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The Effect of Cognitive-Behavioral Intervention on Self-Care Behaviors and Blood Pressure Control in Patients with Primary Hypertension

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ABSTRACT

Aims Adopting self-care behaviors in patients with hypertension is one of the most effective ways to control blood pressure. The present study was designed to evaluate the effect of the cognitive-behavioral intervention on self-care behaviors and blood pressure control.

Materials & Methods This clinical trial study conducted in 2019 on patients over 30-years with primary hypertension in Dorcheh 1 Health Center in Isfahan, Iran. Patients were randomly selected from 100 people with high blood pressure and divided into two groups, Intervention, and control. In addition to receiving routine care, the intervention group participated in a cognitive-behavioral educational intervention program. The required information was collected using background, cognitive, and behavioral information questionnaires related to blood pressure control, (with optimal validity and reliability) before and one month after the intervention. Data were analyzed by SPSS 25 software using statistical methods of Chi-Square, Fisher exact test, Mann-Whitney, ANCOVA, t-test.

Findings After the intervention, the mean scores of cognitive and behavioral variables in the intervention group were significantly different from the control group. Also, systolic blood pressure decreased significantly in the experimental group ($p<0.05$).

Conclusion Cognitive-behavioral intervention improves systolic blood pressure and improved the level of cognitive and behavioral variables associated with blood pressure control in patients.

Keywords Hypertension; Cognitive Behavioral Therapy; Self-Care; Blood Pressure Control

CITATION LINKS

[1] Effectiveness of group therapy based on cognitive models ... [2] 2014 evidence-based guideline for the management ... [3] Worldwide trends in blood pressure from 1975 ... [4] Projections of global mortality and burden ... [5] Global burden of hypertension and ... [6] Relationship between illness perceptions and ... [7] Prevalence, awareness, treatment, control and ... [8] Health system strengthening and hypertension ... [9] Effects of education on self-monitoring ... [10] Heart disease and stroke statistics ... [11] Prevalence and associated factors of pre-hypertension ... [12] Hypertension prevalence and risk factors ... [13] Prevalence, associated factors, awareness ... [14] Prevalence and correlates of hypertension in ... [15] Prevalence and associated factors of ... [16] Evaluation of education program based on social ... [17] The relationship between hypertension and ... [18] Effects of the DASH-JUMP dietary intervention in ... [19] Hypertension Improvement Project (HIP) Latino: Result ... [20] The effect of short-term aerobic exercise on ... [21] Racial differences in blood pressure control ... [22] Self-care in health: We can define it, but should ... [23] Practice and predictors of self-care behaviors among ... [24] Factors associated with medication nonadherence ... [25] Self-care assessment of patients with hypertensi ... [26] Prevalence rates of hypertension self-care ... [27] Correlates of self-care behaviors for managing ... [28] Self-regulation, self-efficacy, outcom expectations ... [29] Impact of education based on theory of planned ... [30] Effect of self-care education on lifestyle ... [31] Effects of a cognitive-behavioral ... [32] Determinants of adherence to treatment in ... [33] Self-care behavior and related factors in ... [34] Hypertension knowledge-level scale (HK-LS) ... [35] Educational text for health care providers ... [36] Relation of physical activity and body mass ... [37] Impact of empowerment program based on ... [38] Effects of a self-regulation program on blood ... [39] The association between self-efficacy and ...

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Introduction

Chronic diseases account for 60% of the world's deaths. Hypertension is a chronic disease and a global health problem [1]. Hypertension is a steady increase in cytological blood pressure above or equal to 14 mm Hg or a persistent increase in diastolic blood pressure above or equal to 9 mm Hg [2]. According to the World Health Organization (WHO), the number of adults with hypertension rose from 594 million in 1975 to 1.13 billion in 2015, with one in five women and one in four men suffering from high blood pressure. The disease is growing more rapidly in developing and low- to middle-income countries than in developed countries [3, 4], and its prevalence is projected to reach 1.56 million by 2025 [5]. In Iran, the prevalence of hypertension in adults is reported to be 25-35% [6]. The overall prevalence of hypertension in Isfahan is 17.3% (18.9% in men and 15.5% in women) [7]. Cardiovascular disease and hypertension, along with other non-communicable diseases account for two-thirds of all deaths worldwide [8]. Hypertension has an adverse effect on sexual function, social functioning, family life, and on all aspects of patients' lives; however, less than half of adults with high blood pressure have their disease under control [9, 10]. Many factors, including individual and behavioral factors, are effective in controlling blood pressure. It has been shown that aging, BMI above 25, and obesity, male gender, and family history are directly associated with an increased prevalence of hypertension [11-16]. Adherence to treatment, healthy eating, weight control, and physical activity lead to control blood pressure. There is an inverse relationship between a healthy diet and proper physical activity, and the prevalence of hypertension [17-20].

