Original Article

Home Health Care Management & Practice
1–8

DOI: 10.1177/10848223211012727
journals.sagepub.com/home/hhc
SAGE

The Effects of Home-Based Self-Care Education on Blood Pressure and Self-Care Behaviors among Middle-Aged Patients with Primary Hypertension in Iran: A Randomized Clinical Controlled Trial

Sara Hazrati Gonbad, MSc[1], Masoumeh Zakerimoghadam, PhD[1], Shahzad Pashaeypoor, PhD[2,3], and Shima Haghani, MSc[4]

Abstract

Self-care education (SCE) through home visit is one of the methods with potential effects on self-care. This study aimed to evaluate the effects of home-based SCE on blood pressure and self-care behaviors among middle-aged patients with primary hypertension in Iran. This randomized controlled trial was conducted on 110 middle-aged patients with hypertension recruited from public healthcare centers in the south of Tehran, Iran in September 2019. After convenience sampling, Participants were simple randomly allocated to control and intervention groups. Intervention group received a 2-month home-based SCE while control group received routine care services. Before and 2 months after the intervention, self-care behaviors were assessed using the Hypertension Self-Care Activity Level Effects (H-SCALE). Data were analyzed using the SPSS software (v. 16.0) at a significance level of less than .05. After 2 months, the posttest mean scores of self-care behaviors in medication adherence (17.42 ± 1.03 vs 14.49 ± 1.01, $p = .04$), physical activity (8.16 ± 0.39 vs 6.47 ± 0.52, $p = .01$), low-salt diet (52.51 ± 3.8 vs 35.36 ± 3.47, $p = .001$), and blood pressure control (3.47 ± 0.22 vs 2.42 ± 1.89, $p = .001$), in the intervention group were significantly greater than the control group. However, there were no significant between-group differences respecting the posttest mean scores of the weight management ($p = .06$) and smoking cessation ($p = .2$). Also, the mean blood pressure between the 2 groups changed after the intervention, but this difference was not statistically significant. This study suggests the effectiveness of home-based SCE in significantly improving self-care behaviors among patients with hypertension. But more studies are needed to measure the effectiveness of intervention on blood pressure.
IRCT code: IRCT20190623043985N1. *Registered 06/30/2019*, https://fa.irct.ir/trial/40351.

Keywords

hypertension, blood pressure, home care, self-care

Introduction

Hypertension is a prevalent non-communicable disease with a progressively increasing global disease burden.[1,2] It accounts for 4.5% of total global disease burden and affects more than one fourth of the global adult population. It is estimated that by 2025, the prevalence of hypertension will increase by 24% in developed countries and by 80% in developing countries. A national survey in Iran showed that in 2016, around one third of adults aged over thirty suffered from hypertension. In recent years, hypertension has caused 7.5 million deaths in Iran.[3,4]

The main reasons for primary hypertension are still poorly known. Yet, its modifiable risk factors include smoking, obesity, limited physical activity, alcohol consumption, and high-sodium low-potassium diet.[5] Hypertension is a major modifiable risk factor for cardiovascular disease and the most common cause of cardiac and renal failure and stroke in most countries.[1,2]

[1]School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Community Health and Geriatric Nursing, School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran
[3]Community Based Participatory Research Center, Iranian Institute for Reduction of High – Risk Behaviors, Tehran University of Medical Sciences, Tehran, Iran
[4]Nursing Care Research Center, Iran University of Medical Sciences, Tehran, Iran

Corresponding Author:
Shahzad Pashaeypoor, Department of Community Health and Geriatric Nursing, School of Nursing and Midwifery, Tehran University of Medical Sciences, Nosrat St., Tohid Sq., Tehran 1419733171, Iran.
Email: sh-pashaeipour@tums.ac.ir

Self-care and lifestyle modification are among the key components of effective hypertension management.[3,6] Self-care improves patients' ability to cope with life events, promotes their autonomy, maintains and promotes their health,[7,8] and helps them effectively manage their chronic conditions.[4,7] Self-care among patients with chronic conditions reduces the number of patient visits to general physicians by 40%, number of patient visits to medical specialists by 17%, hospitalization rate by 50%, attendance at emergency healthcare centers by 50%, number of absences from work by 50%, and thereby, reduces healthcare costs and improves quality of life.[4,9]

