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Does a multimedia education program work as a remedy for stress and burden in family caregivers of elderly heart attack patients? A clinical trial study

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Abstract

Background Supportive care has been found to improve quality of life and reduce the disease burden for aging individuals. After a heart attack, elderly patients often require a caregiver. In developing communities, caregiving responsibilities frequently fall on family members. Accordingly, we designed a randomized controlled clinical trial to assess the effect of an educational program on perceived stress and care burden among family caregivers of elderly heart attack patients.

Method In this clinical trial (IRCT20220905055894N1, 01/02/2023), family member caregivers were the study participants, assigned to either intervention or control groups using a simple random sampling method. The control group received only routine in-home caregiving information, without additional nurse training or support, whereas the intervention group received multimedia-based training, monitoring, and communication support from a trained nurse over one month. Perceived stress levels and caregiving burden were measured using the Perceived Stress Scale (PSS) and the Caregiving Burden Inventory, respectively.

Results Before the intervention, a high level of caregiving stress (34.07 ± 8.61 in the control group vs. 34.17 ± 8.62 in the intervention group) and burden (77.7 ± 15.51 in the control group vs. 79 ± 15.6 in the intervention group) was observed. After one month of intervention, the average scores of stress and burden remained unchanged in the control group, whereas the intervention group showed a significant reduction ($P < 0.001$). The inter-group comparison revealed lower levels of stress and care burden in the intervention group ($P < 0.001$).

Conclusion A brief multimedia education intervention could help alleviate the stressful conditions experienced by family caregivers of elderly heart attack patients. Future studies could investigate whether a more extended educational program would have more lasting effects.

Keywords Elderly, Heart attack, Stress, Caregiving burden, Education, Family caregivers

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Background

Based on global reports, cardiovascular diseases (CVDs) are an emerging threat causing health and financial burden. On a global scale, about a third of deaths are related to CVDs [1]. Every year, more than 60 million people die from CVDs in Europe [2]. In Asia, CVD deaths have almost doubled in 30 years (5.9 million in 1990 to 10.8 million in 2019) [3]. In the Iranian population, about half of deaths and more than 20% of all burden diseases are related to CVDs [4].

The main risk factors for CVDs are socioeconomic condition, obesity, unhealthy diet, high blood pressure, diabetes mellitus, race, age and gender [5]. The elderly and the residents of low and middle-income countries are among the high-risk groups for CVDs [6, 7]. Accordingly, the population of developing countries with a young-to-aged transition is more at risk to develop CVDs. The elderly population of Iran has been sharply rising during past decades which imminently needs long-term health-care provisions [8].

CVD patients have concomitant physical and psychological issues such as enuresis, polyuria, weakness, fatigue, depression, and poor sleep quality [9, 10]. These problems can result in more serious health outcomes like disrupted quality of life, disease reoccurrence, and disability [11–14]. After a cardiovascular incident like a heart attack, a remarkable part of post-acute patient care at home is on the shoulders of family caregivers [15, 16]. This condition unexpectedly imposes new roles of patient care on family members. When it comes to elderly patients with CVDs, they often need a caregiver to manage medication, prepare or adhere to a healthy diet, and monitor symptoms of CVDs; therefore, the situation for the caregivers becomes more difficult [17, 18].

In-home long-term familial caring raises stress in family members. It is highly recommended to support the family caregivers through training programs [19]. The training programs could help family members to combat high-stress conditions and mental burdens [20]. Durante et al. (2019) reported that caregivers of heart failure patients exposed to a great burden and self-care education could improve caregivers' health outcomes [21]. Dalirirad et al. (2021) also evaluated the effect of a training program for the family members of patients undergoing coronary artery bypass graft surgery. They found that a short-term educational program reduced the burden and improved the daily activities of the family caregivers [22].

Due to the lack of social support, poor financial situation, and family affiliation, Iranian families prefer to care for their heart attack elderly patients (HAEPs) at home as an informal responsibility [23]. Short-term training programs for caregivers' maintenance against burden seem inadequate [24]. Besides, education along with medical

support plays a critical role in the rehabilitation of the HAEPs [25]. Regular tele-nursing follow-up, as an essential part of health care services, helps the patients and their families to actively participate in the treatment process [26, 27].

