Original Article

Effectiveness of a Family-Centered Empowerment Model on Self-Efficacy in Patients with Hypertension: A Randomized Clinical Trial

Alireza Salar[1], Mehdi Rezvaniamin[1], Mahsa A. Hamedani[2]

[1]Community Nursing Research Center, Zahedan University of Medical Sciences, Zahedan, Iran, [2]Department of Nursing and Midwifery, Instructor of Medical Surgical Nursing, Hormozgan University of Medical Sciences, Hormozgan, Iran

Abstract

Background: Hypertension is a major public health challenge, and low self-efficacy undermines adherence to lifestyle change and treatment. Family-centered empowerment may strengthen self-efficacy, yet evidence in Iranian patients with hypertension is limited. This study evaluated the effect of a family-centered empowerment program on self-efficacy in adults with hypertension. **Materials and Methods:** In this randomized clinical trial (Zahedan, Iran; November 2020–September 2021), 70 patients were randomized 1:1 to intervention (four weekly 60-min family-centered empowerment sessions with a primary caregiver) or usual care. The primary outcome was hypertension self-efficacy (17-item validated scale) measured at baseline, immediately post-intervention, 1 month, and 3 months. Repeated-measures analysis of variance (ANOVA) tested time, group, and time × group effects; partial eta squared (η^2p) and Cohen's d complemented p values. **Results:** Groups were comparable at baseline (*all* $p > 0.05$). Repeated-measures ANOVA showed a significant time × group interaction for total self-efficacy ($F = 148.72$, $p < 0.001$; $\eta^2p \approx 0.69$). The intervention group improved across all time points, whereas the control group remained largely stable. At 3 months, total self-efficacy was 53.40 (2.87) (intervention) versus 46.48 (3.64) (control; $p < 0.001$; Cohen's $d = 2.11$). Similar patterns were observed for dietary adherence (32.22 (1.30) vs 28.45 (2.13); $p < 0.001$; $d = 2.14$), treatment adherence (12.88 (1.45) vs 11.65 (1.69); $p < 0.001$; $d = 0.78$), and disease management (8.28 (0.98) vs 6.37 (1.00); $p < 0.001$; $d = 1.93$). **Conclusions:** A structured family-centered empowerment program meaningfully increased self-efficacy in patients with hypertension over 3 months, with large effect sizes across total and domain scores. Given its cultural fit and low resource needs, integrating this model into routine nursing practice may enhance hypertension self-management.

Keywords: *Empowerment, family nursing, hypertension, patient-centered care, randomized controlled trial, self-efficacy*

Introduction

Hypertension is a prevalent chronic condition that significantly contributes to cardiovascular morbidity and mortality worldwide.[1] Currently, chronic and metabolic diseases are significant causes of death globally,[2] with high blood pressure (BP) causing approximately 4 million deaths annually due to complications such as stroke, myocardial infarction, heart failure, and kidney disease.[3] It is estimated that by 2025, more than 1.50 billion people worldwide will have hypertension, increasing the risk of heart disease by 50% and heart attack by 75%.[4] In Iran, approximately one-third of the adult population has hypertension.[5] In Sistan and Baluchestan Province in southeastern Iran, 21,000 patients were diagnosed with high BP in 2018, and official reports showed that in 2016, nearly 700 people died due to hypertension. Currently, 29,549 patients are registered with hypertension under the care of Zahedan University of Medical Sciences.[6] Timely diagnosis and management of hypertension can prevent serious complications such as myocardial infarction, stroke, heart failure, atrial fibrillation, aortic rupture, peripheral artery disease, and cognitive disorders.[7]

Management of hypertension is complex because many patients do not accept or deny their condition. Effective control requires lifestyle changes, including reducing sodium intake, losing weight, increasing physical activity, consuming more fruits and vegetables, limiting alcohol consumption,

How to cite this article: Salar A, Rezvaniamin M, Hamedani MA. Effectiveness of a family-centered empowerment model on self-efficacy in patients with hypertension: A randomized clinical trial. Iran J Nurs Midwifery Res 2026;31:677-84.

Submitted: 27-Jun-2025. **Revised:** 22-Nov-2025. **Accepted:** 24-Feb-2026. **Published:** 16-Jul-2026.

