

## Original Article

# Health literacy and quality of life in hospitalized heart failure patients: a cross-sectional study

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**Abstract:** Introduction: Heart Failure (HF) treatment may be improved by good knowledge of the disease (Health Literacy) that, despite the well-established role on improving self-care, preventing complications and avoiding worse outcomes, has little evidence on affecting QoL of HF patients. Therefore, the objective of the present study was to evaluate the impact of Health Literacy on QoL in hospitalized HF patients. Methodology: A cross-sectional exploratory study was conducted with HF patients hospitalized at a public cardiological hospital. Health Literacy was assessed using the “Questionnaire about Heart Failure Patients’ Knowledge of Disease” and QoL using the “Minnesota Living with Heart Failure Questionnaire” (MLHFQ). The association between Health Literacy and QoL was assessed by linear regression ( $P < 0.05$ ). Results: 50 patients were included in the study; the mean Health Literacy score was  $34.2 \pm 15.1$  (the majority presenting acceptable or better knowledge). The mean MLHFQ score was  $73.5 \pm 19.8$ . The one-year hospital readmission rate ( $\beta = +3.8$ ;  $P = 0.009$ ) and the patients’ Health Literacy score ( $\beta = -0.4$ ;  $P = 0.024$ ) or good knowledge category ( $\beta = -20.2$ ;  $P = 0.016$ ) were independently associated with QoL. Conclusion: While the readmission rate was inversely associated with QoL, the better the HF knowledge the better QoL in hospitalized HF patients.

**Keywords:** Health literacy, knowledge, quality of life, heart failure, multidisciplinary team

## Introduction

Heart failure (HF) affects 26 million people worldwide and, with 2 million new cases diagnosed each year [1-4], is considered a public health problem because of the increasing prevalence and high hospitalization and readmission rates [5, 6], which impacts countries’ economies and quality of life (QoL) of its owners [4].

QoL may worsen during HF progression due to necessity of several pharmacological and non-pharmacological treatments, dietary restrictions, significant morbidity and to the occurrence of acute decompensations and hospitalizations [7, 8]. In this setting, HF patients’ clinical stability is more than the pharmacological prescription, it includes improvement in adherence to treatment and in self-care behaviors [5, 7], which can be enhanced through the multidisciplinary team follow-up [5] and by stimula-

tion of health literacy [1], that “represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health” [9].

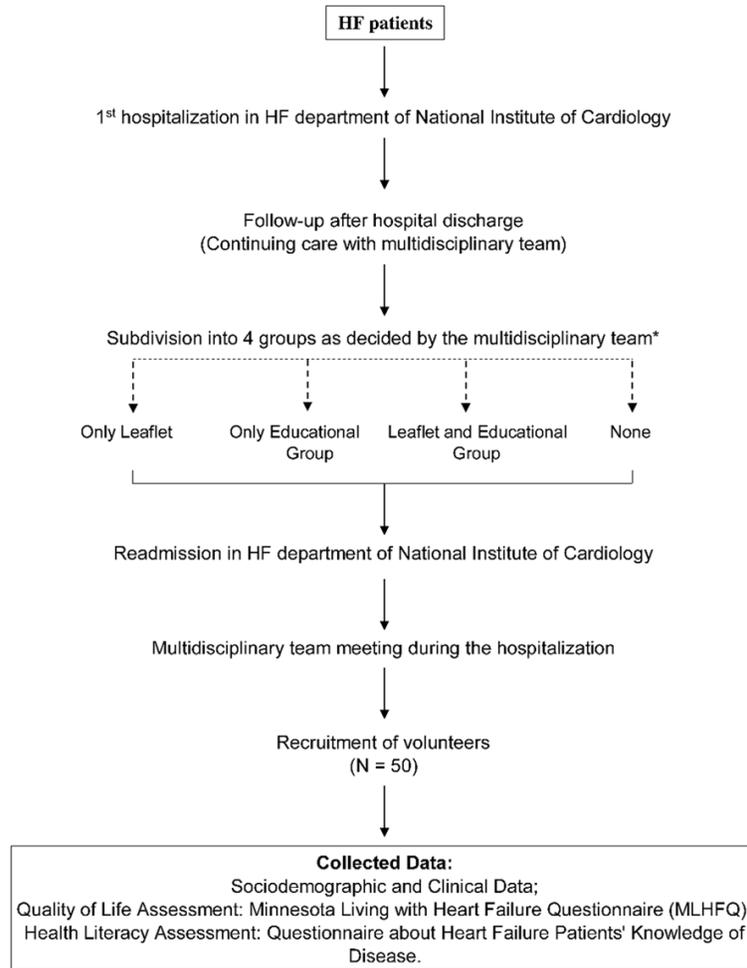
However, few studies investigated the impact of health literacy on QoL of hospitalized HF patients [1, 10-15]. Therefore, the objective of the present study is to evaluate the association between health literacy and QoL in hospitalized HF patients.

