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The effect of a caring program based on the Pender's health promotion model on caregiver burden in family caregivers of patients with chronic heart failure: A quasi-experimental study

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Abstract:

BACKGROUND: The Pender's Health Promotion Model is a comprehensive solution to improve health and reduce the risk of chronic conditions. This study aimed to determine the effect of a care program based on the Pender's Health Promotion Model on the caregiving burden of family caregivers of patients with chronic heart failure.

METHODS: This semi-experimental study with a control group was conducted at the Imam Khomeini Heart Clinic in Saqqez in 2022-2023. In this study, 90 family caregivers from patients with chronic heart failure were randomized to intervention and control groups. Data were collected through a demographic information questionnaire and the Caregiver Burden Inventory (CBI) prior to and 50 days after the intervention. Data were analyzed using independent *t*-test, Chi-square, and paired *t*-test in SPSS V 25. A significance level of 5% was considered.

RESULTS: The results of this study indicated that the control and intervention groups were homogeneous in terms of demographic characteristics ($P = 0.643$). The findings also showed a statistically significant difference in the mean scores of all dimensions of caregiving burden between the two groups after the intervention, such that the overall mean score of caregiving burden in the intervention group had a significant reduction ($P < 0.0001$).

CONCLUSION: The present study demonstrated that a care program based on the Pender's Health Promotion Model can reduce the caregiving burden of family caregivers of patients suffering from chronic heart failure. Additionally based on health policies, this program can play an effective role in improving the quality of life of families with chronic heart failure patients and reducing their medical costs as a comprehensive solution for improving health and reducing the risk of chronic diseases.

Keywords:

Caregiver Burden, Health promotion, heart failure

Introduction

Cardiovascular disease (CVD) is the most common cause of death in the world.^[1] In Iran, the mortality rate due to CVD is higher than global statistics, with 33 to 38 percent of deaths resulting from

these diseases.^[2] In Iran, the increasing epidemic of CVDs may be attributed to social, economic, and cultural changes, alterations in diet, insufficient physical activity, industrialization and urbanization, increased hope for life, increased metabolic and physical risk factors, limited and

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cost-effective access to primary care and treatment, and inadequate adaptation due to economic and psychological challenges.^[3] Specifically, CVDs that cause damage to the coronary arteries can be a contributing factor in the development of chronic heart failure (CHF).^[4]

Heart failure (HF) is a complex clinical syndrome^[5] and one of the most common and debilitating progressive chronic cardiovascular disorders, representing the end-stage of most heart disorders.^[6] Definitions of end-stage heart failure (ESHF) may vary, but here it refers to patients in functional class 3 to 4, classified according to the New York Heart Association.^[7] Despite important advances in the treatment of cardiac patients over the past decades, the prevalence of the HF is rising. Approximately 15 million people worldwide are affected by this disease, including about 6 million in the United States alone.^[8,9] The impact of HF is not just on patients, but also on their families.^[10] Chronic disease and disability disrupt the life process and related adaptations, and due to the impact of the disease on the patient and family, family dynamics often change.^[11]

Patients with HF often experience mild to severe disruptions in their daily lives due to fatigue, shortness of breath, and other cardiac symptoms, and often require daily support and assistance. Therefore, caregivers play a crucial role as primary supporters, being individuals who have the most involvement in caring for and assisting patients during a period of illness and chronic disease management, and are often referred to as hidden patients themselves.^[12,13] Although caregivers play an important role in caring for patients with HF, they are often neglected.^[14,15] Research has shown that routine care and surveillance of patients with HF with their caregivers can improve their quality of life, reduce hospitalizations, and reduce mortality rates.^[16-18] The chronic, progressive, and disabling nature of HF, and the fact that these patients are often elderly, means that caregivers are often required to provide very demanding care for their loved ones, which often leads to a significant burden on caregivers for a decade or more.^[10,19,20] Family caregivers of patients with HF are involved in many health care tasks such as medication management, monitoring for warning signs, coordinating care and patient transfer, providing emotional and psychological support, promoting self-care, and supporting decision-making.^[21,22] It is evident that caring for and supporting patients with HF requires a high level of effort and energy from caregivers and can create a high caregiving burden for them.^[20]