Address for correspondence:
Dr. Mehdi Rezvaniamin, Community Nursing Research Center, Zahedan University of Medical Sciences, Zahedan, Iran. Postal Code: 9817699693
E-mail: mehdi.rezvaniamin@gmail.com

Access this article online

Website: https://journals.lww.com/jnmr

DOI: 10.4103/ijnmr.ijnmr_246_25

Quick Response Code:

and adhering to prescribed medications.[8] However, only about 20% of patients with hypertension in Iran receive appropriate treatment.[9] Therefore, self-efficacy plays a pivotal role in changing behavior and improving the quality of life among patients with hypertension.[10] Self-efficacy enhances motivation and participation in self-care programs.[11] It refers to an individual's belief in their ability to perform self-care activities consistently and effectively.[12] Bandura's theory of self-efficacy emphasizes that it affects all aspects of behavior and can either inhibit or facilitate action, ultimately influencing health outcomes. Improving quality of life is one of the primary goals of the health care system, achievable by promoting self-efficacy.[13]

Patient and family education in hypertension has utilized multiple modalities, including brief clinician counseling or group classes, printed booklets, SMS/text reminders, smartphone or telehealth apps, and peer- or family-support programs, showing improvements in knowledge and, variably, adherence and self-management.[1-7] Yet many trials are patient-only with limited, structured caregiver engagement; when families are involved, programs often lack explicit self-efficacy–based techniques (mastery, vicarious learning, social persuasion, self-regulation), and follow-up durations are short with inconsistent reporting of effect sizes for self-efficacy outcomes.[1,3,8-11] The present trial addresses these gaps via a structured, family-centered empowerment program that systematically involves a primary caregiver, operationalizes self-efficacy strategies across four sessions, and reports standardized effects alongside Consolidated Standards of Reporting Trials (CONSORT)-aligned outcomes. With the rising prevalence of chronic diseases and limited health care facilities, the family-centered empowerment model has become a priority in medical and nursing education systems.[14] This model involves professional interaction with families to empower them in managing patient care, respecting their cultural beliefs and values, and addressing their needs to reduce dependence on the health care system.[15] Family-centered care is an innovative approach requiring collaboration between patients, families, and providers to plan, deliver, and evaluate health care effectively.[16] Given the strong connection between family and individual health status, educating family members on disease prevention and control can be effective. In chronic diseases such as hypertension, patients often depend on their families, and their attitudes are influenced by them.[17] A review of literature demonstrated that family-centered empowerment models are effective in improving quality of life and self-efficacy in diabetic teenagers,[18] elderly individuals with hypertension,[19] diabetic patients,[20] and adolescents with thalassemia major.[21]

Despite evidence supporting the benefits of family-centered empowerment models in managing various chronic diseases,[22,23] there is still a lack of evidence regarding their effectiveness specifically for patients with hypertension in Iran. Considering that families are often the best source for information exchange between health personnel and patients in the Iranian cultural context, where family plays a central role in individual health decisions and disease management, evaluating such models in hypertension care is crucial to developing effective and culturally appropriate interventions.

We hypothesized that patients receiving the family-centered empowerment program would exhibit greater increases in total self-efficacy from baseline to 3-month follow-up than those receiving usual care (primary hypothesis). We further hypothesized greater improvements in self-efficacy subdomains—dietary adherence, treatment adherence, and disease management in the intervention group versus the control at immediate, 1-month, and 3-month assessments (secondary hypotheses). Therefore, this study aimed to evaluate the effect of a family-centered empowerment program on self-efficacy among adults with hypertension.

Materials and Methods

This was a parallel group, randomized clinical trial (allocation ratio 1:1) conducted from November 2020 to September 2021 in two Comprehensive Health Centers affiliated with Zahedan University of Medical Sciences (Zahedan, Southeastern Iran). The trial adhered to CONSORT recommendations and was prospectively registered (IRCT20201028049223N1). Adults with a documented diagnosis of hypertension were screened using the Integrated Health System records and clinic lists. Inclusion criteria were age 25–65 years; systolic blood pressure (SBP) >140 mmHg or diastolic blood pressure (DBP) >90 mmHg (per medical record/clinic measurement); ≥6 months since diagnosis; basic literacy; availability of one primary family caregiver willing to attend sessions; no participation in similar educational programs in the preceding 6 months; and availability for 3-month follow-up. Exclusion criteria were acute intercurrent illness; hospitalization during the study; or withdrawal of consent at any time. Sampling proceeded in multiple stages: urban districts were treated as clusters; two districts were randomly selected, and one health center per district was included. After writing informed consent and baseline assessment, participants were randomized to intervention or control. The random sequence was generated by an independent statistician using computer-generated permuted blocks with variable block sizes to ensure balance. Allocation concealment was maintained using Sequentially Numbered, Opaque, Sealed Envelopes (SNOSE) prepared off-site by a researcher not involved in enrollment. Clinic staff opened the next envelope only after completing baseline measures, preventing foreknowledge of assignment. Given the behavioral nature of the program, participants and facilitators could not be blinded. To mitigate detection bias, outcome assessors (nurses administering the questionnaires) were not part of the

intervention team, followed a standardized script, and were instructed to avoid discussing allocation. Potential impacts of the open-label design (performance and reporting biases) are acknowledged in the Discussion.

