



The relationship between caregiver contributions to self-care and quality of life in heart failure patients in Ardabil hospitals in Ardebil-Iran

Parisa Karimi^{a,1}, Mohammad Ali Mohammadi^{b,*,3}, Behrouz Dadkhah^b, N. Mozaffari^{c,*,2}

^a School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran

^b Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran

^c Department of Critical Care Nursing, School of Nursing and Midwifery, Ardabil University of Medical Sciences, Ardabil, Iran

ARTICLE INFO

Keywords:

Caregiver contribution to self-care
Heart failure
Quality of life

ABSTRACT

Background: Heart Failure (HF) is one of the most common chronic diseases in worldwide. The long process of chronic diseases and their impact on patients' health dimensions require effective care methods to control the physical, psychological, and social complications. Among the methods suggested for taking care of chronic diseases is caregiver contribution to self-care. This study was conducted to determine the relationship between caregiver contributions to self-care and quality of life in HF patients hospitalized in Ardabil hospitals in Ardebil-Iran.

Methods: This correlational study was conducted on 280 HF patients and their caregivers in Ardabil hospitals, Iran. Data collection tools were a demographic information questionnaire (Patient and caregiver), Caregiver Contributions to Self-Care of Heart Failure Index2 (CC-SCHFI 2), and Minnesota Living with Heart Failure Questionnaire (MLHFQ). The data were analyzed by SPSS (Version 26) software using descriptive (mean, standard deviation, and frequency) and analytical statistics (t-test, F-test, and linear regression analysis). The significance level was considered to be 0.05.

Results: The respondents reported favorable caregiver contribution to self-care of HF patients (90.38 ± 34.15). The majority (56.1 %) of patients had an unfavorable quality of life. Further, there was a positive and weak correlation between caregiver contribution to self-care and patients' quality of life ($p < 0.01$, $r = 0.02$). The regression analysis showed that the Caregiver contributions to self-care management, gender, caregiver's marital status, and co-residence of the caregiver and the patient had the greatest impact on the HF patients' quality of life ($p < 0.05$).

Conclusion: There was a significant relationship between caregiver contribution to self-care and the HF patients' quality of life. Caregiver contributions to self-care management, gender, caregiver's marital status, and co-residence of the caregiver and the patient had the greatest impact on the HF patients' quality of life. Therefore, to improve the caregiver contributions to self-care and quality of life of these patients, it is better to use married female caregivers who live together with the patient.

1. Introduction

Currently, Heart Failure (HF) is one of the most common chronic diseases around the world. (Ponikowski et al., 2016). As a complex clinical syndrome, it is caused by a structural and functional disorder in filling the ventricles or removing blood from the heart (Herrmann,

2022). Heart Failure accounts for about 5 % of cardiovascular diseases (Savarese et al., 2022). According to the estimate by the World Health Organization, 64.3 million people suffer from HF worldwide (James et al., 2018). In Iran, according to the latest statistics published by the Center for Disease Control, HF patients constitute 3.3 % of the population (Moshki et al., 2019). HF with clinical manifestations, such as

* Corresponding authors.

E-mail addresses: Parisakarimi6291@gmail.com (P. Karimi), Mmohammadali319@gmail.com (M.A. Mohammadi), Behrouz.dadkhah@gmail.com (B. Dadkhah), naser.m51@gmail.com (N. Mozaffari).

¹ ORCID: 0000-0002-8581-0736.

² ORCID: 0000-0002-1895-5257.

³ ORCID: 0000-0001-8063-3366.

<https://doi.org/10.1016/j.ijans.2022.100511>

Received 29 September 2022; Received in revised form 1 December 2022; Accepted 10 December 2022

Available online 12 December 2022

2214-1391/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

edema, shortness of breath, reduced tolerance in daily life activities, and the long-term course of the disease and its complexity, affects not only the biological aspects but also the social, emotional, and psychological aspects of the patients and decreases their well-being and quality of life (Calixtre et al., 2016). People with HF face a significant decrease in quality of life compared to people with other chronic diseases and people without HF. At the individual level, quality of life includes physical and psychological health over time and is evaluated by disease-specific criteria and general criteria understood by patients. (Giles, Freeman, Field, Sörstadius, & Kartman, 2019) The World Health Organization defines quality of life as “people’s understanding of their life under the influence of their culture and value system in life, which is related to their goals, expectations, standards, and concerns and is a reflection of a person’s mental and physical health in everyday life (Group, 1993).

One way to control HF is self-care. HF patients with effective self-care behaviors have a better quality of life, lower mortality, and fewer readmissions than patients with insufficient self-care (Jaarsma et al., 2021). Self-care of HF is defined as the activities that patients do to maintain the physiological stability of the disease (self-care maintenance) and to respond to the exacerbation of HF symptoms upon occurrence (self-care management). In general, self-care of HF patients is insufficient in all three dimensions (self-care maintenance, monitoring, and management) (Riegel, Dickson, & Vellone, 2022), because self-care is a complex process that is influenced by individual, contextual, and situational factors (Harkness, Spaling, Currie, Strachan, & Clark, 2015). Factors such as cognitive and functional limitations, old age, low education level, psychological problems, and insufficient social support can also disturb patients’ self-care (Santemasmas-Masana, González-de Paz, Hernández-Martínez-Esparza, Kostov, & Navarro-Rubio, 2019).