The term of caregiver burden (CB) is used to describe the physical, emotional, financial, and social challenges of caregiving^[23] and is generally defined as the negative effect of life with these patients.^[24] Care for patients with chronic conditions such as HF is also accompanied by a

variety of issues for caregivers, such as fatigue, anxiety, and depression.^[25] The level of this burden depends on factors such as the age and gender of the caregiver, the quality of their previous relationship with the patient, their assessment of the situation, their perception of the disease, and the coping strategies they use. Additionally, factors such as the nature of the patient's problems, emotional, practical, and financial support available to the family, and their knowledge of caring for their loved one can also affect the CB experienced.^[25-27] Caring for a HF patient is a very tough job. Studies have shown that caregivers of these patients experience a reduction in quality of life, and caring for the patient has had a negative impact on their physical and emotional health, social life, economic status, and employment.^[16,28-30] Anxiety and depression are a psychological burden on caregivers of patients with HF and can be exacerbated by unanticipated hospitalizations, isolation, and lack of professional support.^[21,28,31-33] In addition, a study has shown that the probability of the caregiver dying or being hospitalized after the patient's death increases.^[34] As the disease progresses, caregivers must devote more time to caring for the patient, and their tasks may become more complex, which in turn may increase the caregiver's anxiety and worsen their quality of life related to their health.^[35]

The topic of health promotion, lifestyle change, and improvement is one of the important issues that the global community has undertaken extensive efforts and has invested significant costs to achieve. Health promotion is the science and art of helping individuals reach a level of maximum health through a combination of efforts that increase awareness, change behavior, and create a supportive environment for healthy behaviors.^[36] One comprehensive and predictive model that has been used to study health-promoting behaviors and provides a theoretical framework for identifying factors that affect these behaviors is the Pender's Health Promotion Model (HPM). The HPM is one of the comprehensive models used to perform health-promoting behaviors and is recognized as a framework for explaining healthy lifestyles and health-promoting behaviors.^[37-39] The positive effect of HPM on many acute and chronic diseases such as chronic kidney failure,^[40] diabetes,^[41] hypertension,^[42] AIDS,^[43] and myocardial infarction^[44] has been proven.

Karataş and colleagues conducted a study to determine the effect of a nurse-led program based on the HPM on the exercise behavior of patients with coronary artery disease. The findings showed that the nurse-led program increased exercise behavior in the intervention group.^[45] Additionally, in a study by Faroughi and colleagues, the results showed that an educational intervention based on the HPM led to increased adherence to treatment in patients with coronary artery disease.^[46]

Given the importance of caring for patients with HF and the innovation of using a nursing model on the caregivers of patients, this study aimed to determine the effect of caring program based on HPM on the caregiving burden of family caregivers of patients with CHF.

Materials and Methods

Study design and setting

This study was an experimental pretest-posttest design with a control group, conducted in the Shohada heart Clinic of Imam Khomeini Hospital in Saghez, Kurdistan University of Medical Sciences, in 2022-2023.

Study participants and sampling

The study population consisted of 90 patients with CHF referred to the Shohada heart Clinic of Imam Khomeini Hospital in Saghez. Inclusion criteria for patients were a definitive diagnosis of CHF by a physician, class III and IV HF, and a minimum of 6 months since the diagnosis of the disease. Inclusion criteria for caregivers were age between 18 and 65 years, ability to read and write, willingness to participate in the study, ability to speak and communicate in Persian or Kurdish, being the primary caregiver of the patient, having at least six months of experience in caring for the patient, and having a first-degree family member (father, mother, sister, brother, and child) as the caregiver. Exclusion criteria for both groups were non-cooperation of caregivers until the end of the intervention, absence from one educational session, incomplete questionnaires, and patient death or transfer to other care facilities. The sample size was calculated based on the following