According to the WHO and the National Association for the Prevention, Diagnosis, Evaluation, and Treatment of Hypertension, self-care behaviors, such as adherence to medications, physical activity, following a low-salt and low-fat diet, weight control, reducing alcohol consumption, avoiding tobacco and smoking are the most effective ways to control blood pressure [21]. Self-care can be defined as the ability of individuals, families, and communities to prevent disease, maintain and promote health, and the ability to cope with illness and disability with or without the support of others [22]. Although adherence to self-care behaviors is critical for the control of hypertension [23], little adherence has been reported to the recommended self-care behaviors [24, 25].

Cognitive factors are one of the factors associated with self-care behaviors in controlling blood pressure. Warren-Findlow and Seymour and Lee *et al*. showed that high self-efficacy leads to improved self-care behaviors in hypertensive patients [26, 27]. Several studies have shown that outcome expectations and outcome assessments are effective predictors of self-care behaviors, including physical activity and healthy eating in hypertensive patients [28, 29]. One of the most important and basic strategies to improve self-care behaviors and blood pressure is proper and principled education based on an appropriate educational model [30, 31]. Meinema *et al*. showed that an appropriate and culturally appropriate education improves self-efficacy in adherence to the correct use of the drug in hypertensive patients [32]. Golshahi indicated that self-care education improves the determinants of lifestyle, drug resistance, and blood pressure [30]. Zinat Motlagh showed that educating patients with hypertension based on cognitive-social theory reduced patients' blood pressure and significantly increased their self-care behaviors [16]. Moreno *et al*. reported that education based on the cognitive-behavioral model reduced blood pressure in patients with hypertension [31]. Some studies have suggested the role of self-regulation in improving self-care behaviors [15, 33].

Given that in the mention studied, only a limited number of cognitive and behavioral factors have been used to improve self-care behaviors or control blood pressure; thus, the present study (similar studies have not been conducted in Dorcheh, Isfahan) was done using simultaneous intervention on cognitive and behavioral factors related to hypertensive self-care behaviors, which is fully addressed in the cognitive-behavioral and self-regulatory theories.

Materials and Methods

This clinical trial with a pretest-posttest design and a control group was performed on patients over 30 years of age with primary hypertension referring to Darcheh health center, Isfahan. The sample size for a two-way analysis was considered 45 people for each group using a confidence level of 95%, a test power of 0.8, the effect size of 0.6, which increased to 50 subjects considering attrition of 10%. The target group of the study was 100 patients (70 females and 30 males) from all patients in the center (200: 130 females and 70 males) with hypertension, which was selected by simple random sampling (lottery) and according to the sample size (gender), of whom 50 patients were randomly divided into two experimental and 50 patients in the control group (Figure 1). Due to the homogeneity of demographic and regional information of the two health centers in Darcheh city, Darcheh 1 health center was randomly selected (lottery) from two health centers No. 1 and 2. Inclusion criteria included having primary hypertension, lack of participation in cognitive-behavioral training courses related to the intervention of the present study, willingness to participate in the study, and signing the consent form by patients. Exclusion criteria were unwillingness to participate in the study, being absent in training classes for more than one session, and lack of

answering to the questionnaire, and having diseases leading to the withdrawal from the study.

Four questionnaires were used, including background information questionnaire, cognitive constructs questionnaire based on social cognitive theory, modified standard questionnaire of Hypertension Self-Care Activity Level Effects (H-scale), and Hypertension Knowledge-Level Scale (HK-LS).

The variables assessed in the background questionnaire were selected according to the literature and their importance on hypertension and included age, sex, the time of hypertension diagnosis, family history of the disease, referral to a doctor or health center, receiving treatment, blood pressure control, blood pressure control frequency.