Despite the increasing focus on supportive care for family caregivers of elderly patients with cardiovascular diseases, several critical gaps remain in current research. First, while numerous studies have investigated caregiver burden and stress associated with chronic illnesses, there is limited research on the effectiveness of multimedia-based interventions tailored specifically for family caregivers of elderly patients who have experienced a heart attack [21]. Moreover, the long-term impact of such educational interventions on caregiver mental health and quality of life has yet to be fully explored, particularly in developing countries where informal caregiving is more common due to limited social support structures (8). Additionally, most studies focus on either the patient or the caregiver in isolation; few address the intertwined well-being of both, leaving a gap in understanding how comprehensive, family-oriented programs can support both patients and caregivers effectively [28]. Therefore, we designed the current study aimed at investigating the effect of family-oriented multimedia training on the care burden and perceived stress of family caregivers of HAEPs as a randomized controlled clinical trial.

Methods

The present study was a randomized controlled clinical trial in which the caregiving burden and perceived stress of caregivers of elderly patients with heart attack were investigated at a hospital in Kordkuy (Golestan, Iran). The participants were assigned into two intervention and control groups using a simple random sampling method. The participants in the study were family caregivers of heart attack elderly patients (HAEPs).

To ensure the integrity of the randomization process and minimize selection bias, assignment concealment was implemented. Randomization was conducted using sealed, opaque, sequentially numbered envelopes, which were prepared by an independent researcher not involved in the enrollment or data collection. This method ensured that neither the enrolling personnel nor the participants were aware of the group assignment until after the allocation had been completed. This approach helped maintain the internal validity of the study by preventing any potential influence on group assignments.

Inclusion and exclusion criteria

The inclusion criteria for participants in the study included the following:

1. Caring for an elderly patient at home with a history of heart attack that is at least 60 years old
2. Having a family relationship with the patient (immediate family members)
3. Owns and operates a smartphone

However, participants who were unwilling to participate in the study, cut off their communication with the researchers during the study, and those caregivers whose patients died or re-hospitalized due to disease recurrence, were excluded from the study.

Study procedure

After explaining the objectives of the research, informed consent was obtained from all participants of both control and intervention groups. Then, the participants were asked to fill out the care burden and perceived stress questionnaires. On the day of discharge, family caregivers of the control group received only the necessary recommendations including personal hygiene, diet, tacking medicine and checking vital signs of a HAEPs patient (routine care). In the intervention group, along with routine care recommendations, an educational session with the help of multimedia (sound, video, image, and animation) run on a smartphone was shared with the caregivers.

The educational content prepared by the researcher, which was previously approved by the research committee, includes the following 3 main areas:

1. Method, type, and amount of physical activity
2. Information about medicines
3. Information about diet

The intervention program was separately implemented for each participant, one by one, because the patients were discharged from the hospital at different times. However, all the participants in the intervention group received the same educational information, procedure and schedule. At the end of the briefing meeting, a question-answer session was performed. Then primary data gathering was carried out and then the additional training files with the content of in-home caring of HAEPs patient was shared with the patient's caregivers through a smartphone. The caregivers were able to review and study the educational session at home. After the discharge of the patients, the researchers (trained post-discharge care nurses) maintained their connection with the caregivers through smartphones (social media, messages, or phone calls) for 1 month (once a week). These connections aimed to assess study participants' concerns about care and retraining the supportive care principles. Also, the intervention group participants could contact the researcher to discuss their problems. The researcher's

contact time was determined by agreement with the caregivers. The participants in both groups were again asked to complete the questionnaires after the determined period (1 month).

Assessment tools (questionnaires)

The caregiving burden inventory developed by Novak and Guast (1989) was used to evaluate the burden on family caregivers. The questionnaire has 24 items in 5 scales including time-dependent, developmental, physical, social, and emotional burden. The responses score on a 5-point Likert scale from "not at all descriptive" indicating a score of 1, to "very descriptive" expressing a score of 5. Finally, the scores range from 24 to 120 with the following classification: scores 24–39 indicating mild burden, 40 to 71 presenting moderate burden, and 72 to 120 showing severe burden [29]. The validity of the care pressure questionnaire has been validated for the Iranian population by Abbasi et al. The reliability of the instrument was assessed by Cronbach's alpha coefficient which ranged from 69 to 87% for subscales and 80% for the entire questionnaire [30].

We used the Perceived Stress Scale (PSS), a 14-item scale developed in 1983 by Cohen et al., for assessment of stress in the participants. The PSS is scored on a five-point Likert scale from zero (none) to 4 (very high), and questions 5, 6, 7, 8, 9, 10, and 13 are reversely scored. The total scores of PSS range from 0 to 56. A score more than the cut-off point of 21.8 indicates high perceived stress and the higher the PSS score, the higher the stress level. Cohen and his colleagues have reported the reliability using Cronbach's alpha coefficient (0.85 for the scale and 0.84–0.86 for the subscales) [31]. The internal consistency of the instrument in Iran was confirmed in two studies by Bastani et al. and Moradi et al. and they reported Cronbach's alpha coefficient of 0.74 and 0.82, respectively [32, 33].