Participants randomized to the intervention received four weekly, 60-min, small-group sessions attended by the patient and a primary family caregiver (e.g., spouse/adult child). Content, grounded in a family-centered empowerment model, covered: (1) hypertension knowledge (nature, symptoms, complications, prognosis); (2) lifestyle modification (dietary sodium reduction, weight control, physical activity, medication adherence); (3) self-efficacy skills (goal-setting, self-monitoring, problem-solving, relapse prevention), self-control, and self-esteem. Delivery methods included two-way discussions, slide presentations, short videos, and printed booklets. Participants received all educational materials at the final session and a contact number for clarifications. Controls continued routine clinic services (physician/health-education as ordinarily provided). They completed outcome assessments on the same schedule and received the educational booklet after the last follow-up.

Self-efficacy assessment: Self-efficacy was assessed using the Persian version of the hypertension self-efficacy questionnaire, validated in Iranian patients by Gheshlagh *et al*.[24] The final Persian version contains 17 items (after psychometric evaluation) and comprises three domains: diet regimen, disease management, and treatment adherence. Items are rated on a four-point Likert scale from 1 (not sure) to 4 (absolutely sure). Total scores range from 17 to 68, with higher scores indicating greater self-efficacy. The instrument has demonstrated acceptable reliability in the validation study (overall Cronbach's alpha ≈ 0.82; intraclass correlation coefficient [ICC] ≈ 0.93).

A brief demographic/clinical form (age, sex, marital/occupation status, smoking, family history, body mass index (BMI), education years for patients/caregivers, disease duration, BP control status) was also completed. Trained nurses, not involved in delivering the intervention, administered questionnaires in quiet clinic rooms, following a standardized protocol. Forms were checked on site for completeness; any missing responses were immediately clarified with participants. Data were double-entered and cross-checked before analysis. Seventy participants were enrolled and randomized (35 per group). All participants completed all follow-ups (0 dropouts); thus, the analysis included the full randomized sample. Participant flow is presented in the CONSORT flow diagram [Figure 1]. Analyses were conducted in SPSS v26 (IBM Corp., Armonk, NY, USA) with $\alpha = 0.05$ (two-sided). Baseline comparability was assessed using independent-samples t-tests (continuous variables) or Chi-square tests (categorical variables). The primary analysis used repeated-measures analysis of variance (ANOVA) with factors time (baseline, immediate, 1 month, 3 months) and group (intervention vs control). Mauchly's test of sphericity was examined; if violated, Greenhouse–Geisser corrections were applied. Bonferroni-adjusted pairwise comparisons summarized within-group change over time. To complement *P* values, we prespecified reporting of effect sizes: partial eta squared (η^2) for ANOVA main effects and interactions, and Cohen's d for between-group differences at key time points (using pooled standard deviation (SD)). For key mean differences, 95% confidence intervals (CI) are reported. Because there were no missing outcomes, complete-case analysis coincides with intention-to-treat for the measured endpoints.

Ethical considerations

The study was approved by the Ethics Committee of Zahedan University of Medical Sciences (IR.ZAUMS.REC.1399.171). Written informed consent was obtained from all participants. The privacy and confidentiality of all patients were strictly maintained, and no identifiable information was collected or published.

Results

The study included 70 patients with hypertension (35 in each group) and had no dropouts, achieving 100% retention [Figure 1]. Table 1 presents baseline demographic characteristics. The mean (SD) age of patients was 48.80 (6.31) years in the intervention group and 49.91 (7.74) years in the control group ($p = 0.51$). Most participants were female (18 [51.40%] vs 23 [65.70%]) and married (26 [74.30%] vs 27 [77.10%]). No significant between-group differences were found at baseline for gender, marital status, occupation, smoking status, family history of hypertension, underlying diseases, BP control status, BMI, years of education (patients and caregivers), or disease duration ($p > 0.05$ for all variables), indicating comparability between groups.

Table 2 shows the results of repeated-measures ANOVA. There was a significant interaction effect between time and group for total self-efficacy scores ($F = 148.72$, $p < 0.001$), suggesting that the pattern of changes in self-efficacy differed significantly between the intervention and control groups. Significant main effects were also observed for time ($F = 190.18$, $p < 0.001$) and group ($F = 35.65$, $p < 0.001$).

As presented in Table 3, the intervention group showed significant improvements in mean total self-efficacy scores and all its subdomains—dietary adherence, treatment compliance, and disease management—at both one month and three months post-intervention compared to baseline ($p < 0.001$). For dietary adherence, the mean score increased from 28.34 (1.83) at baseline to 31.42 (1.33) at one month and 32.22 (1.30) at three months ($p < 0.001$). Treatment compliance scores increased from 11.91 (1.90) to 12.77 (1.71) at one month and 12.88 (1.45) at three months ($p < 0.001$). Disease management scores improved