Two questionnaires were used to assess cognitive constructs (awareness, self-regulatory self-efficacy, outcome expectations, and outcome evaluation) of self-care behaviors in hypertension, including

The standard questionnaire for assessing the knowledge about hypertension was adapted from the developed 19-item questionnaire of the high level of knowledge (HK-LS), which was used by Arkok in 2012 in Turkey and its validity and reliability have been examined [34]. This questionnaire indicates the knowledge of the respondents about the definition of hypertension (including two items; such as blood pressure 140 over 90 mm Hg), lifestyle (including four items), treatment (including four items), adherence to medications (including two items), diet (including two items), and the complications of high blood pressure (including five items). A correct answer is scored one and a wrong answer is scored zero. A higher score indicates more knowledge and a lower score indicates less knowledge of the patients about high blood pressure. The maximum score is 19 and the minimum is zero.

The Cognitive Constructs Questionnaire based on social cognitive theory was designed by Zinat Motlagh scoring on a five-point Likert scale and its validity and reliability have been approved [16]. In this questionnaire, a higher score indicates the desired condition in the considered construct. The questionnaire includes four constructs of self-efficacy (11 questions; e.g., I am confident I can maintain my medication regimen when I am sick); Outcome expectations (12 questions; e.g., I will be healthier if I follow the diet), assessment of outcome expectations (14 questions; such as it is important for me to be physically active on a daily basis), and self-regulation (16 questions; such as I always control my weight). The questions of each construct are examined in four dimensions, including drug use, following a low-salt diet, regular physical activity, and weight control.

The modified Hypertension Self-Care Activity Level Effects (H-scale) to assess the adherence to self-care behaviors in patients with hypertension was designed by Findlow *et al*. and its validity and reliability have been examined [26]. This questionnaire assesses the status of self-care behaviors in patients with high blood pressure during the last seven days and measures three self-care behaviors, including adherence to medication (3 questions; such as: Have you taken medications prescribed to control your blood pressure?), adopting a low-salt diet (11 questions; such as: Have you eaten pickles, salted olives or other vegetables in salty water?), participation in physical activity (2 questions; such as: Have you had at least 30 minutes of physical activity (moderate intensity)?, and weight control (10 questions; such as I eat less in restaurants and eateries than before) with 26 questions. All dimensions except weight control (5-point Likert scale) are answered on a 7-point Likert scale related to the last 7 days. Each part of the questionnaire is graded and based on the cut-off points, the degree of adherence of individuals to each of the self-care behaviors is determined.

Before conducting the research, its methodology, its benefits, and those who use the research results and also the confidentiality of patient information were explained to all participants. To prevent bias, the study was conducted as a single-blind study, and patients in the experimental and control groups did not know their assignment to the experimental or control group. Before the intervention, the required information was completed as a self-report in a questionnaire in the experimental and control groups. Also, the blood pressure of the patients was accurately determined and recorded by the researcher using the calibrated sphygmomanometer (Gamma G7) according to the standards and observing the correct principles. In this study, in addition to receiving routine care of hypertensive patients, the experimental group participated in cognitive-behavioral training classes based on cognitive-behavioral theory and self-regulation related to hypertensive self-care behaviors while the control group received only routine care of patients with hypertension. The training program consisted of six 2-hour sessions for a month performed by the researcher (Table 1). The educational content was determined based on a reliable source of the Ministry of Health [35]. Group training was done using various educational media (using books, posters, and pamphlets to increase knowledge and using videos and photos to improve outcome expectations, assessment of outcome expectations, and self-efficacy). In addition to receiving educational information, a checklist designed by the researcher to record nutritional behaviors, drug use, and blood pressure levels were delivered to the intervention group to be completed at home. According to this checklist, the patient was required to record the food consumed daily and also to record the blood pressure medication used daily by inserting a tick mark in the day and time of use. Also, blood pressure measured at home or health center was recorded daily (morning and evening) by the patient or health

worker in the relevant section of the checklist. One month after the educational intervention, cognitive-behavioral and background information questionnaires were completed by both experimental and control groups and the blood pressure of patients in both groups was recorded again by the researcher. It is noteworthy that in order to comply with scientific and ethical standards after the intervention, self-care training classes were held for the control group.