Statistical analysis

The chi-square test was used to assess the demographic difference between the groups. Normality was checked through the Shapiro-Wilk test. Since the data distribution was normal, parametric tests were applied. Student's t-tests and paired t-test were used to compare scores before and after the intervention in each group. Comparison of the average scores of the control and intervention groups after the intervention was carried out using Repeated Measures Analysis of Variance (ANOVA). Considering a significance level of less than 0.05, statistical analysis was performed with SPSS software.

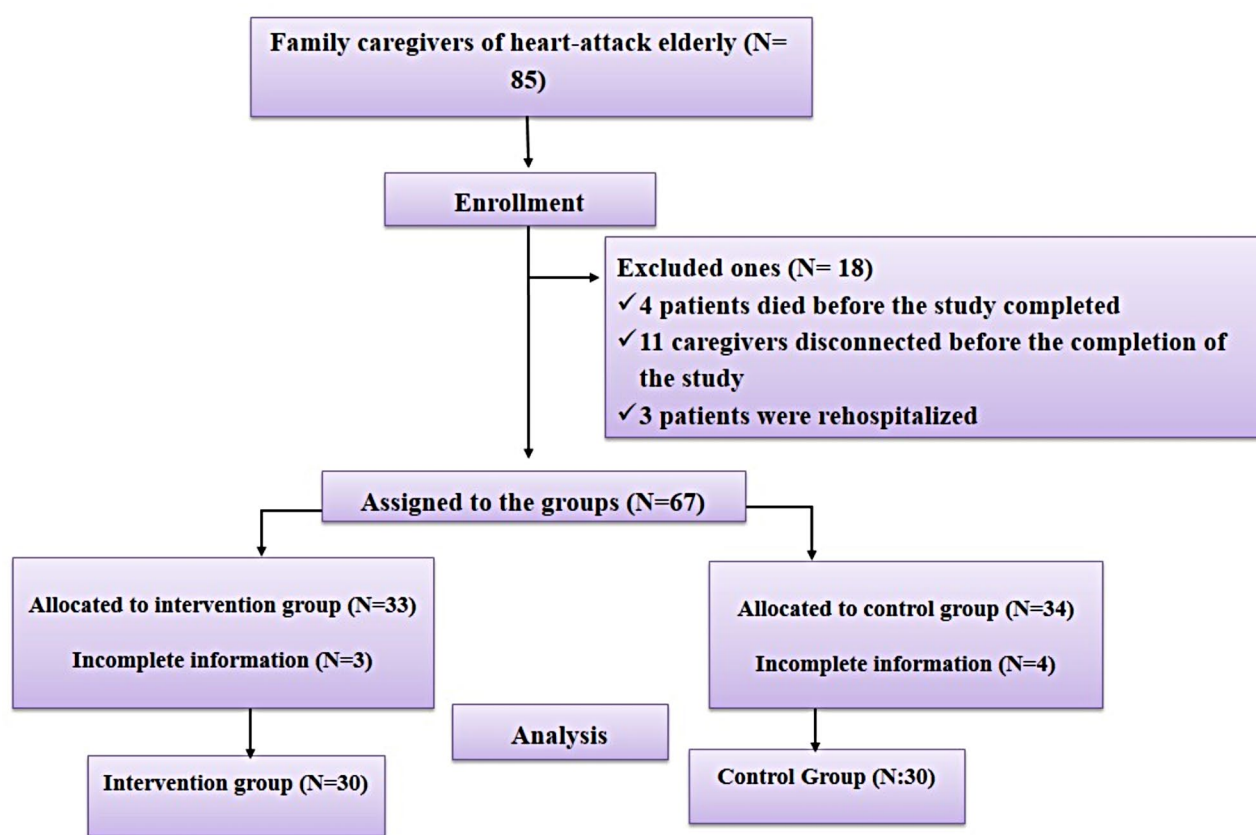


Fig. 1 Consort diagram of the study

Table 1 Descriptive analysis of demographic variables

Variables		Study groups		P-value
		Control (n=30)	Intervention (n=30)	
Gender	Female	17	19	0.83
	Male	13	11	
Age of caregivers (years)	18–27	8	6	0.99
	28–36	4	5	
	37–45	9	7	
	46–54	5	5	
	55 and more	4	7	
Marital status	Married	19	18	0.98
	Single	11	12	
Education level	Primary school	16	16	0.91
	High school	3	3	
	University	11	11	
Relationship with patient	Children	17	19	0.93
	Spouse	6	3	
	Sister	7	8	

Results

Of 85 caregivers included in the study, 18 were excluded in the enrollment phase of the study. Then, 67 participants were assigned to the intervention ($n=34$) and

control ($n=33$) groups. Finally, data from 30 caregivers were completed and analyzed in each group (Fig. 1).