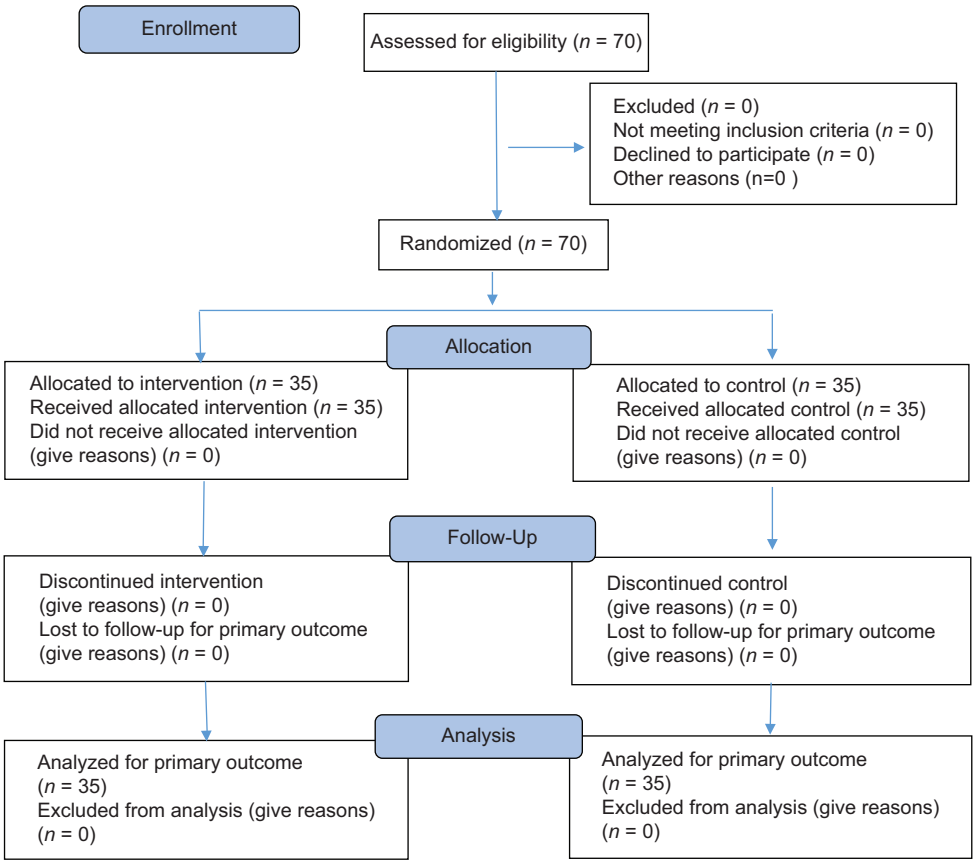

Figure 1: Flow diagram of the progress through the phases of a randomized trial of two groups (that is, enrollment, intervention allocation, follow-up, and data analysis)

Table 1: Frequency distribution of demographic characteristics of Hypertension patients in the intervention and control groups

Variable		Control group, *n* (%)		Intervention group, *n* (%)		*p* value
Gender	Female	23 (65.71%)	23 (65.71%)	18 (51.43%)	18 (51.43%)	0.33*
	Male	12 (34.29%)	12 (34.29%)	17 (48.57%)	17 (48.57%)	
Marital status	Single	8 (22.86%)	8 (22.86%)	9 (25.71%)	9 (25.71%)	0.78*
	Married	27 (77.14%)	27 (77.14%)	26 (74.29%)	26 (74.29%)	
ccupation	Employed	11 (31.43%)	11 (31.43%)	13 (37.14%)	13 (37.14%)	0.60*
	Unemployed	24 (68.57%)	24 (68.57%)	22 (62.86%)	22 (62.86%)	
Smoking	Yes	11 (31.43%)	11 (31.43%)	13 (37.14%)	13 (37.14%)	0.60*
	No	24 (68.57%)	24 (68.57%)	22 (62.86%)	22 (62.86%)	
Family history of hypertension	Yes	25 (71.43%)	25 (71.43%)	29 (82.86%)	29 (82.86%)	0.25*
	No	10 (28.57%)	10 (28.57%)	6 (17.14%)	6 (17.14%)	
Underlying disease	Yes	24 (68.57%)	24 (68.57%)	26 (74.29%)	26 (74.29%)	0.60*
	No	11 (31.43%)	11 (31.43%)	9 (25.71%)	9 (25.71%)	
Blood Pressure control	With medication	23 (65.71%)	23 (65.71%)	25 (71.43%)	25 (71.43%)	0.60*
	Without medication	12 (34.29%)	12 (34.29%)	10 (28.57%)	10 (28.57%)	
Age		49.91 (7.74)		48.80 (6.31)		0.51*
BMI		28.42 (5.10)		29.24 (3.95)		0.46*
Patients' years of education		8.97 (3.75)		7.77 (3.30)		0.16*
Caregiver's academic years		10.80 (3.17)		10.31 (3.03)		0.51*
Disease duration		10.09 (6.03)		12.11 (5.38)		0.14*