Usually, informal caregivers provide significant contributions to HF patients by participating in self-care in compliance with drug and non-drug regimens (Ausili et al., 2016; Cocchieri et al., 2015). Informal caregivers are people who mostly provide free care to their relatives or friends who are in need. Vellone et al. have defined caregiver contribution to HF self-care as the caregiver’s participation in maintaining, monitoring, and managing the self-care of HF patients (Vellone, Barbanelli, et al., 2020). The results of studies have shown that the consequences of HF are positively and negatively correlated with caregiver contribution to self-care behaviors (Lee Geraldine). Since caregivers have a key role in the care of HF patients and better contribution to self-care leads to better control of disease symptoms and better acceptance of the treatment regimen, the patient’s quality of life is also influenced in terms of physical, psychological, emotional, economic, and social aspects.

Various studies on other diseases have shown that caregiver contribution to self-care improves disease outcomes. On the other hand, based on a literature review, few studies have specifically examined the role of the caregiver in HF self-care, and there is little information about caregiver contribution to self-care and HF patients’ quality of life. Therefore, the present study was conducted to determine the relationship between caregiver contribution to self-care and the quality of life of HF patients hospitalized in Ardabil hospitals in Ardebil-Iran.

2. Materials and methods

2.1. Design

This is a correlational study with the aim of investigating the relationship between caregiver contribution to self-care and the quality of life in heart failure patients.

2.2. Participants

The statistical population of this correlational study included the

hospitalized patients and their caregivers in Imam Khomeini Hospital and Sablan Hospital in Ardabil city, Iran. Using the following formula:

$$n = \frac{Z_{1-\alpha/2}^2 * P(1 - P)}{d^2}$$

and considering the confidence level of 95 % and the trait ratio of $P = 0.68$, according to the study of Yee Man Ng, the sample size was estimated to be 334 (Ng & Wong, 2018). Considering a 10 % loss (34 people), the sample size was estimated to be 367 participants. The number of HF patients hospitalized in Imam Khomeini Hospital ($N = 460$) and Sablan Hospital ($N = 180$), during the last year was 640, so the final sample size was 70 using the sample size adjustment formula [$n' = n / (n + 1/N)$]. Since HF has four subgroups (I-II-III-IV) (Nadruz, 2015), the final number of samples was 280. A total of 201 people from Imam Khomeini Hospital and 79 people from Sablan Hospital were included in the study by stratified random sampling method (HF patients with different grades).

The inclusion criteria for the patients were age over 18 years, suffering from HF, absence of cognitive disorder (score less than 4 in the six-item cognitive disorder test), and no history of a coronary event in the last three months. The inclusion criteria for the caregivers included being the main caregiver of an HF patient (according to the patient) and age over 18 years. The exclusion criteria for patients included unwillingness to cooperate and having communication problems such as severe hearing loss, lack of hearing aids, and speech problems. The exclusion criteria for caregivers included unwillingness to participate in the study.

2.3. Data collection

Data were collected by the researcher through face-to-face interviews From November to December 2021. The data collection tool was a 3-part questionnaire: Sociodemographic information questionnaire:

It included the patient’s and caregiver’s age, gender, marital status, level of education, job, etc.

Caregiver Contribution to Self-Care of HF Index2 (CC-SCHF2): This tool was designed and organized by Vellone et al. in 2013 based on the HF self-care tool (Version 6.2) to investigate the effect of caregiver contribution to self-care of HF patients (Vellone et al., 2013). This questionnaire is a standard and self-reporting tool, in which the theoretical framework and situational theory of caregiver contribution to self-care of HF patients have been applied (Riegel, Lee, Dickson, & Carlson, 2009). It should be noted that to assist HF self-care, caregivers adapt their behaviors to the patient’s ability to perform self-care. In some cases, they only provide recommendations on effective self-care maintenance and management behaviors (e.g., weigh yourself daily, eat a low-salt diet, take medications, and call a doctor or nurse if symptoms occur). However, when patients are unable to perform self-care for any reason, caregivers replace HF patients in all stages of self-care (they weigh the patient, choose and prepare low-salt foods, give medications, and consult with the doctor/nurse if symptoms occur). It is believed that trust in caregivers contributes to their success in promoting HF self-care (Vellone et al., 2013). This tool contains 29 items that are arranged on a 5-point Likert scale (never, rarely, sometimes, often, and always). The scores in this questionnaire range from 29 to 145. A higher score indicates better self-care. This tool has three sub-scales, including Caregiver Contribution to Self-Care Maintenance (items 1–10), Caregiver Contribution to Self-Care Perception (items 11–21), and Caregiver Contribution to Self-Care Management (items 22–29). In this tool, a score of 70 or higher is considered favorable for self-care. In the study of Vellone et al., the total reliability of the tool with Cronbach’s alpha method was 0.94, and the reliability of the sub-scales of caregiver contribution to self-care, caregiver contribution to perception, and caregiver contribution to self-care management ranged from 0.7 to

0.85 (Vellone, Barbaranelli, et al., 2020). The items were first translated from English to Persian and then translated again from Persian to English by an expert who was fluent in the English language. The face validity and content validity of the instrument were evaluated by 10 faculty members using Waltz & Bausell's technique (Waltz & Bausell, 1981) (CVR = 0.74, CVI = 0.8). The reliability of the tool in this study was obtained to be 0.87 by Cronbach's alpha.