The descriptive analysis of demographic variables is shown in Table 1. The baseline characteristics of the participants, including age, gender, marital status, educational level, and relationship to the patient, were compared between the groups, and no significant differences were found (P -values > 0.05 for all variables). The age distribution of in the control and intervention groups was similar and there was no significant difference between the two groups. Also, most of the study participants in both groups were married and had primary education without any significant difference between the groups. Regarding the family relationship between caregivers and patients, most of the caregivers were the children of the patients.

Table 2 presents the average scores for perceived stress and caregiving burden, as well as its subscales (time-dependent, developmental, physical, social, and emotional), before and after the intervention for both the control and intervention groups. At baseline, both groups exhibited high levels of perceived stress (34.07 ± 8.61 in the control group versus 34.17 ± 8.62 in the intervention group) and caregiving burden (77.7 ± 15.51 in the control group versus 79 ± 15.6 in the intervention group). No

Table 2 Average scores of perceived stress, caregiving burden and its subscales before and after intervention in both groups

Variables	Control group		P-value	Intervention group		P-value
	Pre-test	Post-test		Pre-test	Post-test	
Perceived stress level	34.07 (\pm 8.61)	33.03 (\pm 9.45)	0.46	34.17 (\pm 8.62)	19.00 (\pm 5.75)	< 0.001
Time-dependent burden	15.66 (\pm 3.32)	15.63 (\pm 4.55)	0.96	15.96 (\pm 3.38)	11.47 (\pm 2.63)	< 0.001
Developmental burden	15.83 (\pm 3.68)	16.36 (\pm 3.81)	0.36	16.2 (\pm 3.84)	11.7 (\pm 3.09)	< 0.001
Physical burden	12.83 (\pm 3.18)	13.16 (\pm 3.73)	0.58	12.93 (\pm 3.09)	9.03 (\pm 2.44)	< 0.001
Social burden	16.83 (\pm 3.75)	16.86 (\pm 3.49)	0.96	17.2 (\pm 3.68)	12.92 (\pm 2.46)	< 0.001
Emotional burden	16.53 (\pm 2.02)	16.2 (\pm 3.38)	0.66	16.7 (\pm 4.02)	11.83 (\pm 2.)	< 0.001
Total burden	77.7 (\pm 15.51)	78.23 (\pm 15.54)	0.80	79.00 (\pm 15.6)	56.97 (\pm 11.35)	< 0.001

Table 3 The comparison between the average scores of the control and intervention groups

Variables	Groups	Average difference	Standard error	P-value
Perceived stress level	Control Vs. Intervention	14.08	1.67	< 0.001
Time-dependent burden	Control Vs. Intervention	4.31	0.89	< 0.001
Developmental burden	Control Vs. Intervention	4.8	0.82	< 0.001
Physical burden	Control Vs. Intervention	4.3	0.73	< 0.001
Social burden	Control Vs. Intervention	4.14	0.66	< 0.001
Emotional burden	Control Vs. Intervention	4.46	0.72	< 0.001
Total burden	Control Vs. Intervention	22.13	3.02	< 0.001

significant differences were found between the groups in the pre-intervention phase for perceived stress or any caregiving burden subscale (P -value > 0.05).

After one month of intervention, scores for perceived stress and caregiving burden remained largely unchanged in the control group, with P -values greater than 0.05 across all subscales. However, significant reductions were observed in the intervention group, with perceived stress decreasing to 19.00 ± 5.75 and total caregiving burden reducing to 56.97 ± 11.35 (P -value < 0.001 for both measures). All caregiving burden subscales, including time-dependent, developmental, physical, social, and emotional burden, showed significant reductions in the intervention group compared to pre-intervention scores (P -value < 0.001 for all subscales).