Education is one of the methods for promoting self-care behaviors.[4,10] As hypertension needs lifelong management, education is needed to improve patients' knowledge about hypertension, its complications, and self-care.[11] Accordingly, self-care education (SCE) about healthy lifestyle is a key component of hypertension management.[7,12]. However, despite the use of SCE programs, evidence shows poor hypertension management and poor self-care status among afflicted patients.[8-10]

Education through home visit is one of the methods for providing SCE. Most previous studies into the effects of home visit reported the positive effects of home-based patient education on quality of life, trainability, satisfaction, and lifestyle among different patient populations.[13-15] Home-based education is provided in patients' daily life environment, promotes family members' involvement in the process of care, improves patients' comfort and their control over their conditions, and helps education providers better assess family structure, sources of family support, and barriers to health promotion. It provides good opportunities for talking to patients who cannot or are unwilling to attend healthcare centers.[1,16-18]

Middle age is the stage of transition to old age. In other words, middle age is the culmination of people's lives that all aspects of health must be considered. But, middle-aged people spend less time on their health. Due to the growing trend of the middle-aged and elderly population in Iran, it is necessary to plan carefully to ensure the health of this group of people in the community; because many middle-aged people suffer from chronic diseases such as hypertension and irreversible complications. Today, trying to reduce mortality due to chronic diseases and disabilities of this period is one of the health goals. So, it is recommended to education of proper lifestyle, healthy nutrition, physical activity, screening for diseases and cancers.[19-22]

Despite the potential positive effects of home-based education on patient outcomes, there are limited data about its effects on self-care behaviors among patients with hypertension. Therefore, the present study was conducted to narrow this gap. The aim of the study was to evaluate the effects of home-based SCE on blood pressure and self-care behaviors among middle-aged patients with primary hypertension in Iran.

Methods

Design and Study Population

This parallel randomized controlled trial was conducted using a 2-group pretest-posttest design in September 2019.

Study population recruited by convenience sampling and comprised all middle-aged patients with primary hypertension who referred to public healthcare centers in the south of Tehran, Iran. This area is covered by Tehran University of Medical Sciences and has a diverse population in demographics. Samples were selected consecutively considering the inclusion criteria. Inclusion criteria were age between 35 and 59 years, basic literacy skills, ability to establish effective communication, definite diagnosis of hypertension, and no history of psychological problems based on the data obtained from medical records. Participants were excluded if they unilaterally withdrew from the study, developed acute hypertension, or went on a trip during the study. In total, 156 patients were eligible who were invited to the study through telephone contact. Subsequently, 138 patients agreed to participate. Each of these 138 patients received a numerical code and then, 28 of them were randomly selected through drawing lot and were excluded. Then, the remaining 110 patients were recruited to the study and randomly allocated to either a control ($n=55$) or an intervention ($n=55$) group through simple randomization and a table of random numbers. Participants did not know which group they belonged to.

Sample size was calculated with a confidence interval of 95%, a power of 80%, and according to previous studies[20] and according to the sample size formula, we determined 44 patients in each group; considering an attrition rate of about 20%, sample size was increased to 55 per group.

$$n = \frac{(z_{1-\alpha/2} + z_{1-\beta})^2 \times \left(s_1^2 + s_2^2\right)}{d^2} = \frac{(1.96 + 0.84)^2 \times \left(17.2^2 + 12.4^2\right)}{9^2} \approx 44$$

In total, 110 patients with primary hypertension were recruited to the study. Ten participants from the intervention group were excluded due to unwillingness to receive SCE (5 participants), going on a trip during the study intervention (3 participants), or non-attendance at the study setting for posttest assessment (2 participants). On the other hand, 6 participants from the control group were excluded due to non-attendance at the study setting for posttest assessment. Finally, the data collected from 45 participants in the intervention group and 49 participants in the control group were analyzed (Figure 1).