Minnesota Living with Heart Failure Questionnaire (MLHFQ): This questionnaire was designed by Thomas Rector (1984) to measure the effects of HF and its treatment on the quality of life (Garin et al., 2008). This tool contains 21 items that measure the physical, emotional-psychological, and socioeconomic limitations caused by HF over the past month. This tool has three sub-scales, including physical performance (items 1-7, 12, and 13), emotional-psychological performance (items 8, 9, 10, 11, 14, 15, 16), and socioeconomic performance (items 17, 18, 19, 20, 21).

This instrument is a 6-point Likert scale that is scored from zero to five, where zero indicates no restriction and five indicates the maximum restriction. The total score is between 0 and 105; the higher the scores obtained from this tool, the poorer the patient's quality of life. In the study of Evi et al., Cronbach's alpha coefficient was 0.89 for the overall score, 0.91 for the physical dimension, 0.89 for the emotional dimension, and 0.82 for the socioeconomic dimension (Uy et al., 2020). In Iran, the reliability indices of this tool using Cronbach's alpha were reported to be 0.87, 0.81, and 0.84 for the total score, physical dimension, and emotional dimension, respectively. The test-retest reliability in its subscales MLHFQ was ≥ 0.7 , which was acceptable (Rajati et al., 2016). In the present study, the reliability of the tool was obtained to be 0.86 by Cronbach's alpha.

2.4. Ethical considerations

The study protocol was approved by the Ethical Committee of University of Medical Sciences Approval documents were presented to the managers of hospitals in Ardabil city to obtain permission. Informed written consent was obtained from all patients and their caregivers. In addition, confidentiality and anonymity issues were detailed in the form. Participants were also informed that the researchers are committed to answering their questions and that their information was kept confidential. In addition, participants were aware that their participation in the study was voluntary and that they could leave the study at any time.

2.5. 3.Data analysis

The data were analyzed by SPSS software (26) using central and dispersion indices for quantitative variables and frequency for qualitative variables. Pearson correlation coefficient and linear regression analysis were used to investigate the relationship between caregiver contribution to self-care and patients' quality of life. Chi-square, independent t-test, and F-test were used to investigate the relationship between caregiver contribution to self-care management and patients' quality of life and their sociodemographic characteristics. The mean score of caregiver contribution to self-care and patients' quality of life and their components was compared with the criterion score. The following formula was used to calculate the criterion score: the maximum score - the minimum score \div two + the minimum score (Bazargan, Sarmad, & Hedjazi, 2005).

3. Results

3.1. Participants' characteristics

In this research, a total of 280 HF patients and caregivers were studied. The mean age of caregivers was 42.42 ± 11.14 , and the mean age of patients was 66.93 ± 7.95 years. Further, 76.4 % of patients and

76.8 % of caregivers were married. Most patients (41.4 %) were illiterate, and 34.6 % of caregivers had secondary education. Other demographic characteristics are presented in Table 1.

3.2. Scales' scores and correlation analysis

The mean score of caregiver contribution to self-care was 90.38 ± 34.15 , and 91.8 % of caregivers reported favorable contribution to self-care. Moreover, the mean scores of caregiver contribution to maintenance and caregiver contribution to self-care management were significantly higher than the criterion score ($p < 0.001$) Table 2.

The mean score of HF patients' quality of life (56.41 ± 13.54) was significantly higher than the criterion value (52.5) ($p < 0.001$). Further, the majority (56.1 %) of the patients had an unfavorable quality of life. Moreover, the mean score of the sub-scales of the quality of life was significantly higher than the criterion value ($p < 0.001$). Furthermore, the physical performance dimension (24.72 ± 6.84) of patients' quality of life was more unfavorable than other dimensions.

Table 1
Distribution of sociodemographic characteristics of patients and caregivers.

