**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**

**Introduction:** 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 was 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:** Health Promotion, Caregiver Burden, Heart Failure.

**Introduction**

Cardiovascular disease (CVD) is the most common cause of death in the world ([1](#_ENREF_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](#_ENREF_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 cost-effective access to primary care and treatment, and inadequate adaptation due to economic and psychological challenges ([3](#_ENREF_3)). Specifically, CVDs that cause damage to the coronary arteries can be a contributing factor in the development of chronic heart failure (CHF) ([4](#_ENREF_4)).

Heart failure (HF) is a complex clinical syndrome ([5](#_ENREF_5)) and one of the most common and debilitating progressive chronic cardiovascular disorders, representing the end-stage of most heart disorders ([6](#_ENREF_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](#_ENREF_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](#_ENREF_8), [9](#_ENREF_9)). The impact of HF is not just on patients, but also on their families ([10](#_ENREF_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](#_ENREF_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](#_ENREF_12), [13](#_ENREF_13)). While caregivers play an important role in caring for patients with HF, they are often neglected ([14](#_ENREF_14), [15](#_ENREF_15)). Research has shown that routine care and surveillance of HF patients with their caregivers can improve their quality of life, reduce hospitalizations and reduce mortality rates ([16-18](#_ENREF_16)). 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 ([19-21](#_ENREF_19)). 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 ([22](#_ENREF_22), [23](#_ENREF_23)). 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 ([24](#_ENREF_24)).

The term of caregiver burden (CB) is used to describe the physical, emotional, financial and social challenges of caregiving ([25](#_ENREF_25)) and is generally defined as the negative effect of life with these patients([26](#_ENREF_26)) . 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 ([27](#_ENREF_27)). 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 ([27-29](#_ENREF_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](#_ENREF_16), [30-32](#_ENREF_30)). Anxiety and depression are a psychological burden on caregivers of HF patients and can be exacerbated by unanticipated hospitalizations, isolation and lack of professional support ([22](#_ENREF_22), [30](#_ENREF_30), [33-35](#_ENREF_33)). In addition, a study has shown that the probability of the caregiver dying or being hospitalized after the patient's death increases([36](#_ENREF_36)) . 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 ([37](#_ENREF_37)).

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 ([38](#_ENREF_38)). 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 ([39-41](#_ENREF_39)).

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 behaviour in the intervention group ([42](#_ENREF_42)). 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 ([43](#_ENREF_43)).

Given the importance of caring for patients with HF and using a structured care approach based on health promotion models, as well as the innovative model's impact on reducing caregivers' burden in Iran, this study aimed to determine the effect of the 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, 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. . 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 et al.'s study, the validity and reliability of the CBI questionnaire were confirmed .([44](#_ENREF_44))

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 behavioural 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.

Table 1: Objectives, Methods and content of educational sessions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Methods | Contents | Objectives | Subconcepts | Sessions |
| Face-to-face, group discussion, exchange of caregivers' experiences | • 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) | • 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 | Individual characteristics and experiences | First (Individual) |
| Face-to-face, group discussion, exchange of caregivers' experiences | •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) | • 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 | Behavior-specific cognitions and affect | Second (Individual) |
| Face-to-face, group discussion, exchange of caregivers' experiences | • 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) | • Discussion of commitment to action planning and competing preferences and urgent demands | Behavioral outcomes | Third (Individual) |
| Lecture, question and answer, group discussion, PowerPoint presentation, booklet | • 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 | • Improvement of knowledge and skills of participants regarding the disease  • Strengthening realistic expectations regarding disease prevention and treatment | Responsibility for health, , Interpersonal support | Fourth (Group) |
| Lecture, question and answer, group discussion, PowerPoint presentation, booklet | • 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. | • 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 | Stress management and Self‑actualization | Fifth (Group) |
| Lecture, question and answer, group discussion, PowerPoint presentation, booklet | • 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 | • 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 | Nutrition, Exercise and Self‑actualization | Sixth (Group) |