Instruments

Data were collected using a personal characteristics questionnaire and the Hypertension Self-Care Activity Level

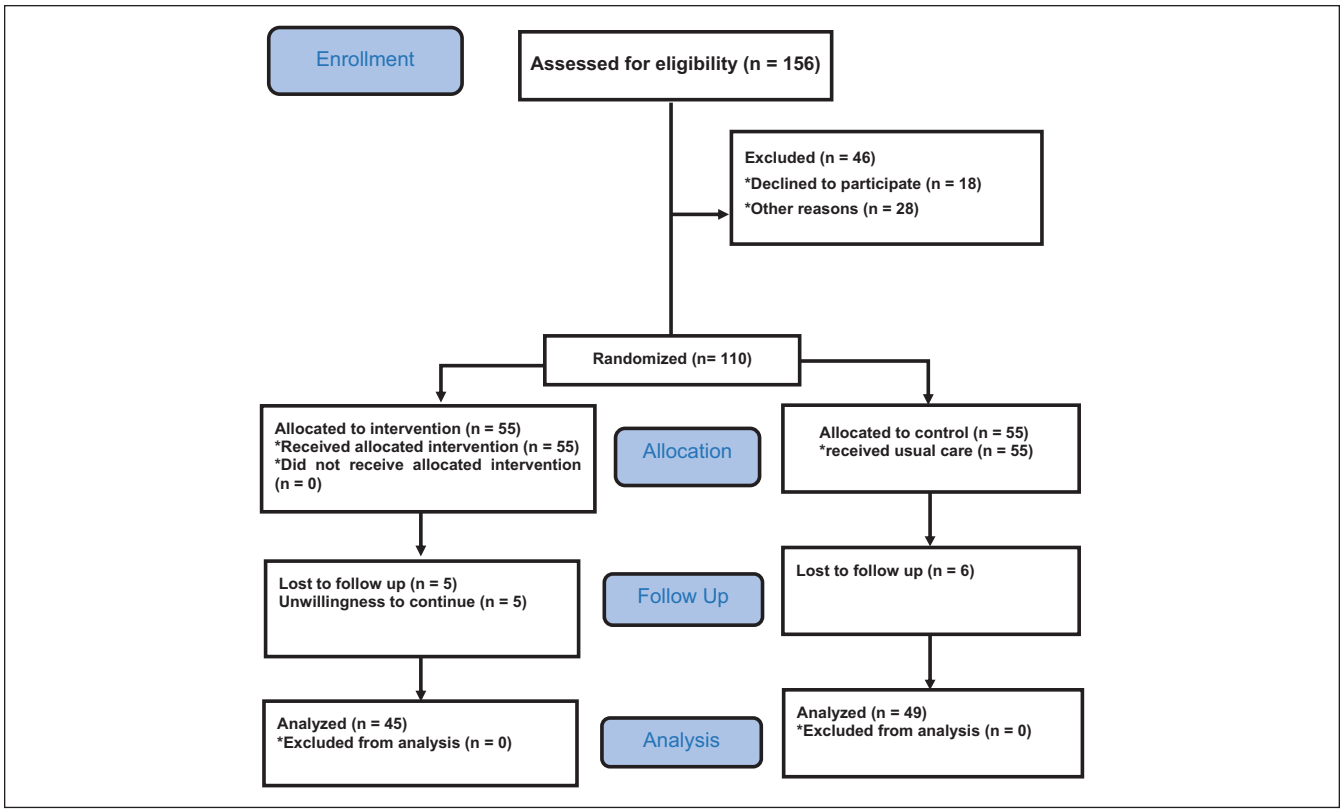

Figure 1. CONSORT diagram.

Effects (H-SCALE).[19] The items of the personal characteristics questionnaire were on age, gender, educational level, financial status, marital status, blood pressure, height, weight, and body mass index.

H-SCALE assesses self-care behaviors in the past 7 days. The original version was designed by Warren et al in 2011 and its validity and reliability were measured and its reliability was 0.70.[23] It contains 30 items in 6 main dimensions, namely medication adherence, weight management, physical activity, smoking cessation, low-salt diet, and blood pressure control. The 3 items of the medication adherence dimension are scored on a 0 to 7 scale, resulting in a total score of 0 to 21 with higher scores showing closer medication adherence. The low-salt diet dimension includes 12 items scored on a 0 to 7 scale, resulting in a total score of 0 to 84 with scores equal to 72 and greater showing closer adherence. The physical activity dimension includes 2 items scored on a 0 to 7 scale, resulting in a total score of 0 to 14 with scores equal to 8 and greater showing regular physical activity. Similarly, the smoking cessation dimension has 2 items scored on a 0 to 7 scale. Respondents who obtain zero score from both items are considered non-smokers and others are considered smokers. The weight management dimension has 10 items scored on a 5-point Likert scale from 1 ("Completely disagree") to 5 ("Completely agree"). Therefore, the possible total score of this dimension is 10 to 50, with scores 40 to 50 showing close adherence to weight management behaviors. The blood pressure dimension also includes 1 item scored 0 to 7, with scores greater than 3 showing regular blood pressure control. Higher total scores of H-SCALE show better hypertension-related self-care behaviors.[23]