Caregiver Sociodemographic Characteristics			Patient Sociodemographic Characteristics		
Variable		(%)n	Variable		(%)n
Gender	female	(70.7) 198	Gender	female	(42.8) 135
	Male	(29.3) 82		Male	(51.8) 145
Marital status	Married	(76.8) 215	Marital status	Married	(76.4) 214
	Unmarried	(20.4) 57		Unmarried	(0.7) 2
	Divorced	(1.4) 4		Divorced	(2.1) 6
	Widower	(1.4) 4		Widower	(20.7) 58
Job	Unemployed	(32.5) 91	Unemployed		146 (52.1)
	Farmer	(41.4) 4		Farmer	(8.6) 24
	Workman	(4.6) 13		Workman	(3.9) 11
	Office worker	(16.8) 47		Office worker	(1.8) 5
Work situation during the week	freelance	(18.9) 53	freelance		(16.4) 46
	Other	(25.7) 72		Other	(17.1) 48
	Full-time	(37.5) 105		I	(30) 84
	Part-time	(26.6) 74		NYHA class II	(27.1) 76
Degree of kinship	none	(36.1) 101	III		(26.1) 73
	Child	(58.9) 165		IV	(16.8) 47
	Spouse	(17.5) 49		Type HF Systolic	(41.8) 117
	daughter-in-law	(9.3) 26		diastolic	(58.2) 163
smoking	Son-in-law	(0.7) 2	Hospitalized in the last 6 months	Yes	(31.1) 87
	sister	(6.4) 18		No	(68.6) 192
	Brother	(3.2) 9		Yes	(24.6) 74
Caregiver lives with the patient	Friend	(1.1) 3	No		(73.6) 206
	Neighbor	(0.4) 1			
	Other	(2.5) 7			
	Yes	(52.1) 146			
	No	(47.9) 134			

Table 2

The mean score of caregiver contribution to self-care, quality of life, and its sub-scales.

Caregiver Contribution	Mean		
	Mean (SD)	criterion score	p-value
Total Caregiver Contribution	15.34 ± 90.38	87	0.001
Self-Care Maintenance	6.38 ± 31.26	30	0.001
Self-Care management	7.15 ± 32.40	33	0.001
Self-Care Perception	26.7 ± 4.61	24	0.16
Quality of Life (Total)	56.41 ± 13.54	52.5	0.001
Physical health	24.72 ± 6.84	22.5	0.001
Emotional health	11.35 ± 4.40	12.5	0.001
Social health	20.33 ± 4.71	17.5	0.001

Pearson correlation test showed a significant correlation between caregiver contribution to self-care and patients' quality of life ($P = 0.01$). Among the dimensions of caregiver contribution to self-care, no significant and positive correlation was observed between caregiver contribution to self-care maintenance and patients' quality of life ($P < 0.06$) (Table 3).

The mean scores of HF patients' quality of life, type of failure, and history of recent hospitalization were significantly different ($P < 0.001$). Also, the mean score of female caregiver contribution to self-care (91.55 ± 15.2) was significantly higher than that of men ($P < 0.04$). The relationship between other sociodemographic characteristics and patients' quality of life and caregiver contribution to self-care is shown in Table 4.

Table 5. Prediction of patients' quality of life based on caregiver contribution to self-care and its components using multivariate linear regression analysis.

Stepwise multiple regression analysis was performed using quality of life as the dependent variable and caregiver contribution to self-care along with its dimensions and sociodemographic characteristics as independent variables. Before estimating the model, the normality of the dependent variable, patients' quality of life, was confirmed by the Kolmogorov Smirnov test ($P < 0.05$). The results of the regression model showed that caregiver contribution to self-care perception, caregiver contribution to self-care management, the caregiver's gender, the history of living with an HF patient, and the caregiver's marital status had a significant effect on the HF patients' quality of life. The step-by-step regression analysis showed that the caregiver contribution to self-care management was a stronger predictor of patients' quality of life than other variables, and self-care management explained 36 % of the changes in patients' quality of life.

4. Discussion

This study was conducted to determine the relationship between caregiver contribution to self-care and the quality of life of HF patients hospitalized in Ardabil hospitals. The majority of caregivers reported favorable caregiver contribution to self-care of HF patients, which is in line with the results of the study by Vellone et al. They also showed that the caregiver's higher self-confidence and more contribution were associated with the improved self-care of HF patients (Vellone, Biagioli, et al., 2020). It seems that the caregiver's readiness for care is one of the

Table 3

The relationship between caregiver contribution to self-care dimensions and quality of life.

Caregiver Contribution Areas	Quality of Life	
	Pearson correlation	P-Value
Self-Care Maintenance	0.01	0.06
Self-Care Perception	0.03	0.001
Self-Care management	0.06	0.001
Total Caregiver Contribution	0.02	0.01

effective factors involved in their contribution to self-care of HF patients. In the study of Bidwell et al., the caregiver contribution to self-care of HF patients was not reported favorably by the caregivers of these patients, as they reported low levels of HF maintenance and management behaviors (Bidwell et al., 2015), which is contrary to the results of the present study and seems to be due to the poor ability of the caregiver contribution to the diagnosis of the physical symptoms caused by HF.

The results also indicated that the majority of patients reported their quality of life was unfavorable, which is consistent with the results of Assen Seid's study, in which the majority of patients had a poor quality of life (Seid, 2020). However, in the study of Azizi et al., the quality of life of patients was much better one month after discharge from the hospital than during admission and discharge (Faghhih, 2019). It seems that behavioral factors such as the level of self-care, social factors such as the patient's residence, and clinical factors such as HF class are effective factors in the quality of life of HF patients (Eydi, Najafi Ghezeljeh, & Haghani, 2020; Seid, 2020).