formula:
$$n = \frac{(S_1^2 + S_2^2)^2 * \left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2}{(x_1 - x_2)^2}$$
. A confidence

level of 95% and an error of 0.05 were considered to calculate the sample size. Based on previous studies, a minimum sample size of 76 participants was estimated. Considering necessary follow-ups and potential sample loss due to time constraints, a 20% sample loss was also accounted for. As a result, a final sample size of 90 participants (45 in the intervention group and 45 in the control group) was estimated. Convenience sampling was used to select participants, and block randomization was employed to allocate them to the intervention and control groups. Blocks were designed based on the variable AABB pattern to prevent information distortion. To prevent contamination, the designed care program for the intervention group was provided to them in a separate classroom. No sample loss occurred in either group.

Data collection tool and technique

Data collection in this study was done using a demographic information questionnaire and the

Caregiver Burden Inventory (CBI) developed by Novak and Guest. The demographic information questionnaire was created by the researcher based on a similar form found in the literature and included demographic characteristics. The CBI questionnaire consists of 24 items and was developed by Novak and Guest in 1989 to measure objective and subjective CB. The questionnaire has five subscales, including time-dependence burden, developmental burden, physical burden, social burden, and emotional burden. In Novak and Guest's^[47] study, the validity and reliability of the CBI questionnaire were confirmed.

In the intervention group, a health promotion program based on the HPM was implemented in six 45-minute sessions. In the first session, after the initial assessment, the researcher reviewed the goals that the caregiver needed to achieve with the help of the patient and determined the desired outcomes for each of them. The intervention group received group and individual training. The first three sessions were allocated to individual training, which focused on the dimensions of the HPM. Patient needs were assessed initially, and group sessions were organized based on this assessment. In the individual phase, caregivers were divided into five groups of nine people, and sessions were held face-to-face with group discussion and exchange of experiences based on the designed care program. In the group phase, all members of the intervention group used various methods, including lectures, question and answer, group discussion, PowerPoint presentations, and instructional booklets, and the main focus was on how to care for patients based on the domains of the HPM, including nutrition, physical activity, health responsibility, stress management, interpersonal relationships, and spiritual growth. Patients were also asked to go through the behavioral modification program described at the end of each session. The content has been evaluated and approved by two faculty members (one nursing faculty member and one cardiology specialist) quantitatively and qualitatively. In Table 1, objectives, content, and implementation methods for all sessions are outlined.

After the six sessions, the researcher asked questions about the educational content of the samples on a bi-weekly basis. If they forgot the educational content, they were advised to review the instructional booklet and contact the researcher if they had any problems. After 50 days, the samples returned to the treatment centers on the dates coordinated with the researcher, and the CBI questionnaire was completed again by the intervention group, and their CB was examined. In the control group, routine and common education was provided by the treating physician and personnel at the clinic, and the control group did not receive any education from the research team. After 50 days, the control group also