Table 3 provides a comparison of the average difference in scores of perceived stress and caregiving burden, including its subscales (time-dependent, developmental, physical, social, and emotional), between the control and intervention groups after one month of intervention. The analysis reveals statistically significant reductions across all measures in the intervention group compared to the control group.

The average difference in perceived stress between the control and intervention groups was 14.08 (standard error = 1.67, P -value < 0.001), indicating a substantial reduction in perceived stress among the intervention group. This result highlights the effectiveness of the multimedia educational intervention in alleviating stress.

Similarly, significant reductions were observed across all caregiving burden subscales. The time-dependent burden showed an average difference of 4.31 (standard error = 0.89, P -value < 0.001), while developmental burden

decreased by 4.8 (standard error = 0.82, P -value < 0.001). Physical burden also showed a notable reduction, with an average difference of 4.3 (standard error = 0.73, P -value < 0.001).

Social and emotional burdens were similarly reduced, with average differences of 4.14 (standard error = 0.66, P -value < 0.001) and 4.46 (standard error = 0.72, P -value < 0.001), respectively. The total caregiving burden experienced by the intervention group was significantly lower than that of the control group, with an average difference of 22.13 (standard error = 3.02, P -value < 0.001).

Discussion

Globally, the population of elderly people is increasing at an exponential rate. Between 1995 and 2050, it has been estimated that the population of elderly people aged 60 years or more increase 10 times. In Iran, the number of aged people increased 1% only in a short while, 2006–2011 [34]. Based on the reports of the National Statistics Center, Iran will face aging in the coming years in any scenario [35]. As the population ages, the concept of maintaining and caring for the elderly becomes more important [36]. Homecare, especially for elderly patients, is known as a job in many developed countries, but in developing regions, due to a lack of social support and financial issues, most of the disabled patients are being cared for by their families. In Iran, caregiving practices are heavily influenced not only by financial constraints but also by cultural norms. Strong family values and societal expectations encourage at-home care by family members, particularly for elderly relatives. In many Iranian families, caregiving is considered a moral duty, deeply rooted in cultural traditions of family solidarity

and interdependence. This can create a disproportionate burden on caregivers, especially women, as they are often expected to shoulder the responsibility of care, impacting their health and well-being [8, 37].

Elderly caring either as an occupation or an informal familial responsibility is very stressful [38]. Although the type of disease may cause a slight difference in the burden made for caregivers, generally, in-home caring creates a lot of burden and stress, which can be managed with support and education. Similar to our results, several studies reported high levels of stress and burden in caregivers of elderly patients. For example, Sheehen et al. (2021) reported a high level of stress among dementia caregivers. They demonstrated that those who transitioned into the role of caring for the elderly with dementia need medical support and disease-specified training [39]. Kitko et al. (2021) provided a scientific statement under the supervision of the American Heart Association. They demonstrated that caregiving brings about physical, psychological, and financial burdens for family members of heart failure patients. It also recommended that family caregivers critically need to be supported [28]. High levels of caregiver stress and fatigue can lead to reduced adherence to treatment protocols and suboptimal patient care, ultimately contributing to higher rates of hospital readmission and poorer overall health outcomes for the patients [14]. In addition, caregiver burden may hinder the caregiver's ability to provide emotional support, which is crucial for the patient's mental and emotional recovery. Studies have shown that caregivers experiencing high levels of burden are less likely to engage in effective caregiving practices, such as timely medication administration and regular monitoring of symptoms, which are vital to the patient's recovery process [16]. Therefore, addressing caregiver burden is not only beneficial for the caregivers themselves but also essential for optimizing patient outcomes.

In this study, we examined the effect of an educational program for family caregivers of HAEPs in two control and intervention groups. The findings indicate that the multimedia-based educational intervention effectively reduced perceived stress and caregiving burden across all measured domains within one month, emphasizing its potential as a short-term intervention strategy to improve caregiver well-being. The lack of significant change in the control group highlights the importance of structured, multimedia-driven support for caregivers to alleviate the comprehensive challenges associated with caregiving. In line with our results, Dalirirad et al. (2021) showed that the implementation of an educational program reduced the caregiving burden of those family members who were caring for patients who underwent Coronary Artery Bypass Graft Surgery [22]. Similarly, in another study on Iranian family caregivers, it was revealed that

nurse-based educational intervention could reduce the burden in cardiovascular patients [40]. Supportive programs have an inevitable effect on the improvement of knowledge and self-confidence of family members of cardiovascular patients which reduces stress, anxiety, and burden on the caregivers [41]. In the current study, we also created a continuous education, monitoring, and communication managed by a trained nurse based on multimedia, which increased the readiness of the caregiver to face stressful situations related to caring HAEPs.

