othman, 2018). Early detection of nutritional status through an effective screening method can be useful for patients with HF. The mini nutritional assessment method (MNA) has been invested in the population, but there is still a scarcity of scientific evidence for the nutritional diagnosis in HF. The MNA it is simple to use and can replace

biomarkers (Zamora, 2016; Ruiz, 2017; Araújo, 2010; Oreopoulos, 2010; Vellas , 1994). Therefore, since patients with HF have been experiencing depression, as well as nutritional alteration, this study aims to invest in the axis of nutritional psychiatry, the association of nutritional status with depression in patients with HF followed up in a specialized clinic.

METHODS

Observational, prospective, cross-sectional study, following the criteria established by *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) (International Committee of Medical Journal Editors, 2015), in outpatients with HF seen at the multi professional clinic specialized. This study was approved by the ethics Committee under opinion 630.078, under CAAE: 25093513.0.0000.5243. All participants signed the Consent Form Free and Informed. Sample selection was convenience, following the diagnostic criteria for CI using the Simpson method and NT-proBNP > 125 pg/dL (Brazilian Heart Failure Guideline). For inclusion criteria, adults and the elderly were classified as functional class I, II or III according to the classification criteria of the *New York Heart Association* (NYHA). For exclusion were considered: use of pacemaker, edema and NYHA IV, use of any anxiolytic, depressive and illiterate medication.

Study protocol

Instruments: Depressive symptoms were assessed using two scales: *Beck Depression Inventory* (BDI-I) and *Patient Health Questionnaire* (PHQ-9). BDI-I is a self-report scale. To be found the presence of depression scores with at least 10 points were considered (Beck 1961). The PHQ-9 is a self-report scale. In order to verify the presence of depression scores with at least 10 points were considered (Santos, 2013).

Nutritional Assessment: To evolute nutritional status, the Mini Nutritional Assessment questionnaire was used Nutritional (MNA) (Vellas, 1994). According to the sum of the score, the patient is classified as: normal (or without risk of malnutrition), when the score is above 23.5 points, at risk nutritional, when the score is between 17 to 23.5 or malnourished, when the score is less than 17 points (Vellas, 1994). For anthropometric assessment, the mean of the measurements performed in duplicates, for the parameters of weight (Kg) and height (A) to obtain BMI and waist circumference (WC) (Fonseca, 2017). WC measures were measured using a flexible anthropometric tape, from the brand Cescorf® (World Health Organization, 2009). The cutoff point was used for men> 102 cm and women> 88 cm (National Cholesterol Education Program, 2001). To assess body composition using the bioimpedance method (BIA) the four-pole model was used or the Biodynamics® model 410, with specific software (version 13.4) and Resng Tab electrodes.

Analyze this: The descriptive analysis characterized the studied population according to frequencies and proportions (Zhou, 2002).

The hypothesis of normality in the distribution of a how much variable was verified by the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW). To compare two independent groups with variable with distribution normal, unpaired Student's t test was used; otherwise, the comparison between two groups was performed using the Mann-Whitney 20 nonparametric test. The agreement of the two instruments for the diagnosis of depression in the population with CI was analyzed using the Fleiss kappa (FK) and Krippendorff alpha (kA) coefficients, consistency of the two instruments in diagnosing depression in the population was assessed by Cronbach's alpha coefficient (Cc). The measure used to express the risk was the odds ratio (OR, from *Odds Ratio*) which assessed the relationship between the chance of an individual in a group presenting an outcome, compared to the individual in the complementary group (Zhou, 2002). This analysis was performed using the *Statistical Package for the Social program Sciences* (SPSS), version 20.0, and all analyzes were performed considering a level of maximum significance of 5.0%.

RESULTS

For eligibility, 85 patients were assessed by convenience sample. Were excluded 09 due to the use of depressive drugs (n=2); cognitive deficit (n=2); education level illiterate (n=2); edema and pacemaker (n=3) and prospectively included n=76.

Different methods of tracking depression in HF: The prevalence of depression diagnosed by the BDI-I scales was 67.1% (n=51) and PHQ-9 was 44.7% (n=34); (p=0.00). The agreement analysis of the instruments in the HF population showed superficial agreement ($k_F = \alpha_K = 0{,}27$) and moderate consistency ($\alpha_C = 0{,}602$, p=0,000). The PHQ-9 instrument was conservative to diagnose depression, with 34.2% of false negative, 56.6% accuracy, 73.1% specificity and 48% sensitivity forget those who are really sick.