Table 1: Objectives, Methods and content of educational sessions

Sessions	Subconcepts	Objectives	Contents	Methods
First (Individual)	Individual characteristics and experiences	<ul style="list-style-type: none"> • Introduction of patient and caregiver by the caregiver • Explanation of research objectives • Clarification of the desired outcome for the caregiver • Introduction of the caregiver's role in ensuring patient health • Discussion of previous related behaviors and personal factors 	<ul style="list-style-type: none"> • Research objectives • Importance of proper care for patients with HF • Evaluation of previous caregiver behaviors (Prior related behavior) • Personal factors influencing patient care (Personal factors) 	Face-to-face, group discussion, exchange of caregivers' experiences
Second (Individual)	Behavior-specific cognitions and affect	<ul style="list-style-type: none"> • Discussion of perceived benefits of behavior, perceived barriers to action, and perceived self-efficacy • Discussion of attitudes related to behavior, interpersonal influencers, and situational influencers 	<ul style="list-style-type: none"> • Focus on benefits of proper patient care (Perceived benefits of action) • Perceived barriers in care (such as inhibitors and costs) • Self-efficacy (use of caregiver capabilities to meet patient needs) • Attitudes related to behavior (judgment of caregiver in relation to care) • Interpersonal influencers (such as seeking support from family, friends, and insurance support system) • Situational influencers (perception and understanding of any situation) 	Face-to-face, group discussion, exchange of caregivers' experiences
Third (Individual)	Behavioral outcomes	<ul style="list-style-type: none"> • Discussion of commitment to action planning and competing preferences and urgent demands 	<ul style="list-style-type: none"> • Commitment to action planning (assessment of patient commitment to patient care) • Competing preferences and urgent demands (environmental dependencies such as work or family caregiving responsibilities) 	Face-to-face, group discussion, exchange of caregivers' experiences
Fourth (Group)	Responsibility for health, Interpersonal support	<ul style="list-style-type: none"> • Improvement of knowledge and skills of participants regarding the disease • Strengthening realistic expectations regarding disease prevention and treatment 	<ul style="list-style-type: none"> • Role of caregiver and family in disease control and patient care • Family challenges in patient care • Strategies for enhancing caregiver support • Nature of the disease 	Lecture, question and answer, group discussion, PowerPoint presentation, booklet
Fifth (Group)	Stress management and Self-actualization	<ul style="list-style-type: none"> • Improvement of knowledge and skills of participants regarding drug treatment • Increased readiness of caregiver in patient care • Improvement of confidence and control of caregiver in patient care • Improvement of communication and adaptation skills between caregiver and patient in patient care • Reduction of stress and pressure caused by caregiving 	<ul style="list-style-type: none"> • Importance and role of medications in preventing disease recurrence • Familiarity with medications, side effects, and related care • Adaptation skills, stress management skills, effective communication with the patient • Control of HF symptoms and signs, including shortness of breath, edema, weight, blood pressure, etc. 	Lecture, question and answer, group discussion, PowerPoint presentation, booklet
Sixth (Group)	Nutrition, Exercise and Self-actualization	<ul style="list-style-type: none"> • Improvement of knowledge and skills of participants regarding drug treatment • Increased readiness of caregiver in patient care • Improvement of confidence and control of caregiver in patient care • Improvement of communication and adaptation skills between caregiver and patient in patient care • Reduction of stress and pressure caused by caregiving 	<ul style="list-style-type: none"> • Control of patient diet • Control of fluid intake • How to exercise and be active in patients • Attention to the mental health of patients • Palliative care and family caregivers • Daily life with HF 	Lecture, question and answer, group discussion, PowerPoint presentation, booklet

returned to the clinic and completed the forms, and to comply with ethical principles, the educational content was provided in the form of an instructional booklet at the end of the study for the control group.

SPSS version 25 was used for data analysis. First, the normality of the data was checked using the Kolmogorov-Smirnov test, and then independent *t*-test, Chi-square test, and paired *t*-test were used to determine

the desired relationships. A significance level of less than 0.05 was considered.

Ethical consideration

The study obtained the ethics code under no: IR.MUK.REC.1401.151 from Kurdistan University of Medical Sciences. Furthermore, the following ethical consideration was taken in the process of study. These considerations are signing an informed consent form by each participant before participating in the study, explaining the purpose of the study to the study participants before they participate in the study, and ensuring participants about confidentiality and privacy.

Findings

A total of 90 caregivers of patients with HF participated in the present study and were randomly assigned to two intervention and control groups (45 participants in each group). The individual characteristics of the caregivers are presented in Table 1. Based on this table, no statistically significant differences were observed in the individual characteristics of the participants between the intervention and control groups. In Table 2, the demographic characteristics of the caregivers in the intervention and control groups are specified.

The results of the independent *t*-test showed no statistically significant difference in the mean score of CB before the intervention between the two groups. However, the mean scores of overall CB between the two groups were statistically significantly different immediately and 50 days after the intervention ($P = 0.0001$). In other words, the mean score of CB in the intervention group was significantly reduced compared to the control group after the intervention. In Table 3, the mean of CB score for the intervention and control groups before and after the intervention is mentioned.