Values are presented as mean (SD) or *n* (%). *p* values were obtained using an independent-samples *t*-test for continuous variables and a Chi-square test for categorical variables. BMI: Body mass index; SD: Standard deviation

Table 2: Repeated-measures ANOVA for self-efficacy in patients with hypertension (intervention vs control)

Variable	Sum of squares	Degrees of freedom	Mean square	*F* value	*p* value	Partial eta
Time	418.31	1	418.31	190.18	<0.001	0.74
Group	1092.58	1	1092.58	35.65	<0.001	0.34
Time × Group	327.11	2	327.11	148.72	<0.001	≈0.69
Error	2084.29	68	30.65	–	–	–

Partial eta squared ($\eta^2 p$) computed as $F \times df\_effect/(F \times df\_effect + df\_error)$. $\eta^2 p$ values indicate large effects for Time (0.74), Group (0.34), and the Time × Group interaction (≈0.69). Interaction $\eta^2 p$ is approximated based on corrected degrees of freedom (e.g., Greenhouse–Geisser). *p* values are two-sided; α=0.05. ANOVA: Analysis of variance

Table 3: Comparison of mean (SD) self-efficacy scores and subscales at baseline, 1 month, and 3 months by group

Variable	Group	Baseline (Mean (SD))	1 month (Mean (SD))	3 months (Mean (SD))	Between-group *p* value (Baseline)	Between-group *p* (1 month)	Between-group *p* (3 months)
Dietary adherence	Intervention	28.34 (1.83)	31.42 (1.33)	32.22 (1.30)			
	Control	28.20 (1.92)	28.45 (1.97)	28.45 (2.13)	*p*=0.33*	*p*<0.001*	*p*<0.001*
Treatment adherence	Intervention	11.91 (1.90)	12.77 (1.71)	12.88 (1.45)			
	Control	11.51 (1.73)	11.57 (1.77)	11.65 (1.69)	*p*=0.75*	*p*<0.001*	*p*<0.001*
Disease management	Intervention	6.63 (1.19)	8.17 (1.22)	8.28 (0.98)			
	Control	6.37 (1.03)	6.37 (1.00)	6.37 (1.00)	*p*=0.36*	*p*<0.001*	*p*<0.001*
Total self-efficacy	Intervention	46.88 (3.38)	52.37 (2.90)	53.40 (2.87)			
	Control	46.08 (3.60)	46.40 (3.69)	46.48 (3.64)	*p*=0.34*	*p*<0.001*	*p*<0.001*

Between-group *p* values at each time point are from independent-samples tests; "*" indicates results consistent with the repeated-measures ANOVA (RM-ANOVA) framework. RM-ANOVA with Bonferroni adjustment: Time $p \leq 0.001$; Group $p > 0.05$; Time × Group $p \leq 0.001$. Cohen's *d* (between-group) at each time point — Total: baseline 0.23; 1-month 1.80; 3-month 2.11. Diet: baseline 0.07; 1-month 1.77; 3-month 2.14. Treatment adherence: baseline 0.22; 1-month 0.69; 3-month 0.78. Disease management: baseline 0.23; 1-month 1.61; 3-month 1.93. Computed using pooled SD; values ≥0.80 are considered large. SD: Standard deviation; ANOVA: Analysis of variance

from 6.63 (1.19) to 8.17 (1.22) at one month and 8.28 (0.98) at three months ($p < 0.001$). The total self-efficacy score in the intervention group increased from 46.88 (3.38) at baseline to 52.37 (2.90) at one month and 53.40 (2.87) at three months ($p < 0.001$).

In contrast, the control group showed no significant changes in mean scores for total self-efficacy or its subdomains at any time point ($p > 0.05$). For example, the total self-efficacy score changed only slightly from 46.08 (3.60) at baseline to 46.40 (3.69) at one month and 46.48 (3.64) at three months, with no statistical significance ($p > 0.05$).

Additionally, pairwise comparisons using the Bonferroni correction indicated that in the intervention group, all comparisons between baseline, one month, and three months post-intervention were statistically significant ($p \leq 0.001$), while no significant changes were observed in the control group.

Overall, these results demonstrate that the family-centered empowerment intervention led to significant and sustained improvements in self-efficacy and its dimensions among hypertensive patients, while no such improvements were observed in the control group.

Discussion

This randomized controlled trial demonstrated that implementing a family-centered empowerment model led to significant improvements in total self-efficacy and its dimensions, including dietary adherence, treatment compliance, and disease management among patients with hypertension. These findings underscore the importance of family involvement as an effective strategy in managing chronic conditions such as hypertension, which remains a major public health challenge globally.[1,3]

Consistent with previous studies, this research confirms the positive impact of self-efficacy enhancement on health behaviors and treatment adherence. For instance, Tan *et al*.[11] in a systematic review highlighted that higher self-efficacy levels are associated with better self-care practices in hypertensive patients. Similarly, Peyman *et al*.[10] found that self-efficacy-based education improved self-care behaviors in heart failure patients, emphasizing its role across cardiovascular conditions.