In our study, the multimedia-based educational intervention led to a significant reduction in perceived stress and all subscales of caregiving burden—time-dependent, developmental, physical, social, and emotional. This finding contrasts with many previous studies that have reported improvements in only select areas of caregiver burden. For instance, Dalirirad et al. (2021) noted improvements primarily in physical and social burden among caregivers following an educational support program [22], whereas Kitko et al. (2021) highlighted reductions in psychological stress but did not report significant changes in physical or time-related burden [28]. Our study's unique outcome of reducing burden comprehensively across all measured domains suggests that a multimedia approach may be particularly effective in addressing the multifaceted challenges faced by caregivers. This holistic improvement may be attributed to the integrated nature of the intervention, which combined practical caregiving knowledge, emotional support, and continuous communication. This emphasizes the importance of utilizing comprehensive educational strategies that cater to both the practical and psychological needs of caregivers to improve their overall well-being [21, 42].

When we compared the intervention and control groups in the post-intervention phase, the level of the perceived stress and caring burden was significantly reduced in the intervention group compared to the control one. The intervention program could remediate stressful conditions of caregivers for two main reasons; increasing the care-related knowledge of caregiver for skillful responses in hardship situations which improves the self-confidence of caregivers, and improving abilities of self-management and mental health self-care [22, 43, 44]. In contrast with our findings, Dionne-Odom et al. found that their intervention did not significantly influence the quality of life, mood, and burden of family caregivers of HF patients. They also demonstrated that the level of burden and distress of caregivers was not at a critical level [45]. It seems that this disagreement in the results of previous studies originates from the difference in the studied population, the social support in advanced societies, and the duration of the intervention. Remarkably, it should be noticed that most of studies have short-term intervention, but in the long term, the effect

of intervention disappears and there is no difference between the control and intervention groups [43]. As a result, the continuation of the intervention, for example with periodic consultations and follow-ups by nurses, can protect family caregivers against mental or physical disorders.

In this study, the duration of the intervention was set at one month to evaluate the immediate impact of a multimedia-based educational program on caregiver burden and perceived stress. Short-term interventions are often practical in real-world settings, where caregivers may face challenges with prolonged commitments due to competing responsibilities. Moreover, previous studies have indicated that short-term interventions can be effective in reducing the burden and stress of caregivers, particularly in the critical period immediately following patient discharge [21, 22]. Despite this, we recognize the potential value of extended interventions, which could further enhance caregiver preparedness and mental well-being over the long term.

One of the common limitations in such studies with an educational program is that often one target group for education is investigated, patients or caregivers, while both patients and their caregivers need education. Most heart attack elderly patients have an acceptable level of consciousness, so they could be involved in the training programs. Besides, the limited number of participants in this trial was another limitation of the present study.

Conclusion

In this study, a high level of caregiving stress and burden among family caregivers of elderly patients who experienced heart attack was highlighted. The educational intervention using multimedia helped caregivers to have a better adaptation to their new transitioned role and they reported better mental condition with lower levels of mental burden and perceived stress. Compared to the participants with routine medical support after discharge of the patients, the participants of the intervention group had lower stress and burden scores indicating a successful multimedia educational program in comparison with routine after-care education.

Abbreviations

PSS	Perceived Stress Scale
CVD	Cardiovascular disease
HAEP	Heart Attack Elderly Patients
IRCT	Iranian Registry of Clinical Trial
ANOVA	Analysis of Variance

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12912-024-02567-8>.

Supplementary Material 1

Acknowledgements

The authors thank Islamic Azad University-Babol Branch for logistic support for setting up this research. All authors contributed solely as volunteers.

Author contributions

Nadia Kolbadinezhad, and Maliheh Abbasi: Patient registration and data collection, Somayeh Rostami, and Mahya Ahmadi: Analysis and interpretation of results, Nadia Kolbadinezhad, Somayeh Rostami, and Maliheh Abbasi: Draft manuscript preparation. All authors reviewed the results and approved the final version of the manuscript.

Funding

This work was not financially supported.

Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to the institution's opposition but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was ethically approved in research ethic committees of Islamic Azad University-Babol Branch (reference number: IR.IAU.BABOL.REC.1401.088). All methods were carried out in accordance with relevant guidelines and regulations. Written informed consent was obtained from all subjects and/or their legal guardian(s).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 24 September 2023 / Accepted: 29 November 2024

Published online: 06 January 2025

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