Sociodemographic biomarkers: In the analysis of the association of sociodemographic characteristics with depression there was a significant difference between depression with group (DG) and without depression (DGW) for income (BDI-I: p=0.01; PHQ-9: p=0.004). In the analysis of logistic regression sociodemographic variables were not related to risk developing depression. It was observed that the sociodemographic risk factors better predict the result in BDI-I (AUC [BDI-I = 0.78]; AUC [PHQ-9 = 0.69]).

Clinical Biomarkers: In the distribution of the sample, there was a significant difference between the DG and DGW for clinical variables: LVEF (BDI-I: p=0.01); PEFhf (BDI-I: p=0.03); REFhf (PHQ-9: p=0.004) (Table 1). In the logistic regression analysis, clinical variables were not related to the risk of developing depression. It was observed that the risk factors clinicians better predict the outcome on PHQ-9 (AUC [BDI-I = 0.77]; AUC [PHQ-9 = 0.79]).

Nutritional status biomarkers: As for the biomarkers of nutritional status, the MNA had a risk score nutritional status (<23.5) associated with depression by different screening methods (BDI-I: p = 0.02; PHQ-9: p = 0.001). Nutritional risk is an increased risk factor of 3.11 to develop depression (BDI-I) (95% CI [1.17-8.31]; p <0.001) (Table 2). It was observed that nutritional risk factors better predict the outcome on BDI-I (AUC [BDI-I = 0.76]; AUC [PHQ-9 = 0.68]) (Figure 1).

DISCUSSION

The present study is a pioneer in studying the nutritional psychiatry axis with the association of nutritional status assessed by different screening methods of depression in

Table 1. Clinical characteristics among groups of patients with heart failure

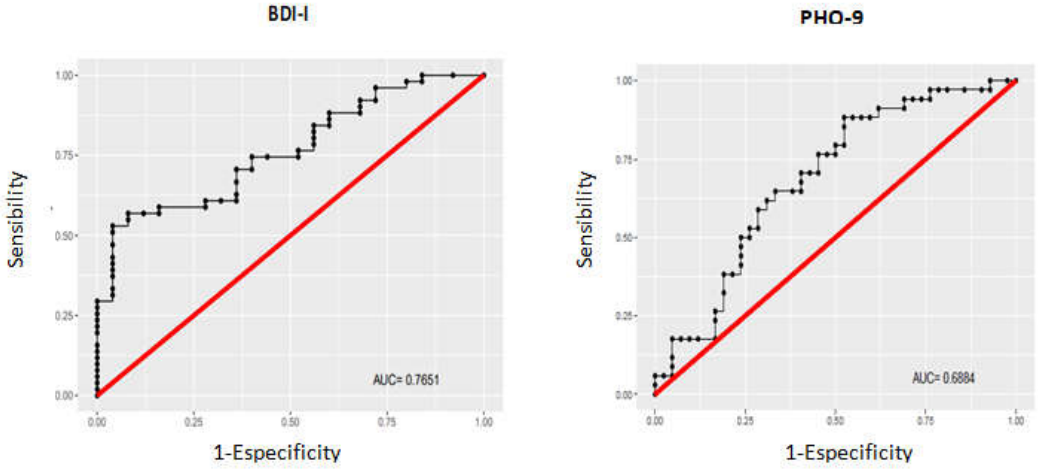
CLINICAL CHARACTERISTICS	n=76	DG/BDI-I (n=51)	DGW/BDI-I (n=25)	p-valor X^2	DG/PHQ-9 (n=42)	DGW/PHQ-9 (n=42)	p-valor X^2
CLASSIFICATION HF							
LVFE (%)#	54±15,7	50±15,39	63±15,12	0,01*	58±15,70	60±16,70	0,23
PEFhf	46,0%	64,4%(29)	35,6%(16)	0,03*	51,7%(23)	48,9%(22)	0,38
REFhf	54,0%	71%(22)	29% (9)		61,3%(19)	38,7%(12)	
FUNCTIONAL CLASS							
NYHA I	25,1%	47,4%(9)	52,6%(10)		68,4%(13)	31,6%(6)	
NYHA II	51,3%	74,4%(29)	25,6%(10)	0,10	51,3%(20)	48,7%(19)	0,41
NYHA III	23,6%	72,2%(13)	27,8%(5)		50%(9)	50%(9)	
COMORBIDITIES							
Diabetes	56,6%	68,9%(31)	31,1%(14)	0,69	53,3%(24)	46,7%(21)	0,69
Dyslipidemia	81,6%	63,3%(38)	36,7%(22)	0,17	45%(27)	55%(33)	0,92
Failure Renal cronic	23,7%	76,2%(16)	23,8%(5)	0,29	71,4%(15)	28,6%(6)	0,004*

Legend: (*) Unpaired T-Student test or Mann Whitney test to compare variations between groups; (#) Average and standard deviation; (%) percentage; DG: Group with depression; DGW: Group without depression; BDI-I: Beck Depression Inventory; PHQ-9: Patient Health Questionnaire-9; %LVFE: left ventricule ejection fraction; PEFhf: preserved ejection fraction heart failure; REFhf: reduzid ejection fraction heart failure; NYHA: New York Heart Association.