The present study expands on these findings by incorporating family-centered empowerment as a culturally sensitive intervention. In Iran, where family plays a central role in health-related decisions,[5,14] engaging family members enhances social support, facilitates behavior change, and addresses psychosocial barriers to treatment adherence. This aligns with Bandura's social cognitive theory, which posits that observational learning, social persuasion, and emotional support from significant others enhance self-efficacy beliefs.[12,13]

The significant improvement in dietary adherence observed in our study is consistent with Aggarwal *et al*.,[25] who reported that low social support was associated with poor dietary compliance in cardiovascular patients. Unlike Chien *et al*.,[26] who reported that education alone did not significantly impact dietary behaviors, the multisession empowerment approach in the present study combined knowledge provision with practical skill-building and family involvement, leading to sustained behavioral changes. This suggests that educational interventions should extend beyond information transfer to include strategies for enhancing self-efficacy and leveraging family support systems.

Treatment compliance also improved significantly, aligning with findings by Rezaei Asl *et al*. demonstrating the effectiveness of family-centered empowerment in improving treatment adherence among diabetic and cardiac patients.[27,28] Multimodal interventions combining verbal, written, and interactive educational methods, as shown by Wu *et al*. and Berben *et al*.,[29,30] further reinforce the necessity of diverse strategies for optimizing adherence. Moreover, van Dulmen *et al*.[31] emphasized that multifaceted approaches targeting patient motivation and skills are essential for chronic disease management.

However, Khosravizade *et al*.[32] found no significant improvement in medication adherence among hypertensive women following self-efficacy-based education, despite dietary and weight control improvements. This discrepancy may be due to differences in intervention design, population characteristics, and duration of follow-up.

Regarding disease management, the observed improvements support the assertion that self-efficacious patients are more likely to engage in health-promoting behaviors and achieve better clinical outcomes.[26,33] Algabbani *et al*. showed that patients with better knowledge and understanding of their disease were significantly more likely to adhere to treatment plans,[34,35] while van Truong *et al*.[36] highlighted the positive impact of self-management programs on BP and self-efficacy in elderly hypertensive patients.

The family-centered empowerment program likely improved self-efficacy and related behaviors through mutually reinforcing psychosocial and behavioral pathways grounded in social cognitive theory. First, session activities (goal setting, self-monitoring, problem-solving, and relapse-prevention drills) provided mastery experiences and self-regulatory skills, directly strengthening patients' confidence to perform hypertension self-care. Second, the presence of a designated caregiver enabled vicarious learning (observing and practicing skills together) and social persuasion (verbal encouragement, positive feedback), while also supplying emotional and instrumental support (e.g., help with medication refills, shopping, meal preparation), which reduces day-to-day barriers to adherence. Third, the dyadic format enhanced accountability and cueing (shared routines, reminders), likely increasing treatment adherence and diet fidelity between sessions. Fourth, culturally tailored discussion of family roles may have realigned injunctive and descriptive norms around salt intake, physical activity, and medication use, translating knowledge into sustained behavior change. These mechanisms map onto the observed pattern of effects: the largest between-group differences emerged in dietary adherence and disease management, domains most sensitive to daily household support and shared routines, followed by treatment adherence, which benefits from reminders and logistical help. Conceptually, self-efficacy functions as a proximal mediator linking the intervention to improved behaviors; downstream, better adherence should facilitate BP control and cardiovascular risk reduction over time. Future work should (i) measure mediators (e.g., self-efficacy, perceived support, habit strength) at multiple time points, (ii) test mediation models to quantify indirect effects, (iii) examine moderators (baseline social support, caregiver relationship quality, health literacy, gender), and (iv) incorporate objective outcomes (e.g., home BP, pharmacy refill data, sodium biomarkers) to triangulate self-report and clarify the full pathway from empowerment to clinical benefit.

This single-region trial was conducted in two comprehensive health centers in Zahedan, which may limit generalizability to other provinces in Iran or health systems with different family structures, resources, or educational norms. Because enrollment required the availability of a willing family caregiver, participants may represent a subgroup with higher baseline social support and motivation than the broader hypertensive population, potentially inflating observed benefits. Although individual randomization within two sites reduces selection bias, we did not model a potential site/cluster effect; unmeasured differences between centers could have influenced outcomes. The intervention was necessarily unblinded to participants and facilitators; despite using outcome assessors who were separate from the intervention team and followed a standardized script, some performance, detection, and social-desirability biases are still possible. Outcomes relied on self-report (self-efficacy and its subscales) using a four-point scale, which can introduce common-method variance and ceiling effects after training; this may overestimate true behavior change. We did not include objective clinical endpoints (e.g., home/ambulatory BP, pharmacy refill data, or sodium biomarkers), nor electronic adherence monitoring, so links between improved self-efficacy and downstream clinical control of BP remain inferential. The follow-up was short (3 months); the durability of effects beyond this window is unknown. Finally, multiple time-point and subscale comparisons raise the risk of type I error; while we used repeated-measures ANOVA with appropriate corrections and reported effect sizes, *a priori* multiplicity control across all secondary comparisons was limited. Future studies should recruit from

diverse urban/rural settings, incorporate objective adherence and BP measures, account for clustering, extend follow-up, and test mediation (self-efficacy, perceived support) to clarify mechanisms and strengthen external validity.