Furthermore, the analysis of data related to the dimensions of CB showed that the mean scores of CB dimensions in the intervention group were statistically significantly different in all dimensions ($P = 0.0001$), but this difference was not statistically significant in the control group ($P = 0.751$). Table 4 shows the average scores of caregivers in CB dimensions for the intervention and control groups.

Discussion

The present study was conducted with the aim of determining the effect of the care program based on HPM on the CB of family caregivers of patients with CHF referred to the heart clinic of Imam Khomeini Hospital in Saghez in 2022–2023. The results of the study showed that the care program based on HPM significantly reduced the CB of patients with CHF. Li-Chi Chiang *et al.*^[48] (2012)

demonstrated that telehealth care is effective in reducing the CB of patients with CHF in all dimensions of CB. Among the reasons that make telehealth care effective are easier access to physicians and the most specialized medical services, reduction in medical errors, increased patient and caregiver satisfaction, and reduced healthcare costs, all of which were to some extent observed in the implementation of the health promotion-based care program. Additionally, Xiaolin Hu *et al.*^[49] (2016) concluded that a multidisciplinary support program has an impact on the CB of family caregivers of patients with HF, leading to a significant reduction in all dimensions, which is consistent with the findings of the present study. Alina *et al.* (2019) also found that a home-based HF palliative care program can significantly reduce CB scores in patients with HF between the intervention and control groups after 4 weeks.^[50] Therefore, various interventions can be used to improve the CB of patients with HF, but more research is needed to consider the specific conditions and needs of each patient and community. Generally, most nursing interventions on these patients have shown improvement in CB, which confirms the main findings of the present study. Thus, nurses play an important role in improving CB in these patients. On the other hand, Etemadifar *et al.*^[51] (2014) found that an educational program has a positive effect on reducing the CB of these patients, which is consistent with the findings of the present study. Additionally, Cooney *et al.*^[52] (2021) demonstrated that promoting and maintaining positive social caregiver-patient relationships is a hopeful approach for interventions aimed at reducing the experienced burden of caregivers for patients with HF. Therefore, it can be concluded that implementing the health promotion-based care model has had a positive impact on the main factors causing CB in caregivers of patients with HF. This model is recommended as an effective and community-based solution for reducing CB and improving the quality of life, self-care behaviors, and health promotion of patients with HF. Moreover, various methods such as psychological support, rehabilitation, and self-care education can be used to improve the quality of life of caregivers of patients with HF.

It should be noted that the average CB score in both groups was higher than normal, and previous studies have reported similar results. Caregivers help patients with HF by providing care, health support, and improving their quality of life.^[53] Caregivers are required to meet their own needs as well as those of their patients simultaneously, which leads to additional pressure in all physical, emotional, social, and economic dimensions, and consequently disrupts caregiving roles and changes the caregivers' lifestyle.^[54] Based on this, the findings of the study by Hu *et al.*^[55] (2012) showed that 86.7% of caregivers of patients with HF perceive a high

Table 2: Comparison of demographic and clinical characteristics of caregivers of patients with HF in the intervention and control groups