Validity and reliability of the translated version of the H-SCALE questionnaire has done by Khosravizade et al.[20] The content validity was approved by the expert panel. The reliability of this questionnaire in this study according to Cronbach's alpha was .862.

In the present study, the Cronbach's alpha and the test-retest Pearson's correlation coefficient of H-SCALE were .806 and .89, respectively. Participants responded to this scale both before and 2 months after the intervention. Participants' blood pressure was also measured at the same time points using a mercury sphygmomanometer. Their weight and height were also measured before the intervention using a digital body weight scale and a wall mounted height meter, respectively.

Participants in the control group just received care services routinely provided in public healthcare centers in the south of Tehran Iran, including face-to-face education for self-care in hypertension.

Intervention

Their counterparts in the intervention group received both routine care services and home-based SCE for 2 months. The

Table 1. Between-Group Comparisons Concerning Participants' Personal Characteristics.

Variable	Intervention, *N* (%)	Control, *N* (%)	*p* Value
Gender			
Male	15 (27.3)	16 (29.1)	.83*
Female	40 (72.7)	39 (70.9)	
Marital status			
Single	2 (3.6)	0 (0)	.30**
Married	41 (74.5)	46 (83.6)	
Widowed or divorced	12 (21.9)	9 (16.4)	
Educational level			
Below diploma	38 (69.1)	37 (67.3%)	.83*
Diploma or higher	17 (30.9)	18 (32.7%)	
Occupation			
Housewife	47 (85.5)	36 (65.5)	.10**
Self-employed	2 (3.5)	6 (10.9)	
Employee	3 (5.5)	5 (9.1)	
Retired	3 (5.5)	8 (14.5)	
Family income			
Sufficient	30 (54.5)	28 (50.9)	.70*
Insufficient	25 (45.5)	27 (49.1)	
Age (mean ± SD)	49.67 ± 6.51	49.25 ± 7.66	0.78***
BMI (mean ± SD)	29.23 ± 3.45	28.72 ± 3.29	0.42***

*Chi-square.
**Fisher's exact test.
***Independent-sample *t* test.

home-based SCE program was implemented based on the principles of home visit (1) and aimed to provide participants with education and support and encourage them for behavior modification. Educational materials were developed based on relevant textbooks and were related to low-salt diet, weight management, medication adherence, smoking cessation, regular physical activity, and regular blood pressure control. Home-based SCE was provided to each participant and at least 1 of his/her family members in 8 home visit sessions. In the first session, participants' home environment and living conditions were assessed to determine their educational needs. Then, an individualized SCE program was developed based on the unique educational needs of each participant. Each home visit session lasted 45 to 60 minutes and all of them were conducted at participants' preferred time and with their permission. In all sessions, we attempted to establish effective communication with participants and their family members and encouraged them to actively engage in self-care activities. SCE was provided through lecture, question-and-answer, and discussion methods. The number of sessions on each aspect of self-care was determined based on the needs of each participant and his/her family members. For instance, the number of sessions on hypertension dietary regiment was 2 for a participant and 1 for another. At the end of each session, educational materials were summarized and reviewed and the aim, content, and time of the next session were determined. Two months after the end of the study intervention, all participants were invited to the study setting for the posttest assessment of self-care behaviors. All steps of data collection were performed by the researcher.

Participants in the study were randomly divided into 2 groups and did not know whether they were in the intervention or control group. Blinding was also performed for a person who gave a statistical analysis.

This study was approved by the Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran (code: IR.TUMS.FNM.REC.1397.064) Written informed consent was obtained from all participants and they were informed about the study aim and confidential data management.