In the present study, the physical performance dimension of patients' quality of life was more unfavorable than other dimensions. In the study of Jovanich, the patients had a poorer quality of life in the physical dimension and had obtained the best grades in the emotional dimension and social performance (Jovanić, Zdravković, Stanisavljević, & Jović Vraneš, 2018). However, in the study of Mansouri et al., the three dimensions of quality of life (physical, emotional-psychological, and socio-economic) were reported to be favorable (Mansouri, Baraz, Elahi, Malehi, & Saberipour, 2019). It seems that the physical changes caused by HF, such as shortness of breath, fatigue, and edema, have a significant effect on the physical dimension of the quality of life of HF patients.

The results also showed that contribution to self-care was significantly more favorable in female than in male caregivers. In Bidwell's study, the female caregiver contribution was also an important determining factor in the better self-care maintenance of HF patients (Bidwell et al., 2015). Yet, in Bertog's study, men scored higher in caregiver contribution to self-care (Bertogg & Strauss, 2020). The additional emotional support from female caregivers may encourage patients to engage in better self-care or to protect themselves against some aspects of HF (such as depression) that are associated with lower levels of self-care.

The caregivers who lived with the patients had a more favorable contribution to self-care, and the patient's quality of life was also better. Chen et al. reported that co-residence with the recipient of care was associated with more contribution to self-care (Cohen, Cook, Sando, Brown, & Longo, 2017). Co-residence of the caregiver with the patient allowed the caregiver to devote more hours during the week to self-care. In the study of Komgai et al., unemployed caregivers who lived with the patient had the least contribution to self-care (Kumagai, 2017). This difference can be caused by the effect of unemployment pressure on the caregiver's behaviors. In the present study, most of the caregivers were employed.

The married caregivers had better conditions than the single ones, which is in line with the findings of Cohen et al.'s study (Cohen et al., 2017). but contrary to the results of Bidwell et al.'s study because although most of the caregivers were married, they reported low contribution to self-care (Bidwell et al., 2015). It seems that values, beliefs, and norms affect the married caregivers' health behaviors and contribution to self-care.

Quality of life was worse in patients with systolic HF than in those with diastolic HF. Consistent with the results of the present study, Chen et al. reported patients with systolic HF had a poorer quality of life (Chen et al., 2019). In Chandra's trial, the quality of life before intervention was more unfavorable in diastolic HF patients than in systolic HF patients (Chandra et al., 2019). These differences in quality of life can be mainly due to the difference in the functional status of the heart and the burden of disease symptoms between the two groups.

Moreover, the results indicated a significant correlation between

Table 4

Relationship between the quality of life and caregiver contribution to self-care and sociodemographic characteristics of the participants.

Relationship between the quality of life and sociodemographic characteristics of the patients				Relationship between the caregiver contribution and sociodemographic characteristics of the caregivers			
Variable	group	Quality of Life Mean (SD)	P-value	Variable	group	Caregiver Contribution Mean (SD)	P-value
Gender	Female	12.81 ± 93.84	0.261	Gender	Female	15.2 ± 91.55	0.04
	Male	14.23 ± 76.05			Male	15.43 ± 87.58	
Marital status	Married	13.71 ± 54.81	0.001	Education	illiterate	13.08 ± 85.82	0.001
	Unmarried	0.57 ± 45.66			Elementary school	16.28 ± 86.11	
	Divorced	6.18 ± 61.5			Middle school	13.4 ± 87.98	
Education	Widower	11.87 ± 62.31	0.001	High school	13.95 ± 90.28	0.001	
	illiterate	12.07 ± 61.36		Bachelor's degree	16.94 ± 94.98		
	Elementary school	13.02 ± 55.05		Masters	15.69 ± 109.55		
	Middle school	12.73 ± 51.68		Unemployed	13.33 ± 90.43		
	High school	14.6 ± 50.64		Farmer	8.81 ± 75.5		
	Bachelor's degree	15.79 ± 48		Workman	12.55 ± 77.53		
Job	Masters	2.12 ± 53.5	0.001	Office worker	18.19 ± 96.57	0.001	
	Unemployed	13.24 ± 59.99		freelance	13.63 ± 87.96		
	Farmer	13.26 ± 55.54		Other	15.7 ± 91.22		
	workman	9.13 ± 54.18		Full-time	15.67 ± 88.09		
	Office worker	14.28 ± 60.8		Part-time	17.45 ± 93.82		
NYHA class	freelance	13.27 ± 49.39	0.001	none	12.81 ± 90.25	0.05	
	Other	11.99 ± 52.77		Marital status	Unmarried		15.91 ± 90.03
	I	13.29 ± 49.30		Married	13.68 ± 91.92		
	II	10.08 ± 52.98		Caregiver lives with the patient	Yes		14.08 ± 93.84
smoking	III	12.49 ± 61.65	0.001	No	15.81 ± 86.64	0.001	
	VI	11.08 ± 66.63		0.42			
	Yes	14.03 ± 78.22					
No	13.51 ± 86.64						

Table 5

Prediction of patients' quality of life based on caregiver contribution to self-care and its components using multivariate linear regression analysis.