Table 2. Nutritional status characteristics among groups of patients with heart failure

Nutritional status characteristics	N (76)	DG/BDI (n=51)	DGW/BDI-I (n=25)	p-value X^2	OR	$CI_{95\%}$ da OR	DG/PHQ-9 (n=34)	DGW/PHQ-9 (n=42)	p-value X^2	OR	$CI_{95\%}$ da OR
MNA< 23,5	58%(44)	76%(39)	38,5(9)	0,02*	3,11	1,17-8,32	79%(27)	42%(17)	0,001*	0,14	0,39-5,60
BMI ≥ 25Kg/m^2	85%(64)	67,8%(34)	32,2%(8)	0,01*	1,67	0,45-6,15	93%(32)	7%(3)	0,22	0,16	0,46-6,58
WC: Male > 102 cm	41,5%(32)	30,0%(16)	11,5%(9)	0,02*	1,43	0,4-5,11	20,5%(7)	10%(4)	0,05*	1,32	0,4-5,38
WC: Female > 88 cm	59%(45)	36,1%(33)	19,2%(11)				37%(12)	14%(6)			
BIOIMPEDANCE											
Phase fase#	6,2± 0,9	6,1±0,9	6,5±1,0	0,16	0,22	0,07-1,85	5,9±0,7	5,8±0,8	0,46	0,37	0,27-0,52
CBM (kg)#	24,91±5,1	25,1±6,1	24,5±5,4	0,51	0,32	0,08-1,56	27,2±5,8	23,5±5,8	0,31	0,21	0,05-1,22
EM(L)#	29,4±6,0	29,7±6,2	28,8±5,6	0,53	0,14	0,09-1,29	29,4±6,1	29,5±6,1	0,74	0,19	0,1-1,08
WTB (L/%)#	40,6±9,5	41,3±9,8	38,8±8,6	0,17	0,11	0,03-2,23	40,7±9,8	40,5±9,9	0,62	0,16	0,05-3,21
IBW (L/%)#	21,8±5,8	21,4±5,6	22,1±4,0	0,54	0,45	0,21-1,99	21,6±5,8	21,8±5,8	0,95	0,54	0,11-1,39
EBW (L/%)#	19,2±4,8	19,3±5,0	19,1±4,3	0,66	1,34	0,21-2,98	10,9±4,7	19,4±4,8	0,50	1,86	0,45-2,56
TBF (%)#	33,4±6,2	33,7±6,4	33,1±5,7	0,65	1,91	0,38-4,21	34,3±5,6	32,7±6,6	0,27	1,22	0,33-3,15
CM (kg)#	50,7±15,3	49,2±12,1	43,3±11,2	0,01*	1,65	0,33-8,33	32,1±15,3	41,6±12,2	0,22	1,52	1,01-6,56
FC (kg)#	30,5±10,9	32,6±16,8	35,8±5,2	0,01*	2,11	0,59-7,5	40,5±11,7	29,3±10,2	0,03*	1,19	0,34-4,21
BMR (Kcal)#	1442±390	1449±310	1428±372	0,49	1,98	0,11-2,34	1437±313	1428±384	0,1	2,08	0,41-5,34

Legend: (*) Unpaired T-Student test or Mann Whitney test to compare variations between groups; (#) Average and standard deviation; (%) percentage; DG: Group with depression; DGW: Group without depression; BDI-I: Beck Depression Inventory; PHQ-9: Patient Health Questionnaire-9; MNA: Mini assessment nutritional; BMI: body mass index; WC: waist circumference; CBM: cellular body mass; EM: extracellular mass; WTB: water total body; IBW: Intracellular body water; EBW: Extracellular body water; TBF: total body fat; CM: cell mass; FC: fat mass; BMR: basal metabolic rate.



Legend: Roc Curve; BDI-I: Beck Depression Inventory; PHQ-9: Patient Health Questionnaire-9.

Figure 1. Risk factors for nutritional status associated with depression in heart failure patients

outpatients with HF from the Public Health System/Brazil (PHS/ Brazil).In this study, a high percentage of depression in HF was identified, when tracked by the BDI-I and PHQ-9 instruments. In patients without HF, depression is between 14.0% - 26.0% of individuals, but in patients with HF, the incidence increases to 24.0% -85.0% (Celano, 2018; Beck, 1961; Santos, 2013; Fonseca, 2017).