Data Analysis

The SPSS software (v. 16.0) was employed for data analysis. The data were described through the measures of descriptive statistics, including frequency tables, mean, and standard deviation. Moreover, the Chi-square, Fisher's exact, paired-sample *t*, and independent-sample *t* tests were used for data analysis. The level of significance was set at less than .05.

Results

The mean age of the subjects was 49.67 ± 6.51 and 49.25 ± 7.66 years and body mass index was 29.23 ± 3.45 and 28.72 ± 3.29 in the intervention and control groups, respectively. Other variables include gender, educational level, occupation, family income, marital status are shown in Table 1. There were no significant differences between the

Table 2. Between-Group Comparisons Concerning Participants Blood Pressure and Self-Care Behaviors.

Outcomes		Time / Group	Before	After	*p* Value*
Blood pressure	Systolic	Control	129.09 ± 10.32	124.44 ± 8.13	<.001
		Intervention	132.18 ± 10.26	126.28 ± 8.66	<.001
		p Value^	0.11	0.30	
	Diastolic	Control	89.45 ± 10.03	86.56 ± 8.51	.11
		Intervention	88.27 ± 9.39	86.40 ± 7.96	.08
		p Value^	0.52	0.92	
Self-care behaviors	Regular blood pressure control	Control	2.02 ± 0.13	2.42 ± 1.89	.3
		Intervention	2.13 ± 0.15	3.47 ± 0.22	.001
		p Value^	0.60	0.001	
	Low-salt diet	Control	24.85 ± 5.33	35.36 ± 3.47	.05
		Intervention	26.73 ± 4.61	52.51 ± 3.8	.001
		p Value^	0.051	0.001	
	Regular physical activity	Control	3.40 ± 0.38	6.47 ± 0.52	.01
		Intervention	3.11 ± 0.35	8.16 ± 0.39	.001
		p Value^	0.58	0.01	
	Medication adherence	Control	14.35 ± 0.85	14.49 ± 1.01	.43
		Intervention	13.05 ± 1.03	17.42 ± 1.03	.007
		p Value^	0.34	0.047	
	Weight management	Control	21.96 ± 6.47	23.51 ± 5.94	.35
		Intervention	22.96 ± 3.97	25.53 ± 3.83	.006
		p Value^	0.33	0.062	
	Smoking cessation	Control	2.64 ± 0.42	2.73 ± 0.49	.50
		Intervention	3.95 ± 0.63	3.79 ± 0.76	.05
		p Value^	0.087	0.24	
	Total	Control	61.63 ± 1.02	84.98 ± 0.86	.45
		Intervention	71.93 ± 0.95	110.88 ± 0.7	.03
		p Value^	0.35	0.02	

^Independent-sample *t* test.
*Paired-sample *t* test.

study groups respecting participants' characteristics ($p > .05$; Table 1).

Study groups did not significantly differ from each other respecting the pretest and the posttest mean values of systolic and diastolic blood pressures ($p > .05$), According to the primary object, the mean blood pressure between the 2 groups changed after the intervention, but this difference was not statistically significant (Sys: $p = .30$, Dia: $p = .92$).

In secondary object, there was no statistically significant difference between the groups respecting the pretest mean scores of all dimensions of self-care behaviors. However, the posttest mean scores of the medication adherence (17.42 ± 1.03), physical activity (8.16 ± 0.39), low-salt diet (52.51 ± 3.8), and blood pressure control (3.47 ± 0.22) dimensions of self-care behaviors and the total score of self-care behaviors (110.88 ± 0.7) in the intervention group were significantly greater than the control group ($p < .05$). There was no significant between-group difference respecting the posttest mean scores of the smoking cessation ($p = .87$) and the weight management ($p = .44$; Tables 2 and 3) dimensions of self-care.

Discussion

This study evaluated the effects of home-based SCE on blood pressure and self-care behaviors among patients with primary hypertension. The results suggests the effectiveness of home-based SCE in significantly improving self-care behaviors among patients with hypertension. But more studies are needed to measure the effectiveness of intervention on blood pressure.

Findings showed that blood pressure significantly reduced in both groups, while the between-group difference respecting the posttest mean value of blood pressure was not statistically significant. Moreover, findings showed significant improvement in the mean score of the blood pressure control dimension of self-care behaviors, indicating the effectiveness of the study intervention in significantly improving adherence to blood pressure control. Similarly, 2 former studies showed that home visit had no significant effects on hypertension management.[24] However, a systematic review on 72 randomized clinical trials showed that self-care had significant inverse relationship with blood pressure.[25] The

Table 3. Mean Differences Between-Group Comparisons concerning Participant's Blood Pressure and Self-Care Behaviors.