predictor variables	R	R ²	F	Non-std. Coefficient β	SE	St. Coefficient β	T	P
Total Caregiver Contribution to Self-Care of HF	0.02	0.0004	0.12	54.78	4.86	0.1	11.26	0.01
Caregiver Contribution to Self-Care Maintenance	0.01	0.0001	0.04	55.56	4.06	0.01	13.68	0.06
Caregiver Contribution to Self-Care Perception	0.03	0.0009	0.28	54.45	3.76	0.032	14.46	0.001
Caregiver Contribution to Self-Care management	0.06	0.0036	0.01	55.94	4.77	0.006	11.72	0.001
Caregiver sex	0.11	0.014	3.91	95.52	2.75	0.1	34.7	0.001
Caregiver lives with the patient	0.23	0.055	16.19	101.05	2.79	0.2	36.11	0.001
Caregiver marital status	0.02	0.0004	0.11	89.67	2.28	0.02	39.2	0.001

caregiver contribution to self-care and patients' quality of life. In agreement with the results of the present study, Hua et al. found the caregiver contribution to self-care model significantly increased the HF patients' physical and mental quality of life (Hua, Huang, Su, Bu, & Tao, 2017). In the study of Deek et al., no difference was observed between the physical dimension of quality of life and the emotional-psychological dimension of the intervention group compared to the control group (Deek et al., 2017). It seems that despite the obvious relationship between self-care and positive health outcomes, other variables such as patients' lack of attention to the self-care recommendations of caregivers, lack of motivation, lack of ability, or insufficient support for HF patients are also involved. This difference can also be due to the limitations of the self-reporting method so that the results of quality of life are poor from the patients' point of view, and the results of caregiver contribution to self-care have been reported to be higher from the caregivers' point of view.

The results of multiple linear regression showed that caregiver contribution to self-care management was a stronger predictor than other variables in patients' quality of life and explained most changes in patients' quality of life. In line with the results of the present study, Srisuk et al. showed that the HF educational program in the intervention group compared to the control group improved the knowledge and perceived control over caregiver contribution to self-care management and enhanced the quality of life (Srisuk, Cameron, Ski, & Thompson, 2017). Furthermore, in Vellone's study, greater readiness for caregiver

contribution to self-care was associated with higher self-confidence of the caregiver, and high self-confidence of the caregiver was associated with their greater participation in self-care maintenance and management (Vellone, Biagioli, et al., 2020). In Iovino's study, caregivers reported an insufficient level of participation in self-care management behaviors (Iovino et al., 2021). Regarding caregiver contribution to self-care management of HF, it can be argued that the caregiver's level of knowledge and skill in HF self-care helps the caregivers' dominance and increases their expertise in and control of stressful situations (Browne, Macdonald, May, Macleod, & Mair, 2014).

5. Limitations

Using the self-report method and not having enough time to fill out the questionnaire was one of the limitations of the research. Also, HF patients and caregivers who were more dissatisfied were more likely to not give appropriate answers to the Minnesota Quality of Life Questionnaire and Caregiver Contribution to Self-Care of HF. Therefore, it was tried to control its effects to a great extent by choosing the right time, giving enough time, explaining the importance of the study objectives and emphasizing the confidentiality of the questionnaires. Finally, the other limitations of this study include its cross-sectional design, which prevents causal conclusions.

6. Conclusion

The findings showed that there was a relationship between and Caregiver Contribution to Self-Care and the quality of life of heart failure patients. Caregiver Contribution to self-care management of patients, caregiver's gender and marital status and co-residence of the caregiver with the patient had the greatest impact on the quality of life of heart failure patients. Therefore, in order to improve the Caregiver Contribution to self-care and the quality of life of these patients, it is better to use female caregivers who are married and live together with the patient.

Author contributions

Study Design: Parisa Karimi, Mohammad Ali Mohammad, Naser Mozaffari; Data collection: Parisa Karimi, Data Analysis: Naser Mozaffari, Mohammad Ali Mohammad, and Manuscript Preparation: Naser Mozaffari, Mohammad Ali Mohammadi and Parisa Karimi. The author (s) read and approved the final manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

All authors thank all the patients and caregiver contribution to self-care for their heartfelt collaboration.

Funding

Not funding.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations Ethics approval and consent to participate

The study protocol was approved by the Ethical Committee of Ardabil University of Medical Sciences (IR.ARUMS.REC.1400.164). Approval documents were presented to the managers of hospitals in Ardabil city to obtain permission. Informed written consent was obtained from all patients and their caregivers. In addition, confidentiality and anonymity issues were detailed in the form.