## Materials and methods

### Study design

This is a cross-sectional exploratory study. Patients were recruited in a public quaternary hospital, the National Institute of Cardiology (Rio de Janeiro, Brazil) (**Figure 1**).

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**Figure 1.** Recruitment and data collection processes. \*Multidisciplinary team of HF department is responsible for allocate the HF patients in each educational strategy according to clinical decisions. HF = heart failure; MLHFQ = Minnesota Living with Heart Failure Questionnaire.

Inclusion criteria: patients  $\geq 18$  years old; previously diagnosed with HF; with left ventricular ejection fraction (LVEF)  $< 45\%$  on the last available echocardiogram; admitted ( $\geq 24$  hours) in the hospital due to decompensated HF.

Exclusion criteria: illiterate patients or patients with communication difficulties; first hospitalization in the HF hospital department; patients in end-of-life care; or with acute decompensated HF in period of data collection.

After signing the informed consent, volunteers answered health literacy and QoL questionnaires. In addition, the research team collected clinical, sociodemographic, and educational strategy data.

## Health literacy assessment

Patients' knowledge about HF (health literacy) was evaluated using the "Questionnaire about heart failure patients' knowledge of disease", a 19 item questionnaire about ten important areas for patients' education (HF pathophysiology; HF concept; risk factors; signs and symptoms; lifestyle; diagnosis; drugs; treatment; self-care; and physical exercise), each containing four multiple-choice alternatives scoring as follows: correct answer (3 points), incomplete answer (1 point), wrong answer (0 point) and "I do not know" (0 point). The total score ranging from 0 to 57 points and categorized as "excellent knowledge" (51-57 points), "good knowledge" (40-50 points), "acceptable knowledge" (29-39 points), "little knowledge" (17-28 points) and "insufficient knowledge" ( $< 17$  points) [4].

## QoL assessment

The Minnesota Living with Heart Failure Questionnaire (MLHFQ) was used for assessing health-related QoL of volunteers. MLHFQ is composed by 21 items concerning about how the disease affects patient's life, scoring from 0 to 105, with higher scores denote worse QoL [16-18].

## Sociodemographic and clinical data assessment

Sociodemographic data (age, gender, ethnic group, occupation, level of education, religion, household income and the presence of a caregiver) was collected by interview. Clinical data (LVEF, New York Heart Association (NYHA) functional class, HF etiology, comorbidities and hemodynamic profile) was collected from the patient's medical records.

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**Table 1.** Sociodemographic characteristics of patients in the study

VARIABLES	N (%) or Mean $\pm$ SD
Age (years)	51.0 $\pm$ 12.8
Gender	
Male	31 (62%)
Female	19 (38%)
Religion	
Atheism	4 (8%)
Agnosticism	6 (12%)
Catholicism	13 (26%)
Protestantism	25 (50%)
Spiritualism	2 (4%)
Marital Status	
Single	13 (26%)
Married	26 (52%)
Divorced	6 (12%)
Widowed	5 (10%)
Household Income (US\$)	389.1 $\pm$ 248.8
Occupation	
Active working	32 (64%)
Retired	18 (36%)
Education Degree	
Elementary (incomplete)	14 (28%)
Elementary	15 (30%)
High School	20 (40%)
Graduate	1 (2%)
Ethnic group	
White	23 (46%)
Black	20 (40%)
Brown	7 (14%)

HF = Heart Failure; SD = standard deviation.