Outcomes		Intervention Mean ± SD	Control Mean ± SD	*p* Value*
Blood pressure	Systolic (after–before)	−6.74 ± 10.11	−4.66 ± 7.18	.26
	Diastolic	−2.79 ± 10.42	−2.33 ± 9.62	.83
Self-care behaviors	Regular blood pressure control	1.37 ± 0.22	0.37 ± 0.12	.001
	Low-salt diet	29.77 ± 26.89	10.26 ± 23.05	.03
	Regular physical activity	4.97 ± 3.21	3.02 ± 4.22	.01
	Medication adherence	4.27 ± 0.89	0.88 ± 0.35	.00
	Weight management	2.16 ± 4.92	1.08 ± 7.82	.44
	Smoking cessation	−0.13 ± 0.07	−0.11 ± 0.16	.87
	Total	38.95 ± 0.16	21.35 ± 0.25	.02

*Independent-sample *t* test.

insignificant effects of the study intervention on blood pressure may be due to its short course.

On the other hand, in the Iranian health system, home-based SCE is not a routine service and in the present study has been done briefly. Continuous home visits can promote self-care behaviors and consequently correct high blood pressure.

Study findings also showed that the home-based SCE intervention of the study significantly improved self-care behaviors in the medication adherence, dietary regimen, and physical activity dimensions. This is in line with the findings of 2 former studies. A systematic review showed that more than 50% of patients with cardiovascular disease regularly performed physical activity, more than 60% of them had poor medication adherence, and only 10% of them adhered to a low-salt diet. That study also showed that people are generally unwilling to reduce salt consumption and hence, interventions for promoting low-salt diet consumption are usually unsuccessful.[26] Studies in Iran also suggested that patients with hypertension have limited knowledge about self-care behaviors and have limited treatment adherence.[3,11,14,19] In the present study, the level of ability of each patient was considered physically and mentally and the trainings were completely unique.

One of the benefits of a home visit is being in the natural environment of the home and considering the client's circumstances, which need to be considered in educational and care policies. Therefore, strategies such as home visit and home-based SCE are recommended to promote self-care behaviors among patients with hypertension.

Limited treatment adherence is among the main reasons of poor hypertension management and is a major global healthcare challenge. Studies showed that only 60% of patients with hypertension in the world may show close treatment adherence.[27] A study also showed that even periodical educations were ineffective in significantly improving treatment adherence and lowering blood pressure.[28] However, in line with our findings, a study showed that home-based SCE can improve medication adherence among patients with hypertension.[29] Therefore, home-based SCE and regular home visits are recommended for promoting treatment adherence among these patients.

Study findings also revealed that home-based SCE was ineffective in significantly improving the mean score of the weight management dimension of self-care behaviors. In line with our findings, a former study reported that home-based SCE had no significant effects on body weight and self-care behaviors in the area of weight management among patients with diabetes mellitus.[30] In contradiction to our findings, a meta-analysis study on 25 clinical trials showed that educational interventions, adherence to a healthy diet, and physical activity reduced body weight by 5.1 kg and thereby, reduced systolic blood pressure by 4.44 mm Hg and diastolic blood pressure by 3.57 mm Hg.[31] This contradiction may be due to the short course of the study intervention and the short course between the intervention end and the posttest. These findings denote that multi-component interventions consisting of home-based SCE are needed to effectively manage body weight among patients with hypertension.

We also found that home-based SCE was ineffective in significantly affecting smoking-related self-care behaviors. Former cross-sectional and longitudinal studies also showed no significant relationship between smoking cessation educations and adherence to smoking-related self-care behaviors.[27] Two other studies also reported that conventional smoking cessation strategies have limited effectiveness in reducing smoking.[30] However, a cohort study showed that using electronic cigarettes was effective in significantly reducing smoking and blood pressure among patients with hypertension.[29] Smoking is a major risk factor for cardiovascular problems such as hypertension[28,32] and hence, smoking cessation is considered as a key component of hypertension management.[26] Therefore, new strategies are needed to promote smoking cessation among patients with hypertension.[30,32] Quitting smoking is a behavior change that takes time to change. Nurses as agents of change can plan medium-term plans to change the behavior. However, in the present

study, due to the short duration of the intervention and post-test, no change in behavior occurred.