References

- Ausili, D., Rebora, P., Di Mauro, S., Riegel, B., Valsecchi, M. G., Paturzo, M., ... Vellone, E. (2016). Clinical and socio-demographic determinants of self-care behaviours in patients with heart failure and diabetes mellitus: A multicentre cross-sectional study. *International Journal of Nursing Studies*, *63*, 18–27.
- Bazargan, A., Sarmad, Z., & Hedjazi, A. (2005). *Research Methods in Behavioural Sciences* (11th ed.). Teharn: Agah Pub.
- Bertogg, A., & Strauss, S. (2020). Spousal care-giving arrangements in Europe. The role of gender, socio-economic status and the welfare state. *Ageing and Society*, *40*(4), 735–758.
- Bidwell, J. T., Vellone, E., Lyons, K. S., D'Agostino, F., Riegel, B., Juárez-Vela, R., ... Lee, C. S. (2015). Determinants of heart failure self-care maintenance and management in patients and caregivers: A dyadic analysis. *Research in Nursing & Health*, *38*(5), 392–402.
- Browne, S., Macdonald, S., May, C. R., Macleod, U., & Mair, F. S. (2014). Patient, carer and professional perspectives on barriers and facilitators to quality care in advanced heart failure. *PLoS One*, *9*(3), e93288.
- Calixtre, E. M., Prado, F. A. A., de Almeida, E., Fontes, G. M., da Silva, K. F. M., Gemme, C. N., & Rodrigues, S. R. (2016). Reabilitação cardíaca fase III associada à

- VNI no tratamento da ICC: Um estudo de caso. *Revista Saúde e Meio Ambiente*, *3*(2), 62–73.
- Chandra, A., Vaduganathan, M., Lewis, E. F., Claggett, B. L., Rizkala, A. R., Wang, W., ... Ge, J. (2019). Health-related quality of life in heart failure with preserved ejection fraction: The PARAGON-HF trial. *JACC: Heart Failure*, *7*(10), 862–874.
- Chen, X., Xin, Y., Hu, W., Zhao, Y., Zhang, Z., & Zhou, Y. (2019). Quality of life and outcomes in heart failure patients with ejection fractions in different ranges. *PLoS One*, *14*(6), e0218983.
- Cocchieri, A., Riegel, B., D'Agostino, F., Rocco, G., Fida, R., Alvaro, R., & Vellone, E. (2015). Describing self-care in Italian adults with heart failure and identifying determinants of poor self-care. *European Journal of Cardiovascular Nursing*, *14*(2), 126–136.
- Cohen, S. A., Cook, S. K., Sando, T. A., Brown, M. J., & Longo, D. R. (2017). Socioeconomic and demographic disparities in caregiving intensity and quality of life in informal caregivers: A first look at the National Study of Caregiving. *Journal of Gerontological Nursing*, *43*(6), 17–24.
- Deek, H., Chang, S., Newton, P. J., Noureddine, S., Inglis, S. C., Al Arab, G., ... Macdonald, P. S. (2017). An evaluation of involving family caregivers in the self-care of heart failure patients on hospital readmission: Randomised controlled trial (the FAMILY study). *International Journal of Nursing Studies*, *75*, 101–111.
- Eydi, M., Najafi Ghezleh, T., & Haghani, S. (2020). The prediction of self-care behaviors and quality of life based on disease perception in patients with heart failure. *Iran Journal of Nursing*, *33*(124), 13–26.
- Faghih, A. A. S. (2019). Comparison of quality of life in patients with acute myocardial infarction, heart failure and normal. *Scientific magazine-Research of Sabzevar University of Medical Sciences*, *26*(5), 93–598.
- Garin, O., Soriano, N., Ribera, A., Ferrer, M., Pont, À., Alonso, J., & Permanyer, G. (2008). Validación de la versión española del Minnesota Living with Heart Failure Questionnaire. *Revista Española de Cardiología*, *61*(3), 251–259.
- Giles, L., Freeman, C., Field, P., Sörstadius, E., & Kartman, B. (2019). Humanistic burden and economic impact of heart failure—a systematic review of the literature. *F1000Research*, *8*, 859.
- Group, W. (1993). Study protocol for the World Health Organization project to develop a Quality of Life assessment instrument (WHOQOL). *Quality of Life Research*, *2*, 153–159.
- Harkness, K., Spaling, M. A., Currie, K., Strachan, P. H., & Clark, A. M. (2015). A systematic review of patient heart failure self-care strategies. *The Journal of Cardiovascular Nursing*, *30*(2), 121–135.
- Herrmann, J. (2022). *Cardio-Oncology Practice Manual: A Companion to Braunwald's Heart Disease E-Book*. Elsevier Health Sciences.
- Hua, C., Huang, Y., Su, Y., Bu, J., & Tao, H. (2017). Collaborative care model improves self-care ability, quality of life and cardiac function of patients with chronic heart failure. *Brazilian Journal of Medical and Biological Research*, *50*.
- Iovino, P., Lyons, K. S., De Maria, M., Vellone, E., Ausili, D., Lee, C. S., ... Matarese, M. (2021). Patient and caregiver contributions to self-care in multiple chronic conditions: A multilevel modelling analysis. *International Journal of Nursing Studies*, *116*, Article 103574.
- Jaarsma, T., Hill, L., Bayes-Genis, A., La Rocca, H. P. B., Castiello, T., Čelutkienė, J., ... Riegel, B. (2021). Self-care of heart failure patients: Practical management recommendations from the Heart Failure Association of the European Society of Cardiology. *European Journal of Heart Failure*, *23*(1), 157–174.
- James, S. L., Abate, D., Abate, K. H., Abay, S. M., Abbafati, C., Abbasi, N., ... Abdelalim, A. (2018). Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet*, *392*(10159), 1789–1858.
- Jovanić, M., Zdravković, M., Stanislavljević, D., & Jović Vraneš, A. (2018). Exploring the importance of health literacy for the quality of life in patients with heart failure. *International Journal of Environmental Research and Public Health*, *15*(8), 1761.
- Kumagai, N. (2017). Distinct impacts of high intensity caregiving on caregivers' mental health and continuation of caregiving. *Health Economics Review*, *7*(1), 1–14.
- Lee Geraldine, A. Coronary artery disease and quality of life: Center for International Rehabilitation Research Information and Exchange (CIRRRIE); 2010 [cited 2016 7/8].
- Mansouri, A., Baraz, S., Elahi, N., Malehi, A. S., & Saberipour, B. (2019). The effect of an educational program based on Roy's adaptation model on the quality of life of patients suffering from heart failure: A clinical trial study. *Japan Journal of Nursing Science*, *16*(4), 459–467.
- Moshki, M., Khajavi, A., Hashemizadeh, H., Vakilian, F., Minaee, S., & Martin, S. S. (2019). Dark or bright half of the moon: A qualitative study exploring the experience of Iranian heart failure patients regarding their quality of life. *Open Access Macedonian Journal of Medical Sciences*, *7*(5), 824.
- Nadruz, W. (2015). Myocardial remodeling in hypertension. *Journal of Human Hypertension*, *29*(1), 1–6.
- Ng, A. Y. M., & Wong, F. K. Y. (2018). Effects of a home-based palliative heart failure program on quality of life, symptom burden, satisfaction and caregiver burden: A randomized controlled trial. *Journal of Pain and Symptom Management*, *55*(1), 1–11.
- Ponikowski, P., Voors, A. A., Anker, S. D., Bueno, H., Cleland, J. G., Coats, A. J., Jankowska, E. A., & ESC Scientific Document Group. (2016). ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *European Heart Journal*, *37*(27), 2129–2200.
- Rajati, F., Feizi, A., Tavakol, K., Mostafavi, F., Sadeghi, M., & Sharifirad, G. (2016). Comparative evaluation of health-related quality of life questionnaires in patients with heart failure undergoing cardiac rehabilitation: A psychometric study. *Archives of Physical Medicine and Rehabilitation*, *97*(11), 1953–1962.