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 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.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables | subgroup | intervention | control | Test statistics |
|  | frequency (percentage) | frequency (percentage) |
| Age | by year | 34.27±5.25 | 34.09±4.86 | 0.167 |
| Duration of caregiving | by month | 69.45±4.32 | 66.76±3.86 | 0.088 |
| Gender | male | (44.4)20 | (40.0)18 | 0.18= Chi- square |
| female | (55.6)25 | (60.0)27 |
| Marital status | married | (71.1)32 | (77.8)35 | 1.38= Chi- square |
| Single | (20.0)9 | (15.6)7 |
| divorced | (6.7)3 | (6.7)3 |
| deceased wife | (2.2)1 | (0.0)0 |
| Education level of caregiver | High school | (15.6)7 | (22.2)10 | 0.75= Chi- square |
| Cycle and diploma | (33.3)15 | (31.1)14 |
| Associate degree | (26.7)12 | (22.2)10 |
| Bachelor and above | (24.4)11 | (24.4)11 |
| Occupation of caregiver | free | (655.)25 | (66.7)30 | 52.3= Chi- square |
| manual worker | (3.13)6 | (111.)5 |
| Employee | (2.22)10 | (9.8)4 |
| Unemployed | (9.8)4 | (3.13)6 |
| Economic status | weak | (8.17)8 | (8.17)8 | 0.51 = Chi- square |
| medium | (3.53)24 | (7.46)21 |
| Good | (28.9)13 | (635.)16 |
| Utilization of government aids | Yes | (76.)3 | (.44)2 | 210.= Chi- square |
| no | (393.)42 | (695.)43 |
| Access to alternatives | Yes | (282.)37 | (66.7)30 | 2.86= Chi- square |
| no | (17.8)8 | (33.3)15 |

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.

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P value | After intervention | | Before intervention | | Groups | Variable |
| SD | Mean | SD | Mean | The amount of CB Variable |
| p<0.0001 | 4.88 | 76.00 | 4.49 | 84.91 | Intervention |
| p=0.751 | 5.82 | 85.82 | 4.11 | 85.47 | Control |
|  | P<0.0001 | | 0.542=p | | P value | |

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.

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

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

**Disscussion**

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 (2012) demonstrated that telehealth care is effective in reducing the CB of patients with CHF in all dimensions of CB ([45](#_ENREF_45)). 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 (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 ([46](#_ENREF_46)). Wong et al (2019) also found that a home-based HF palliative care program can significantly reduce CB scores in HF patients between the intervention and control groups after 4 weeks ([47](#_ENREF_47)). Therefore, various interventions can be used to improve the CB of HF patients, 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 (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 ([48](#_ENREF_48)). Additionally, Cooney et al (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 HF patients ([49](#_ENREF_49)). 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 HF patients. 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 HF patients.

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 ([50](#_ENREF_50)). 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([51](#_ENREF_51)) . Based on this, the findings of the study by Hu et al (2012) showed that 86.7% of caregivers of HF patients perceive a high level of CB ([52](#_ENREF_52)). Additionally, Jackson et al (2018) showed that more than 80% of family caregivers of HF patients in China, experience severe CB, which leads to dissatisfaction, depression, and fatigue([53](#_ENREF_53)) . Overall, the results indicate that CB on family caregivers of HF patients is high and requires support and assistance programs for these individuals. Huang et al (2022) stated that the higher the economic pressure and the higher the heart disease classification, the greater the perceived CB felt by family members ([54](#_ENREF_54)). 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 (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([55](#_ENREF_55)) . Additionally, Dirikkan et al (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 ([33](#_ENREF_33)). Also, Mohebi et al. (2021) showed that family income and body mass index will predict nutrition knowledge and diet adherence, respectively ([56](#_ENREF_56)). Hwang et al (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([54](#_ENREF_54)) . Bahrami et al. (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 HF patients ([57](#_ENREF_57)). Also, Shakibazadeh et al. (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 ([58](#_ENREF_58)). 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, 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, Mohebi et al (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 ([59](#_ENREF_59)). Jafari-Diziche et al (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 ([60](#_ENREF_60)). The impact of this model has been shown on many aspects of the lives of individuals with HF. However, Habibzadeh et al (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 ([61](#_ENREF_61)). 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 (2016) demonstrated that a multidisciplinary support program did not significantly improve caregiver physical burden at 3 or 6 months after discharge ([46](#_ENREF_46)). 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, while a Pender-based caring program is effective in all dimensions of CB. Liljeroos et al (2017) showed that a psychoeducational intervention did not have a significant difference on any dimension of CB in patients with HF after 24 months ([62](#_ENREF_62)). 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 (2013) showed that a coping-based intervention had no significant impact on CB ([63](#_ENREF_63)) . 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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**Conflict of Interest**

The authors declare that there is no conflict of interest in the present study.

**References**

1. Gholikhani-Darbroud R, Khaki-Khatibi F, Mansouri F, Hajahmadipoorrafsanjani M, Ghojazadeh MJBll. Decreased circulatory microRNA-4478 as a specific biomarker for diagnosing non-ST-segment elevation myocardial infarction (NSTEMI) and its association with soluble leptin receptor. 2017;118(11):684-90.