One of the strengths of this research is paying attention to self-care of patients with hypertension to control their blood pressure and more importantly using the home visit process to educate patients. It is important to provide educational intervention at home and in accordance with the circumstances and living environment of the individual. It is therefore cost-effective and reduces the burden of disease and the exorbitant costs of additional treatments. The present study was able to provide credible evidence for the effect of home visit on self-care.

This study had some limitations. The first was the short 2-month interval between the intervention end and the post-test. Moreover, we had different problems regarding home visit, including family members' limited collaboration (Because most of them were busy, coordinating the family's suggested time for training sessions was a major study challenge) and participants' concerns over home visit (Like trusting a researcher for a home visit, . . .). We attempted to reduce these problems through providing participants with adequate information about the study and establishing close relationships with them.

Conclusion

This study shows that home-based SCE can improve self-care behaviors, particularly in the medication adherence, physical activity, dietary adherence, and blood pressure control areas, among patients with primary hypertension. But more studies are needed to measure the effectiveness of intervention on blood pressure. Healthcare providers, including nurses and public health specialists, can conduct regular home visits for patients with hypertension in order to improve the outcomes of treatments and reduce the burden of hypertension. Future studies in this area are recommended to assess the outcomes of SCE in different time points.

Acknowledgments

The authors want to thank all the participants for their valuable contributions in this study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study is a thesis at Tehran University of Medical Sciences. Researchers have not received funding.

ORCID iD

Shahzad Pashaeypoor https://orcid.org/0000-0002-2012-3783

References

1. Clark MJ. *Community health nursing*. Prentice Hall; 2015.
2. Wang Z, Luo Y, Yang S, et al. Death burden of high systolic blood pressure in Sichuan Southwest China 1990–2030. *BMC Public Health*. 2020;20(1):406.
3. Izadirad H, Zareban I. Assessment of knowledge, treatment and blood pressure control in hypertensive patients. *J Health Literacy*. 2016;1(1):61-66.
4. Organization WH. *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020*. 2013. https://www.who.int/publications/i/item/9789241506236
5. Brunner LS. *Brunner & Suddarth's Textbook of Medical–Surgical Nursing*. Lippincott Williams & Wilkins; 2010.
6. Shimamoto K, Ando K, Fujita T, et al. The Japanese Society of Hypertension guidelines for the management of hypertension (JSH 2014). *Hypertension Res*. 2014;37(4):253-390.
7. Wake AD, Bekele DM, Tuji TS. Knowledge and attitude of self-monitoring of blood pressure among adult hypertensive patients on follow-up at selected public hospitals in Arsi Zone, Oromia Regional State, Ethiopia: a cross-sectional study. *Integr Blood Press Control*. 2020;13:1-13.
8. Peters RM, Templin TN. Theory of planned behavior, self-care motivation, and blood pressure self-care. *Res Theory Nurs Pract*. 2010;24(3):172-186.
9. Dickson VV, Nocella J, Yoon H-W, Hammer M, Melkus GDE, Chyun D. Cardiovascular disease self-care interventions. *Nurs Res Pract*. 2013;2013:407608
10. Shim J-S, Jung SJ, Kim HC. Self-reported diet management, dietary quality, and blood pressure control in Korean adults with hypertension. *Clin Hypertens*. 2019;25:24.
11. Babaei-Sis M, Ranjbaran S, Mahmoodi H, Babazadeh T, Moradi F, Mirzaeian K. The effect of educational intervention of life style modification on blood pressure control in patients with hypertension. *J Educ Community Health*. 2016;3(1):12-19.
12. Worku Kassahun C, Asasahegn A, Hagos D, et al. Knowledge on hypertension and self-care practice among adult hypertensive patients at University of Gondar comprehensive specialized hospital, Ethiopia, 2019. *Int J Hypertens*. 2020;2020:5649165.
13. Dehi M, Norozi K, Aghajari P, Khoahbakht M, Vosoghi N. The effect of home visit on quality of life of patients with type ii diabetes. *Iran J Diabet Metabol*. 2018;17(1):38-41.
14. Khosravi A, Pourheidar B, Roohafza H, et al. Evaluating factors associated with uncontrolled hypertension: Isfahan cohort study, Iran. *ARYA Atheroscler*. 2014;10(6):311.
15. Warren-Findlow J, Seymour RB. Prevalence rates of hypertension self-care activities among African Americans. *J Nat Med Assoc*. 2011;103(6):503-512.
16. Vakilian K, Farahani OCT, Heidari T. Enhancing breastfeeding – home-based education on self-efficacy: a preventive strategy. *Int J Prev Med*. 2020;11:63.
17. Hoyt Drazen C, Abel R, Lindsey T, King AA. Development and feasibility of a home-based education model for families of children with sickle cell disease. *BMC Public Health*. 2014;14:116.
18. Jarrín OF, Pouladi FA, Madigan EA. International priorities for home care education, research, practice, and management: qualitative content analysis. *Nurse Educ Today*. 2019;73:83-87.