- Riegel, B., Dickson, V. V., & Vellone, E. (2022). The situation-specific theory of heart failure self-care: An update on the problem, person, and environmental factors influencing heart failure self-care. *The Journal of Cardiovascular Nursing*, *10*, 1097.
- Riegel, B., Lee, C. S., Dickson, V. V., & Carlson, B. (2009). An update on the self-care of heart failure index. *The Journal of Cardiovascular Nursing*, *24*(6), 485.
- Santesmases-Masana, R., González-de Paz, L., Hernández-Martínez-Esparza, E., Kostov, B., & Navarro-Rubio, M. D. (2019). Self-care practices of primary Health care patients diagnosed with chronic heart failure: A cross-sectional survey. *International Journal of Environmental Research and Public Health*, *16*(9), 1625.
- Savarese, G., Becher, P. M., Lund, L. H., Seferovic, P., Rosano, G., & Coats, A. J. (2022). Global burden of heart failure: A comprehensive and updated review of epidemiology. *Cardiovascular Research*.
- Seid, M. A. (2020). Health-related quality of life and extent of self-care practice among heart failure patients in Ethiopia. *Health and Quality of Life Outcomes*, *18*(1), 1–7.
- Srisuk, N., Cameron, J., Ski, C. F., & Thompson, D. R. (2017). Randomized controlled trial of family-based education for patients with heart failure and their carers. *Journal of Advanced Nursing*, *73*(4), 857–870.
- Uy, V., Hays, R. D., Xu, J. J., Fayers, P. M., Auerbach, A. D., Black, J. T., ... Ong, M. K. (2020). Do the unlabeled response categories of the Minnesota Living with Heart Failure Questionnaire satisfy the monotonicity assumption of simple-summed scoring? *Quality of Life Research*, *29*(5), 1349–1360.
- Vellone, E., Barbaranelli, C., Pucciarelli, G., Zeffiro, V., Alvaro, R., & Riegel, B. (2020). Validity and reliability of the caregiver contribution to self-care of heart failure index version 2. *The Journal of Cardiovascular Nursing*, *35*(3), 280–290.
- Vellone, E., Biagioli, V., Durante, A., Buck, H. G., Iovino, P., Tomietto, M., ... Petruzzo, A. (2020). The influence of caregiver preparedness on caregiver contributions to self-care in heart failure and the mediating role of caregiver confidence. *The Journal of Cardiovascular Nursing*, *35*(3), 243–252.
- Vellone, E., Riegel, B., Cocchieri, A., Barbaranelli, C., D'Agostino, F., Glaser, D., ... Alvaro, R. (2013). Validity and reliability of the caregiver contribution to self-care of heart failure index. *The Journal of Cardiovascular Nursing*, *28*(3), 245–255.
- Waltz, C. F., & Bausell, R. B. (1981). *Nursing research: Design, statistics, and computer analysis*. FA Davis company.