Variables	Subgroup	Intervention frequency (percentage)	Control frequency (percentage)	Test statistics
Age	by year	5.25±34.27	4.86±34.09	<i>t</i> =0.167
Duration of caregiving	by month	4.32±69.45	3.86±66.76	<i>t</i> =0.088
Gender	male	20 (44.4)	18 (40.0)	Chi-square=0.18
	female	25 (55.6)	27 (60.0)	
Marital status	married	32 (71.1)	35 (77.8)	Chi-square=1.38
	Single	9 (20.0)	7 (15.6)	
	divorced	3 (6.7)	3 (6.7)	
	deceased wife	1 (2.2)	0 (0.0)	
Education level of caregiver	High school	7 (15.6)	10 (22.2)	Chi-square=0.75
	Cycle and diploma	15 (33.3)	14 (31.1)	
	Associate degree	12 (26.7)	10 (22.2)	
	Bachelor and above	11 (24.4)	11 (24.4)	
Occupation of caregiver	free	25 (55.6)	30 (66.7)	Chi-square=3.52
	manual worker	6 (13.3)	5 (11.1)	
	Employee	10 (22.2)	4 (8.9)	
	Unemployed	4 (8.9)	6 (13.3)	
Economic status	weak	8 (17.8)	8 (17.8)	Chi-square=0.51
	medium	24 (53.3)	21 (46.7)	
	Good	13 (28.9)	16 (35.6)	
Utilization of government aids	Yes	3 (6.7)	2 (4.4)	Chi-square=0.21
	no	42 (93.3)	43 (95.6)	
Access to alternatives	Yes	37 (82.2)	30 (66.7)	Chi-square=2.86
	no	8 (17.8)	15 (33.3)	

Table 3: Mean score of CB in the intervention and control groups before and after the intervention

Variable	Groups	Before intervention		After intervention		<i>P</i>
		Mean	SD	Mean	SD	
The amount of CB Variable	Intervention	84.91	4.49	76.00	4.88	<i>P</i> <0.0001
	Control	85.47	4.11	85.82	5.82	<i>P</i> =0.751
<i>P</i>		<i>P</i> =0.542		<i>P</i> <0.0001		

level of CB. Additionally, Jackson *et al.*^[29] (2018) showed that more than 80% of family caregivers of patients with HF in China experience severe CB, which leads to dissatisfaction, depression, and fatigue. Overall, the results indicate that CB on family caregivers of patients with HF is high and requires support and assistance programs for these individuals. Huang *et al.*^[56] (2022) stated that the higher the economic pressure and the higher the heart disease classification, the greater the perceived CB felt by family members. In the present study, approximately 94.4% of the caregivers did not use government assistance programs, and the sampling was conducted from patients with class III and IV HF, which can justify the high CB and similarity of the results. Davidson *et al.*^[57] (2013) also demonstrated in their study that a significant burden is imposed on caregivers of individuals with HF over long periods in the community, often due to differences in access to palliative services, which has been addressed in the HPM. Additionally, Dirikkan and Mutlu^[31] (2018) concluded that 94% of caregivers have experienced physical, psychological,

social, occupational, or economic changes after the diagnosis of the disease, and the participants' psychosocial adaptation was below the average level and significantly related to CB. Also, Mohebbi *et al.*^[58] (2021) showed that family income and body mass index will predict nutrition knowledge and diet adherence, respectively. Huang *et al.*^[56] (2022) further stated that the higher the economic pressure and the higher the heart disease classification, the greater the perceived CB felt by the patient's family. Bahrami *et al.*^[59] (2014) concluded that lack of knowledge related to caregiving, physical exhaustion, psychological and social exhaustion, and lack of family and organizational support in emotional and financial dimensions are the four main factors that create CB in Iranian caregivers of patients with HF. Also, Shakibazadeh *et al.*^[60] (2021) showed that the perceived health competence in CVDs has a statistically significant relationship with the physical and mental aspects of their quality of life. However, special attention should be paid to the specific needs of caregivers and their families, and educational and supportive programs should be designed for them. Since CB can become a major challenge for families, it is necessary for these programs to be provided continuously and in the long term to achieve continuous improvement in family functioning and caregivers' quality of life. Of course, it is clear that there are many influential factors in assessing the level of CB in these patients, including study environment, average age of participants and their caregivers, gender,

Table 4: Comparison of CB dimensions before and after the intervention in the intervention and control groups