19. Bairami S, Fathi Y, Mohammadinasab S, Barati M, Mohammadi Y. Relationship between self-care behaviors and quality of life among hypertensive patients visiting comprehensive health centers in Hamadan, Iran. *J Educ Community Health*. 2017;4(1):20-27.
20. Khosravizade A, Hassanzadeh A, Mostafavi F. The impact of self-efficacy education on self-care behaviours 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(5):506-511.
21. Miri F, Khodaveisi M, Karami M, Mohammadi N. The effect of training home care to type-2 diabetic patients on controlling blood glucose levels in patients admitted to the diabetes research center of Hamadan. *Avicenna J Nurs Midwifery Care*. 2014;22(3):24-32.
22. Miri M, Ramazani A, Hanafi H, Gholinejad B. Analysis of quality assessment of the prevention & control of hypertension plan in Birjand University of Medical Sciences. *Horizon Med Sci*. 2006;12(2):39-45.
23. Warren-Findlow J, Basalik DW, Dulin M, Tapp H, Kuhn L. Preliminary validation of the Hypertension Self-Care Activity Level Effects (H-SCALE) and clinical blood pressure among patients with hypertension. *J Clin Hypertens*. 2013;15(9):637-643.
24. Vrijens B, Antoniou S, Burnier M, de la Sierra A, Volpe M. Current situation of medication adherence in hypertension. *Front Pharmacol*. 2017;8:100.
25. Svarstad BL, Kotchen JM, Shireman TI, et al. Improving refill adherence and hypertension control in black patients: Wisconsin TEAM trial. *J Am Pharm Assoc*. 2013;53(5):520-529.
26. Papathanasiou G, Zerva E, Zacharis I, et al. Association of high blood pressure with body mass index, smoking and physical activity in healthy young adults. *Open Cardiovasc Med J*. 2015;9:5.
27. Bulbulia R, Sherliker P, Clack R, Halliday A, Peto R, Lewington S. Adiposity, systolic blood pressure, smoking and atrial fibrillation: analyses of 2.3 million us adults attending cardiovascular screening. *Circulation*. 2015;132(suppl_3):A15578-A.
28. Polosa R, Morjaria JB, Caponnetto P, et al. Blood pressure control in smokers with arterial hypertension who switched to electronic cigarettes. *Int J Environ Res Public Health*. 2016;13(11):1123.
29. Glasser AM, Collins L, Pearson JL, et al. Overview of electronic nicotine delivery systems: a systematic review. *Am J Prevent Med*. 2017;52(2):e33-e66.
30. Fagerström KO, Bridgman K. Tobacco harm reduction: the need for new products that can compete with cigarettes. *Addict Behav*. 2014;39(3):507-511.
31. Leung AA, Nerenberg K, Daskalopoulou SS, et al. Hypertension Canada's 2016 Canadian hypertension education program guidelines for blood pressure measurement, diagnosis, assessment of risk, prevention, and treatment of hypertension. *Can J Cardiol*. 2016;32(5):569-588.
32. Andriani H, Kosasih RI, Putri S, Kuo H-W. Effects of changes in smoking status on blood pressure among adult males and females in Indonesia: a 15-year population-based cohort study. *BMJ Open*. 2020;10(4):e038021.