This study was conducted in two health centers affiliated with Zahedan University of Medical Sciences, which may limit generalizability. The coronavirus disease (COVID-19) pandemic affected full participation and implementation fidelity. Additionally, reliance on self-reported questionnaires may introduce response biases. Future studies should incorporate objective clinical outcome measures alongside self-reported scales.

Conclusion

This clinical trial supports the use of family-centered empowerment models in hypertensive care. The family-centered empowerment model significantly improved self-efficacy and its dimensions in hypertensive patients. Given its affordability, cultural compatibility, and effectiveness, this intervention is recommended as a practical strategy for nurses and policymakers to enhance self-management behaviors and improve hypertension control, especially in resource-limited settings.

Acknowledgments

This study is extracted from the master's thesis in Internal Surgical Nursing, approved by the Nursing and Midwifery Faculty of Zahedan University of Medical Sciences (Code: 51746).

Financial support and sponsorship

Internal Surgical Nursing at Zahedan University of Medical Sciences

Conflict of interest

Nothing to declare.

References

1. Li X, Li C, Zhang W, Wang Y, Qian P, Huang H. Inflammation and aging: Signaling pathways and intervention therapies. Signal Transduct Target Ther 2023;8:239.
2. Chowdhury SR, Chandra Das D, Sunna TC, Beyene J, Hossain A. Global and regional prevalence of multimorbidity in the adult population in community settings: A systematic review and meta-analysis. EClinicalMedicine 2023;57:101860.
3. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: A pooled analysis of 1201 population-representative studies with 104 million participants. Lancet 2021;398:957-80.
4. Mancia G, Kreutz R, Brunstrom M, Burnier M, Grassi G, Januszewicz A, *et al*. 2023 ESH guidelines for the management of arterial hypertension. J Hypertens 2023;41:1874-2071.
5. Mohammadi S, Hassanipour S, Delam H, Nikbakht HA, Far ZG, Firoozi D, *et al*. Prevalence of hypertension in Iran: An updated systematic review and meta-analysis of community-based studies. Caspian J Intern Med 2023;14:607-17.
6. Zare MG, Okati-Aliabad H, Ansari-Moghaddam A, Mohammadi M, Shahraki-Sanavi F. Prevalence and risk factors of pre-hypertension and hypertension among adults in Southeastern Iran: Findings from the baseline survey of the Zahedan adult cohort study. PLoS One 2023;18:e0295270.
7. McEvoy JW, McCarthy CP, Bruno RM, Brouwers S, Canavan MD, Ceconi C, *et al.*; ESC Scientific Document Group. 2024 ESC guidelines for the management of elevated blood pressure and hypertension. Eur Heart J 2024;45:3912-4018.
8. Carey RM, Muntner P, Bosworth HB, Whelton PK. Prevention and control of hypertension. J Am Coll Cardiol 2018;72:1278-93.
9. Mirzaei M, Mirzaei M, Bagheri B, Dehghani A. Awareness, treatment, and control of hypertension and related factors in adult Iranian population. BMC Public Health 2020;20:1-10.
10. Peyman N, Shahedi F, Abdollahi M, Doosti H, Zadehahmad Z. Impact of self-efficacy strategies education on self-care behaviors among heart failure patients. J Tehran Heart Cent 2020;15:6.
11. Tan FC, Oka P, Dambha-Miller H, Tan NC. The association between self-efficacy and self-care in essential hypertension: A systematic review. BMC Fam Pract 2021;22:1-12.
12. Abolhassani M, Beheshtifar M. Job skill the essence of self-efficacy. QUID Investig Cienc Technol 2017;2017:2417-22.
13. Isnaini N, Dewi FT, Madyaningrum E, Noviana U. Family-centered education for older adults with hypertension: A scoping review. Iranian J Public Health 2025;54:36-47.
14. Salar A, Rezvaniamin M, Pournamdar Z, Yoosefian N. Impact of family-centered empowerment on laboratory outcomes in hemodialysis: A quasi-experimental study. Jundishapur J Chronic Dis Care 2025;14:e165757.
15. Farias DH, Almeida MF, Gomes GC, Lunardi VL, Queiroz MV, Nörnberg PK, *et al*. Beliefs, values and practices of families in the care of hospitalized children: Subsidies for nursing. Rev Bras Enferm 2020;73:e20190553.
16. Kokorelias KM, Gignac MA, Naglie G, Cameron JI. Toward a universal model of family centered care: A scoping review. BMC Health Serv Res 2019;19:1-11.
17. Liu L, Qian X, Chen Z, He T. Health literacy and its effect on chronic disease prevention: Evidence from China's data. BMC Public Health 2020;20:1-14.
18. Sargazi Shad T, Kermansaravi F, Navidian A. Effect of the family-centered empowerment model on quality of life and self-efficacy in adolescents with type 1 diabetes referring to the Ali Asghar's clinic in Zahedan, 2016. Iran J Endocrinol Metab 2018;19:330-9.
19. Hedayati B. Effect of family-based empowerment model on the self-efficacy of hypertensive elderly people. Salmand 2018;13:86-97.
20. Atashzadeh-Shoorideh H, Arshi S, Atashzadeh-Shoorideh F. The effect of family-centered empowerment model on the life style, self-efficacy and Hba1c of diabetic patients. Iran J Endocrinol Metab 2017;19:244-51.
21. Borimnejad L, Parvizy S, Haghaani H, Sheibani B. The effect of family-centered empowerment program on self-efficacy of adolescents with thalassemia major: A randomized controlled clinical trial. Int J Community Based Nurs Midwifery 2018;6:29-38.
22. World Health Organization. Guideline for the Pharmacological Treatment of Hypertension in Adults. Geneva: World Health Organization; 2021.
23. Khezri R, Ravanipour M, Motamed N, Vahedparast H. Effect of self-management empowering model on the quality of life in the elderly patients with hypertension. Iran J Aging 2016;10:68-79.
24. Gheshlagh RG, Parizad N, Ghalenoee M, Dalvand S, Baghi V,