2. Seyam S, Heidarnia AR. Quality of life and factors related to it in cardiovascular patients after heart surgery. Journal of Birjand University of Medical Sciences. 2013;19:33-41.

3. Sarrafzadegan N, Mohammmadifard N. Cardiovascular disease in Iran in the last 40 years: prevalence, mortality, morbidity, challenges and strategies for cardiovascular prevention. Archives of Iranian medicine. 2019;22(4):204-10.

4. Gheorghiade M, Bonow RO. Chronic heart failure in the United States: a manifestation of coronary artery disease. Circulation. 1998;97(3):282-9.

5. Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE, Drazner MH, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2013;62(16):e147-e239.

6. Shojaei FJH. Quality of life in patients with heart failure. 2008;14(2).

7. Members ATF, Dickstein K, Cohen-Solal A, Filippatos G, McMurray JJ, Ponikowski P, et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008: the Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2008 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association of the ESC (HFA) and endorsed by the European Society of Intensive Care Medicine (ESICM). European heart journal. 2008;29(19):2388-442.

8. Sh S, MohammadAlian H, Imani R, Khaledifar A, Hatamipour KJJSUMS. The effect of continuous educational and caring interferences on the quality of life patients with heart congestive failure. 2008;10(1):14-9.

9. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al. Heart disease and stroke statistics—2016 update: a report from the American Heart Association. circulation. 2016;133(4):e38-e360.

10. Jeon Y-H, Kraus SG, Jowsey T, Glasgow NJ. The experience of living with chronic heart failure: a narrative review of qualitative studies. BMC health services research. 2010;10(1):1-9.

11. Varaei S, Cheraghi M, Seyedfatemi N, Talebi M, Bahrani N, Dehghani A, et al. Effect of peer education on anxiety in patients candidated for coronary artery bypass graft surgery: a randomized control trial. 2013.

12. Murtagh FE, Addington-Hall J, Higginson IJJAickd. The prevalence of symptoms in end-stage renal disease: a systematic review. 2007;14(1):82-99.

13. Koohestani H, Baghcheghi N. Burn out in caregivers of patients with stroke and its related factors. 2012.

14. Dunbar SB, Clark PC, Quinn C, Gary RA, Kaslow NJ. Family influences on heart failure self-care and outcomes. The Journal of cardiovascular nursing. 2008;23(3):258.

15. Sebern MD, Woda A. Shared care dyadic intervention: outcome patterns for heart failure care partners. Western journal of nursing research. 2012;34(3):289-316.

16. Bidwell JT, Lyons KS, Lee CS. Caregiver well-being and patient outcomes in heart failure: a meta-analysis. The Journal of cardiovascular nursing. 2017;32(4):372.

17. Buck HG, Stromberg A, Chung ML, Donovan KA, Harkness K, Howard AM, et al. A systematic review of heart failure dyadic self-care interventions focusing on intervention components, contexts, and outcomes. International Journal of Nursing Studies. 2018;77:232-42.

18. Gheorghiade M, Vaduganathan M, Fonarow GC, Bonow RO. Rehospitalization for heart failure: problems and perspectives. Journal of the American College of Cardiology. 2013;61(4):391-403.

19. D’Alto M, Pacileo G, Calabrò RJTAjoc. Nonpharmacologic care of heart failure: patient, family, and hospital organization. 2003;91(9):51-4.

20. Jeon Y-H, Kraus SG, Jowsey T, Glasgow NJJBhsr. The experience of living with chronic heart failure: a narrative review of qualitative studies. 2010;10(1):1-9.

21. Pressler SJ, Gradus-Pizlo I, Chubinski SD, Smith G, Wheeler S, Wu J, et al. Family caregiver outcomes in heart failure. 2009;18(2):149-59.

22. Nicholas Dionne-Odom J, Hooker SA, Bekelman D, Ejem D, McGhan G, Kitko L, et al. Family caregiving for persons with heart failure at the intersection of heart failure and palliative care: a state-of-the-science review. Heart failure reviews. 2017;22(5):543-57.

23. Allen LA, Stevenson LW, Grady KL, Goldstein NE, Matlock DD, Arnold RM, et al. Decision Making in Advanced Heart Failure. Circulation. 2012;125(15):1928-52.