### Educational strategies

The hospital HF multidisciplinary team adopts an Institutional informative leaflet and an educational group, a HF patients and healthcare workers meeting occurring once a week, as educational strategies for HF patients after hospital discharge. The participation of volunteers in educational strategies was retrospectively assessed from medical records since their first admission in hospital HF department as follows: only leaflet, only educational group, leaflet and educational group or none.

### Data analysis and statistics

Continuous variables data are expressed as mean and standard deviation (SD) or number

(N) and percentage (%) and categorical variables data as number and percentage (%). The univariate association of each independent variable (age, gender, household income, ethnic group, religion, marital status, education, caregiver presence, comorbidities, HF etiology, ejection fraction, NYHA functional class, number of hospitalizations in the last year, educational strategies and health literacy) to the QoL score was assessed using linear regression. All variables presenting  $P < 0.20$  in the univariate analysis were included in the multivariate model analysis. The significance level was set as  $P < 0.05$ . All analysis and statistics were performed with STATA 13 software (Stata Corp, USA).

### Ethical issues

The study was in accordance of Helsinki Declaration amended in 2013 and approved by the Research Ethics Committee of the National Institute of Cardiology (CAAE: 784256-17.6.00005272). All participants were informed about the aims and procedures of the study and signed an informed consent form before participation.

## Results

### Sociodemographic and clinical characteristics

Sociodemographic characteristics of the 50 patients included in the study are shown in **Table 1**. The mean age was 51.0  $\pm$  12.8 years old and 62% were male. The most self-reported ethnic group was white (46%) and high school (34%) was the most cited education degree. The household income of the participants was approximately 389.1 US\$/month. In addition, most of the patients (80%) declared Christian religion, 52% were married and 64% were actively working.

The most common clinical characteristics (**Table 2**) were NYHA functional class II (58%) and idiopathic HF etiology (46%). Further, patients presented a reduced LVEF (26.7%). Further, hypertension (56%) and dyslipidemia (56%) were the most common comorbidities. The major hemodynamic profile was warm and wet (52%), the hospital readmission rate in the last year was 1.9  $\pm$  1.8 times and the majority of the patients (88%) declared having a caregiver presence at home.

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**Table 2.** Clinical characteristics of patients in the study

VARIABLES	N (%) or Mean $\pm$ SD
HF Etiology	
Idiopathic	23 (46%)
Ischemic Heart Disease	14 (28%)
Valve Dysfunction	5 (10%)
Myocarditis	3 (6%)
Congenital	1 (2%)
Peripartum	3 (6%)
Chagas Disease	1 (2%)
NYHA Functional Class	
II	11 (22%)
III	29 (58%)
IV	10 (20%)
Caregiver Presence	44 (88%)
Comorbidities	
Hypertension	28 (56%)
Diabetes Mellitus	16 (32%)
Dyslipidemia	28 (56%)
Acute Myocardial Infarction	24 (48%)
Atrial Fibrillation/Flutter	19 (36%)
Depression	10 (20%)
LVEF (%)	26.6 $\pm$ 7.9
Hemodynamic Profile	
Warm and Wet	26 (52%)
Warm and Dry	16 (32%)
Cold and Dry	1 (2%)
Cold and Wet	7 (14%)
Readmission rates in the last year (frequency)	1.9 $\pm$ 1.8

HF = Heart Failure; NYHA = New York Heart Association; LVEF = left ventricular ejection fraction.

### QoL and educational strategies description

The questionnaires scores and the educational strategies are shown in **Table 3**. The mean score obtained in the questionnaire about HF patients' knowledge of disease, used to evaluate health literacy, was  $34.2 \pm 15.1$ . The mean MLHFQ score was  $73.5 \pm 19.8$ . Almost half of the participants (48%) attended the educational group meeting and received the leaflet as educational strategy.