The BDI-I scale is one of the most cited instruments in HF, it presents sensitivity around 0.84 and specificity around 0.72, corroborating with our results (Beck,1961; Santos, 2013). However, the present study shows a difference in the prevalence of depression when tracked by the PHQ-9 scale compared to BDI-I. Some possible explanations for this finding can be listed, such as the characteristics self-reported, overlapping symptoms of pathophysiology in HF and the dimensions of questions. BDI-I has a deeper dimension for pathophysiology, which may have influenced the increase in the score in these patients. Although, the PHQ-9 has already has been tested at various levels of health care and different contexts cultural studies, few studies are carried out in Brazil in outpatients with HF (Celano, 2018; Beck, 1961; Santos, 2014). In this study, patients have high percentages of comorbidities such as diabetes, dyslipidemia and CRF. Current evidence reports that diseases systemic conditions and the chronicity of HF contribute to the worsening of the clinical consequently to worsen the quality of life of these patients (Fonseca, 2016; McMurray, 2016; Jimenez, 2018). Regarding the biomarkers of nutritional status, this study shows a high percentage of nutritional risk (MNA) in HF. Bonilla-Palomas *et al.,* (2017) also found similar results when assessing nutritional status with MNA in patients with HF.

Another study that also used MNA showed prevalence of the nutritional risk of 21.68% in elderly patients (Bonilla-Palomas, 2012). One of the possible explanations in the variation in the prevalence of nutritional risk presented in the studies, may be the reflection of the different criteria used in the methodology, the population of evidence on the diagnosis of nutritional risk in patients depressed with HF. Nutrition experts have shown that evaluation with MNA is a strong mortality predictor in HF when compared to other tools. At the However, current evidence on nutritional risk and depression has not been analyzed system in HF and its and dietologies are multifactorial, in order to minimize the impacts on the clinical outcomes of HF, the associated complications due to multimorbidities involved in pathophysiology that can worsen the prognosis (Oreopoulos, 2008; Lin, 2012; Fidelix, 2014; Fernandez-Filha, 2018; Perez, 2014). Another finding in this study reveals a high percentage of overweight and obesity (BMI $\geq$ 25 Kg/m^2) in depressed patients with HF. The Brazilian Heart Failure Guideline, (2018) two studies showed that about 29% to 40% of these patients are overweight, 30% to 49% are obese, our findings are similar to current studies At the However, the concept of the obesity paradox in HF has been debated by several other studies, but not associated with depression. Use BMI as a measure obesity and neglect more precise tools has been cited by specialists as a methodological problem in studies (Perez, 2014; Payahoo, 2013).

The parameters for body composition evaluated with BIA show lower percentage of muscle mass and higher percentage of body fat mass associated with depression. This study strengthens the discussion with new evidence for the use of BIA as a criterion for the diagnosis of obesity in HF. These assessments provided by BIA are very important, as it is essential to check parameters such as total body water, muscle mass, fat mass and phase angle (PA), in order to schedule an appropriate nutritional treatment for this patient profile. In particular, PA in this study was slightly lower in patients with depression (Payahoo, 2013; Bera, 2014; Ferreira, 2015).

PA is an important biomarker of cell integrity, which has been interpreted as a prognostic indicator and predictor of survival in some clinical situations (Bera, 2014; Ferreira, 2015; Colín-Ramirez, 2012). One study compared the cutoff values of PA with the nutritional status in the hospital admission (Men/Women=382/267) was on average 5° from PA and was considered a useful marker for assessing nutritional status (Ferreira, 2015). This finding is conflicting with the present results, when we find the mean PA around of 6° in depressed HF patients. However, this finding is extremely relevant science, because it adds the evidence for other studies with the proposal to evaluate the prognosis of PA in outpatients with HF (Ferreira, 2015; Colín-Ramirez, 2012). Therefore, the results presented in this study on biomarkers factors in the nutritional psychiatry axis contribute to future discussions for mental health and identification of the need to find biological pathways that mediate the nutrition - HF - depression link.

Study limitations: This study has limitations due to the observational and cross-sectional design, be a sample of convenience. However, through the data presented, it is evident the importance of this discussion, as it reinforces a systematic method of assessing nutritional biomarkers applied to the population with HF. It is worth emphasizing the need to deepen the knowledge of the association of depression with other clinical features and in this population to carry out preventive studies in patients with HF.

Conclusion

When employing the assessment of nutritional biomarkers from the perspective of nutritional psychiatry in patients with HF, we conclude that these patients have high rates of depression, depressed patients have higher percentage of nutritional risk, overweight and obesity and worse quality of life. The present study reinforces the importance of the health professional, including the nutritionist, collaborating in the detection / tracking of depression and the importance of nutritional health.

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