24. Pressler SJ, Gradus-Pizlo I, Chubinski SD, Smith G, Wheeler S, Wu J, et al. Family caregiver outcomes in heart failure. American Journal of Critical Care. 2009;18(2):149-59.

25. Mourad GM, Zaki RA, Ali RAJJEP. Improving coping abilities among caregivers of patients with cerebrovascular stroke. 2014;5(36):8-20.

26. Raiesifar A, Torabpour M, Mohsenizad P, Shabani H, Tayebi A, Masoumi MJCcN. Dialysis adequacy in patients of Abadan hemodialysis center. 2009;2(3):87-90.

27. Abbasi A, Asayesh H, Rahmani H, Shariati A, Hosseini S, Rouhi GJJoRDiN, et al. The burden on cargivers from hemodialysis patients and related factors. 2011;8(1):26-33.

28. Jadhav BS, Dhavale HS, Dere SS, Dadarwala DDJMJoDDPU. Psychiatric morbidity, quality of life and caregiver burden in patients undergoing hemodialysis. 2014;7(6):722.

29. Bayoumi MMJOJoN. Subjective burden on family carers of hemodialysis patients. 2014;2014.

30. Lacerda MS, Prado PRd, Barros ALBLd, Lopes JdL. Depressive symptoms in the family caregivers of patients with heart failure: an integrative review. Revista Gaúcha de Enfermagem. 2019;40.

31. Jackson JD, Cotton SE, Wirta SB, Proenca CC, Zhang M, Lahoz R, et al. Burden of heart failure on caregivers in China: results from a cross-sectional survey. Drug design, development and therapy. 2018;12:1669.

32. Karpf E, Jackson J, Cotton S, Proenca C, Calado F, Barbeau M, et al. Assessing the burden of chronic heart failure on caregivers of patients in Colombia. Value in Health. 2017;20(9):A622.

33. Dirikkan F, Mutlu E. The caregiver burden and the psychosocial adjustment of caregivers of cardiac failure patients. Turk Kardiyoloji Dernegi Arsivi: Turk Kardiyoloji Derneginin Yayin Organidir. 2018;46(8):692-701.

34. Fitzsimons D, Doherty LC, Murphy M, Dixon L, Donnelly P, McDonald K, et al. Inadequate communication exacerbates the support needs of current and bereaved caregivers in advanced heart failure and impedes shared decision-making. Journal of Cardiovascular Nursing. 2019;34(1):11-9.

35. McIlfatrick S, Doherty LC, Murphy M, Dixon L, Donnelly P, McDonald K, et al. ‘The importance of planning for the future’: burden and unmet needs of caregivers’ in advanced heart failure: a mixed methods study. Palliative medicine. 2018;32(4):881-90.

36. Dunlay SM, Roger VL, Weston SA, Bangerter LR, Killian JM, Griffin JM. Patient and spousal health and outcomes in heart failure. Circulation: Heart Failure. 2017;10(10):e004088.

37. Pressler SJ, Gradus-Pizlo I, Chubinski SD, Smith G, Wheeler S, Sloan R, et al. Family caregivers of patients with heart failure: a longitudinal study. Journal of Cardiovascular Nursing. 2013;28(5):417-28.

38. Safabakhsh L, Moatary MJSSSoMU. Examination of education protocol based on Pender Theory on lifestyle of patients after coronary Artery Bypass Graft. 2004.

39. Darkhor S, Estebsari F, Hosseini M, Charati JY, Vasli P. Effect of health promotion intervention on Nurses’ healthy lifestyle and health-promoting behaviors: RCT study. Journal of advanced pharmacy education & research| Jan-Mar. 2018;8(1):109.

40. Heydari A, Khorashadizadeh F. Pender’s health promotion model in medical research. studies. 2014;41(59):1067-74.

41. Mohammadian H, Eftekhar Ardebili H, Rahimi Foroushani A, Taghdisi M, Shojaei Zadeh D. Evaluation of Pender health promotion model in predicting living quality of adolescent girls. J Faculty Health Health Res Inst. 2011;8(4):1-13.

42. Karataş T, Polat ÜJPE, Counseling. Effect of nurse-led program on the exercise behavior of coronary artery patients: Pender’s Health Promotion Model. 2021;104(5):1183-92.

43. Faroughi F, Shahriari M, Keshvari M, Shirani FJIJoN, Research M. The effect of an educational intervention based on pender's health promotion model on treatment adherence in the patients with coronary artery disease. 2021;26(3):216.

44. Novak M, Guest C. Application of a multidimensional caregiver burden inventory. The gerontologist. 1989;29(6):798-803.