### Association of sociodemographic, clinical and educational variables with QoL

The **Table 4** shows that NYHA functional class III is significantly associated with QoL score ( $\beta=+15.3$ ;  $P=0.029$ ), as well as the cold and wet hemodynamic profile ( $\beta=+22.6$ ;  $P=0.010$ ),

the hospital readmission rate in the last year ( $\beta=+3.8$ ;  $P=0.010$ ), the patients' health literacy total score ( $\beta=-0.4$ ;  $P=0.038$ ) and health literacy good knowledge category ( $\beta=-22.2$ ;  $P=0.011$ ).

Moreover, only the hospital readmission rate in the last year ( $\beta=3.9$ ;  $P=0.009$ ) and the patients' healthy literacy total score ( $\beta=-0.4$ ;  $P=0.024$ ) and good knowledge category ( $\beta=-20.2$ ;  $P=0.016$ ) are independently associated with QoL score of HF patients even when adjusted by age and sex (**Table 5**).

### Discussion

The main finding of the present study was that good knowledge about HF, expressed by health literacy, improves QoL of hospitalized HF patients. Also, lower readmission rates were associated with better QoL levels. Health literacy is one of 20 priority areas that could transform healthcare, as defined by the Institute of Medicine (National Academy of Medicine, USA) [19]. Our results emphasize health literacy potential for improving QoL in HF patients.

Although some studies didn't found consistent results between health literacy and QoL in patients with atrial fibrillation [20] or type 2 diabetes and depression [21], it has been shown that among hospitalized HF patients, health literacy was positively associated with the social component of QoL [12]. In addition, a recent systematic review and meta-analysis study showed that an inadequate level of health literacy among HF patients is associated with higher risk of mortality, increased risk of hospitalizations and emergency department visits [22].

Besides, the present study also demonstrate that hospital readmission rate is inversely associated with QoL of HF patients. Prior studies did not found a significant relationship between health literacy and 30-day readmission rate [11] and between QoL and number of previous hospitalizations for chronic HF patients [10].

## Health Literacy in heart failure

**Table 3.** Questionnaires scores and educational strategies

VARIABLES	N (%) or Mean $\pm$ SD
Health Literacy (total score)	34.2 $\pm$ 15.1
Health literacy (categories)	
Insufficient knowledge	7 (14)
Little knowledge	7 (14)
Acceptable knowledge	13 (26)
Good knowledge	17 (34)
Excellent knowledge	6 (12)
MLHFQ (total score)	73.5 $\pm$ 19.8
Educational Strategies	
None	7 (14%)
Only Leaflet	17 (34%)
Only Educational Group	2 (4%)
Leaflet and Educational Group	24 (48%)
Frequency in the Educational Group	0.9 $\pm$ 1.3

*Health Literacy = Evaluated using the Questionnaire about heart failure patients' knowledge of disease; MLHFQ = Minnesota Living with Heart Failure Questionnaire.*

However, Murray and cols demonstrated that patients with adequate health literacy present lower risk for hospitalization due to HF [23], a benefit, since the hospital readmission rate is a major risk factor for HF patients death and almost 50% of all hospitalized HF patients are readmitted within 90 days after hospital discharge [24].

Also, the participants in the present study were younger (approximately 51 years old) than those presented by others descriptive [11] and cross-sectional studies [1, 10]. Most of the participants were male, white and married, as prior reported [1, 25], but the most common education degree presented was high school, and over half of them were actively working, what differs from sociodemographic characteristics presented by others cross-sectional studies, that demonstrated the majority of participants being retired [25] and with less than 12 years of schooling [1]. Low educational level influences health literacy, generating vulnerable groups at higher risk of hospitalization, readmission and inappropriate use of emergency care services. Moreover, satisfactory level of health literacy is an important factor on promoting HF knowledge and confidence in self-care behaviors [11], in contrast,

lower health literacy level could be a major barrier for achieving successful management of chronic conditions [26].