Variable	Group	Before intervention		After intervention		P
		Mean	SD	Mean	SD	
Time-dependent CB	Intervention	19.29	2.78	17.24	2.41	P=0.002
	Control	19.64	2.28	19.42	2.8	P=0.69
Evolutionary CB	Intervention	19.09	1.31	17.11	2.32	P<0.0001
	Control	19.07	1.29	19.02	1.41	P=0.87
Physical CB	Intervention	12.33	1.54	11.33	1.99	P=0.006
	Control	12.49	1.60	12.93	1.63	P=0.21
Social CB	Intervention	16.04	2.19	14.80	2.83	P=0.029
	Control	16.58	2.14	16.44	2.14	P=0.82
Emotional CB	Intervention	18.16	2.49	15.51	2.83	P<0.0001
	Control	17.69	2.76	18.00	2.79	P=0.58
Total CB	Intervention	84.91	4.49	76.00	4.88	P<0.0001
	Control	85.47	4.11	85.82	5.69	P=0.751

HF classification, ejection fraction (EF) level of patients' hearts, and socio-economic status, which can affect study results.

The results of the present study showed that the caring program based on the HPM is effective in all dimensions of CB experienced by family caregivers. In this regard, Mohebbi *et al.*^[61] (2021) reviewed 35 studies and showed that interventions based on the theory of health education and promotion were effective in 88% of cases on the practical results of CVDs. Jafari-Diziche *et al.*^[62] (2021) demonstrated the impact of a family-based empowerment model on CB in elderly patients with HF one month after the intervention, indicating the effect of family-centered models on CB, consistent with the present findings. The impact of this model has been shown on many aspects of the lives of individuals with HF. However, Habibzadeh *et al.*^[63] (2021) concluded in their study that the HPM is effective in improving the quality of life of patients with HF in all dimensions except for the physical aspect and promoting their health behaviors, except for physical activity. As a review of existing studies in this field has shown, there are contradictory results regarding the impact of the HPM on CB dimensions, which could reflect cultural differences in the behavior of study participants.

Moreover, the results of the current study showed that the caring program based on the HPM had positive effects on all dimensions of CB, including Time-dependent, Evolutionary, physical, social, and emotional burden. Hu *et al.*^[49] (2016) demonstrated that a multidisciplinary support program did not significantly improve caregiver physical burden at 3 or 6 months after discharge. Therefore, it can be concluded that a multidisciplinary support program may have positive effects on reducing CB in patients with HF, but its effects on caregiver physical burden may be limited, whereas a Pender-based caring program is effective in all dimensions of CB. Liljeroos *et al.*^[64] (2017) showed that a psychoeducational

intervention did not have a significant difference on any dimension of CB in patients with HF after 24 months. Based on these results, it can be concluded that these differences may be due to various factors such as differences in the treatment program model and duration of the program, and these results may be due to the fact that the intervention only focused on psychotherapy and education and did not seem to make an effort to reduce CB. Furthermore, the study by McMillan *et al.*^[65] (2013) showed that a coping-based intervention had no significant impact on CB. These studies may differ from our study in terms of interventions and methods used. Therefore, it can be said that different programs can have different effects on reducing CB in patients with HF, and depending on the type of program and treatment model, the results may vary. For this reason, caregiving programs should be designed based on the specific needs of the patient and their family, and various interventions can be effective in improving CB. Additionally, more research with precise and measurable variables is needed to investigate the impact of different programs on CB.

Despite the positive effects of the caring program based on the HPM on the dimensions of CB in patients with HF, this study had some limitations. One of the limitations was the small number of participants in the study. Therefore, it is recommended that such a program be implemented in future studies in different centers with a larger population of caregivers.

Conclusion

The results of the study showed that the caring program based on the HPM significantly reduces the CB in patients with CHF. According to the findings of this study, the level of CB in patients with HF has decreased, but it should be noted that the average score of CB in both groups was higher than the normal limit. Additionally, the results showed that the caring program based on the HPM was effective in improving most dimensions of CB

in patients with HF. Therefore, nurses can minimize the burden of care for these patients by utilizing a caregiving program based on this model. It is also recommended that in future studies, the effect of the caring program based on the HPM on other psychological issues of caregivers of patients with HF such as depression, stress, and anxiety be addressed.

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Conflicts of interest

There are no conflicts of interest.

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