45. Chiang L-C, Chen W-C, Dai Y-T, Ho Y-L. The effectiveness of telehealth care on caregiver burden, mastery of stress, and family function among family caregivers of heart failure patients: a quasi-experimental study. International journal of nursing studies. 2012;49(10):1230-42.

46. Hu X, Dolansky MA, Su Y, Hu X, Qu M, Zhou L. Effect of a multidisciplinary supportive program for family caregivers of patients with heart failure on caregiver burden, quality of life, and depression: a randomized controlled study. International journal of nursing studies. 2016;62:11-21.

47. Ng AYM, Wong FKY. 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. 2018;55(1):1-11.

48. Etemadifar S, Bahrami M, Shahriari M, Farsani AK. The effectiveness of a supportive educative group intervention on family caregiver burden of patients with heart failure. Iranian journal of nursing and midwifery research. 2014;19(3):217.

49. Cooney TM, Proulx CM, Bekelman DB. Changes in social support and relational mutuality as moderators in the association between heart failure patient functioning and caregiver burden. Journal of Cardiovascular Nursing. 2021;36(3):212-20.

50. Evangelista LS, Dracup K, Doering L, Westlake C, Fonarow GC, Hamilton M. Emotional well-being of heart failure patients and their caregivers. Journal of cardiac failure. 2002;8(5):300-5.

51. Ågren S, Evangelista L, Strömberg A. Do partners of patients with chronic heart failure experience caregiver burden? European Journal of Cardiovascular Nursing. 2010;9(4):254-62.

52. Hu X, Dolansky MA, Hu X, Zhang F, Qu M. Factors associated with the caregiver burden among family caregivers of patients with heart failure in southwest China. Nursing & health sciences. 2016;18(1):105-12.

53. Jackson JD, Cotton SE, Bruce Wirta S, Proenca CC, Zhang M, Lahoz R, et al. Burden of heart failure on caregivers in China: results from a cross-sectional survey. Drug design, development and therapy. 2018:1669-78.

54. Huang H, Xia Y, Zeng X, Lü A. Prevalence of depression and depressive symptoms among intensive care nurses: A meta‐analysis. Nursing in Critical Care. 2022;27(6):739-46.

55. Davidson PM, Abernethy AP, Newton PJ, Clark K, Currow DC. The caregiving perspective in heart failure: a population based study. BMC health services research. 2013;13:1-7.

56. Mohebbi B, Tafaghodi B, Sadeghi R, Tol A, Yekanenejad MS. Factors predicting nutritional knowledge, illness perceptions, and dietary adherence among hypertensive middle-aged women: Application of transtheoretical model. J Educ Health Promot. 2021;10:212.

57. Bahrami M, Etemadifar S, Shahriari M, Farsani AK. Caregiver burden among Iranian heart failure family caregivers: A descriptive, exploratory, qualitative study. Iranian journal of nursing and midwifery research. 2014;19(1):56-63.

58. Shakibazadeh E, Sabouri M, Mohebbi B, Tol A, Yaseri M. Validity and reliability properties of the Persian version of perceived health competence scale among patients with cardiovascular diseases. J Educ Health Promot. 2021;10:19.

59. Mohebbi B, Sabouri M, Tol A. Application of health education and promotion theory-based interventions on patients with cardiovascular disease: A systematic review. J Educ Health Promot. 2021;10:236.

60. Jafari-Diziche S, Izadi-Avanji F-S, Atoof F, Derakhshandeh S-M, Azizi-Fini I. Effect of Family-Centered Empowerment Model on the Care Burden of the Caregivers of Older Adults with Heart Failure. Journal of Client-Centered Nursing Care. 2021;7(4):275-84.

61. Habibzadeh H, Shariati A, Mohammadi F, Babayi S. The effect of educational intervention based on Pender's health promotion model on quality of life and health promotion in patients with heart failure: an experimental study. BMC cardiovascular disorders. 2021;21:1-13.

62. Liljeroos M, Ågren S, Jaarsma T, Årestedt K, Strömberg A. Long-term effects of a dyadic psycho-educational intervention on caregiver burden and morbidity in partners of patients with heart failure: a randomized controlled trial. Quality of Life Research. 2017;26:367-79.

63. McMillan SC, Small BJ, Haley WE, Zambroski C, Buck HG. The COPE intervention for caregivers of patients with heart failure: an adapted intervention. Journal of hospice and palliative nursing: JHPN: the official journal of the Hospice and Palliative Nurses Association. 2013;15(4).