In this study, idiopathic etiology was the most frequent cause of HF while, for the I Brazilian Registry of Heart Failure (BREATHE) and Frail Heart Failure (FRAIL-HF) studies, ischemic and hypertensive were the most prevalent HF etiologies [15, 24]. Comparatively, Chagas heart disease is commonly associated with worse prognosis than hypertensive and ischemic heart disease etiology of HF [27]. Chronic comorbidities presence and number in HF patients also affect clinical outcomes and, interestingly, approximately half of hospitalized HF patients exhibit at least one or two comorbidities [10]. In the present study, hypertension and dyslipidemia were the most common comorbidities occurring in HF patients, as also reported by BREATHE and FRAIL-HF studies [15, 24].

Among the four hemodynamic profiles defined according to the classification of Stevenson, the most prevalent in the participants of this study was warm and wet (commonly called profile B), associated to the presence of pulmonary congestion without signs of peripheral tissue hypoperfusion [24]. A recent study demonstrated that warm and wet was the most common profile associated with acute decompensated HF in ischemic and dilated cardiomyopathy etiology. In addition, this was the secondary profile associated with major ratio death/heart transplant, after the cold and wet profile (patients with signs of pulmonary congestion and peripheral tissue hypoperfusion, also called as profile C), associated with poor prognosis [27].

Another relevant aspect related to HF prognosis is the loss of functional capacity [24]. The NYHA functional classification is commonly used for describing severity of HF symptoms [8]. Over half of patients in the present study demonstrated NYHA functional class II, similar as reported by the FRAIL-HF study [15]. Despite NYHA functional class II and III have already been demonstrated to have an univariate inversely association with QoL among hospitalized patients with chronic HF, in a multivariate analysis it was not proven, similarly to the present study's findings [10].

## Health Literacy in heart failure

**Table 4.** Univariate regression using QoL as dependent variable

VARIABLES	$\beta$	95% CI	P-value
Age (years)	0.2	-0.2 to +0.7	0.282
Gender (female)	9.7	-21.0 to +21.7	0.094
Education Degree (Elementary incomplete)			
Elementary	-4.6	-19.6 to +10.4	0.543
High School	+2.1	-12.0 to +16.2	0.767
Graduate	+15.3	-26.6 to +57.1	0.466
Occupation (retired)	3.4	-8.4 to +15.2	0.563
Religion (atheism)			
Agnosticism	3.1	-23.4 to +29.6	0.816
Catholicism	-0.1	-23.5 to +23.4	0.996
Protestantism	-4.6	-26.7 to +17.5	0.678
Spiritualism	-8.2	-43.8 to +27.3	0.643
Household Income	-0.01	-0.03 to +0.01	0.288
Marital Status (single)			
Married	-0.3	-14.2 to +13.5	0.960
Widowed	-1.9	-23.3 to +19.5	0.857
Divorced	7.7	-12.3 to +27.8	0.442
Caregiver Presence	-3.0	-20.5 to +14.4	0.727
Comorbidities			
Hypertension	-1.7	-13.2 to +9.7	0.761
Diabetes Mellitus	1.8	-14.0 to +10.4	0.767
Dyslipidemia	-3.7	-15.1 to +7.7	0.519
Acute Myocardial Infarction	5.2	-6.1 to +16.4	0.362
Atrial Fibrillation	-4.0	-15.5 to +7.8	0.503
Depression	-6.0	-20.1 to +8.1	0.399
HF etiology (Idiopathic)			
Ischemic Heart Disease	-0.2	-13.8 to +13.3	0.970
Valve Dysfunction	+14.0	-5.8 to +33.8	0.161
Myocarditis	-1.6	-26.2 to +23.0	0.896
Congenital	-24.6	-65.5 to +16.3	0.232
Peripartum	+14.4	-10.2 to +39.0	0.245
Chagas Disease	+13.4	-27.5 to +54.3	0.513
LVEF (%)	-0.4	-1.1 to +0.3	0.233
NYHA Functional Class (II)			
III	+15.3	+1.6 to +28.9	0.029
IV	+14.5	-2.4 to +31.3	0.090
Hemodynamic Profile (Warm and Dry)			
Warm and Wet	+3.5	-8.4 to +15.5	0.556
Cold and Dry	+27.1	-11.7 to +65.9	0.167
Cold and Wet	+22.6	+5.6 to +39.7	0.010
Readmission rates in the last year (frequency)	+3.8	+0.8 to +6.8	0.013
Educational Strategies (none)			
Only Leaflet	-2.7	-20.6 to +15.2	0.763
Only Educational Group	-26.8	-58.7 to +5.1	0.098
Leaflet and Educational Group	-3.8	-20.9 to +13.3	0.658
Frequency in the Educational Group	-3.3	-7.7 to +1.1	0.137
Health Literacy (total score)	-0.4	-0.7 to -0.1	0.038