Najafi F, *et al*. Psychometric features of the Persian version of self-efficacy tool for patients with hypertension. Int Cardiovasc Res J 2018;12:50-6.

25. Aggarwal B, Liao M, Allegrante JP, Mosca L. Low social support level is associated with nonadherence to diet at 1 year in the Family Intervention Trial for Heart Health (FIT Heart). J Nutr Educ Behav 2010;42:380-8.
26. Chien W-T, Chiu Y, Lam L-W, Ip W-Y. Effects of a needs-based education programme for family carers with a relative in an intensive care unit: A quasiexperimental study. Int J Nurs Stud 2006;43:39-50.
27. Rezai Asl H, Pishgooi SA, Alhani F. The effectiveness of "Family-Centered Empowerment Model" on the treatment adherence of patients with type II diabetes and heart disorder admitted to AJA Hospitals, during year 2015. Mil Caring Sci J 2017;4:58-69.
28. Hakim A, Mahmoodi F, Renani HA, Latifi M. Effect of family-centered empowerment model on treatment regimen of the school-aged children with diabetes: A randomized controlled trial. Jundishapur J Chronic Dis Care 2014;3:32259.
29. Wu J-R, Moser DK, Chung ML, Lennie TA. Predictors of medication adherence using a multidimensional adherence model in patients with heart failure. J Card Fail 2008;14:603-14.
30. Berben L, Bogert L, Leventhal ME, Fridlund B, Jaarsma T, Norekvål TM, *et al*. Which interventions are used by health care professionals to enhance medication adherence in cardiovascular patients? A survey of current clinical practice. Eur J Cardiovasc Nurs 2011;10:14-21.
31. van Dulmen S, Sluijs E, Van Dijk L, de Ridder D, Heerdink R, Bensing J. Patient adherence to medical treatment: A review of reviews. BMC Health Serv Res 2007;7:1-13.
32. Khosravizade A, Hassanzadeh A, Mostafavi F. The impact of self-efficacy education on self-care behaviors of low salt and weight setting diets in hypertensive women covered by health-care centers of Dehaghan in 2013. J Pak Med Assoc 2015;65:506-11.
33. Yahyavi SH, Pourrahimi M. Impact of dietary behaviors and exercise activities education on the self-efficacy of middle school students. Med Sci J Islam Azad Univ Tehran Med Branch 2012;22:143-51.
34. Boroumand S, Shahriari M, Jebeli MA, Baghersad Z, Baradaranfard F, Ahmadpoori F. Determine the level of self-efficacy and its related factors in patients with ischemic heart disease: A descriptive correlational study. Iran J Nurs Res 2015;9:61-9.
35. Algabbani FM, Algabbani AM. Treatment adherence among patients with hypertension: Findings from a cross-sectional study. Clin Hypertens 2020;26:1-9.
36. Van Truong P, Apriliyasari RW, Lin MY, Chiu HY, Tsai PS. Effects of self-management programs on blood pressure, self-efficacy, medication adherence and body mass index in older adults with hypertension: Meta-analysis of randomized controlled trials. Int J Nurs Pract 2021;27:e12920.