## Health Literacy in heart failure

Health literacy (Insufficient knowledge)			
Little knowledge	-5.0	-25.0 to + 15.0	0.617
Acceptable knowledge	-6.5	-24.1 to + 11.0	0.458
Good knowledge	-22.2	-39.0 to -5.4	0.011
Excellent knowledge	-6.0	-26.8 to +14.9	0.566

CI = confidence interval; HF = Heart Failure; NYHA = New York Heart Association; LVEF = left ventricular ejection fraction.

**Table 5.** Multivariate regression using quality of life as dependent variable

Variable	Without adjustment			Adjusted by age and sex		
	$\beta$	95% CI	P-value	$\beta$	95% CI	P-value
Readmission rate in the last year (frequency)	+3.9	+1.0 to +6.7	0.009	+3.9	+1.1 to +6.7	0.007
Health Literacy (total score)	-0.4	-0.7 to -0.1	0.024	-0.3	-0.7 to +0.1	0.066
Health literacy (Insufficient knowledge)						
Little knowledge	-6.9	-26.2 to +12.4	0.475	-11.6	-32.1 to +8.9	0.261
Acceptable knowledge	-5.0	-21.9 to +11.9	0.556	-8.1	-25.7 to +9.3	0.353
Good knowledge	-20.2	-36.5 to -4.0	0.016	-19.4	-36.9 to -1.9	0.031
Excellent knowledge	-11.0	-31.5 to +9.6	0.288	-13.5	-35.1 to +7.9	0.210

CI = confidence interval; HF = Heart Failure.

Interestingly, almost 10 years ago, the American Heart Association (AHA) published a scientific statement demonstrating low health literacy as a challenge to effective self-care. Unsatisfactory health literacy impairs patients' understanding of the complex healthcare systems as well as acting on essential health-related information. Therefore, health literacy affect patients ability to understand instructions of medications prescription, health information, importance of treatment adherence and self-care behaviors [28]. Together, AHA and Heart Failure Society of America have recommended further investigation of the effect of health literacy on self-care [28, 29]. Although despite the present research had not specifically evaluate self-care, it brought important results regarding health literacy and QoL among hospitalized HF patients.

### Limitations

This was an exploratory cross-sectional study with a small sample size. Nevertheless, our research evaluated sociodemographic and economic characteristics, clinical profile, education degree, health literacy, QoL and educational strategies-commonly used in the HF service-among hospitalized HF patients. Thus, it is necessary consider all difficulties of having access and enrolling inpatients in a research during in-hospital period. Although cross-sectional

research cannot infer causality about the effect of educational strategies on QoL and health literacy, this study evaluates different educational strategies among hospitalized HF patients, which could be the basis for future clinical trials.

### Conclusion

The main finding of the present study was that good levels of health literacy are associated with better levels of QoL in hospitalized HF patients. Additionally, higher hospital readmission rates are associated with poor QoL in those patients, which represents the impact of recurrent hospitalizations for HF. Finally, the multidisciplinary team could be a key point to improve the patients' knowledge about their disease, their adherence to treatment and consequently their QoL.

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### Disclosure of conflict of interest

None.

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