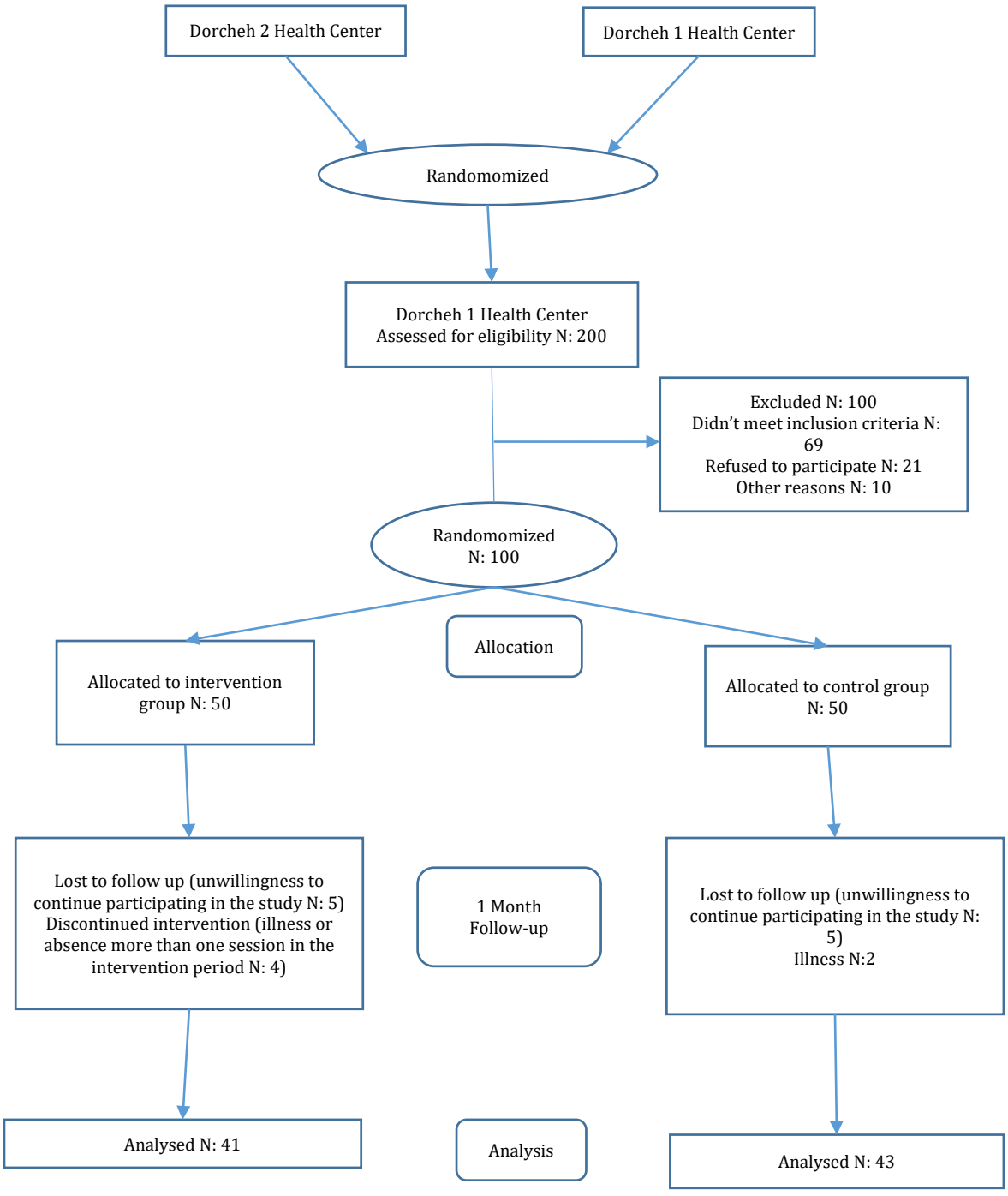

Figure 1) Consort flow diagram of study

Table 1) Objectives and activities of the training sessions in the experimental group

Sessions	Objectives	Summary of topics and activities
First	Goal setting and plan for action to promote self-care behaviors	- Use personal goal setting table and Gantt table
Second	Awareness of the disease	- Definition of hypertension - Definition of types of hypertension - Expression of national and international statistics related to hypertension - Causes of hypertension - Expressing self-care behaviors in blood pressure - Expression of early and late effects of uncontrolled hypertension - Distribution of pamphlets, files and educational books
Third	Outcome expectations, evaluating outcome expectations and promoting self-care behaviors	- Expressing patients' attitudes, feelings and emotions about their illness - Express successful and unsuccessful experiences in performing self-care behaviors - View photos, videos, etc. of complications and disease threats - Strengthen beliefs about the success of a given task - Express the importance of doing behavior And develop an interest in self-care behaviors
Fourth	Self-efficacy and promotion of self-care behaviors	- The first display of behavior and how to perform the behavior - Divide larger behaviors into manageable smaller parts And do it based on previous knowledge and experience - Determine the success rate - Set a time to do each behavior at the right time - Planning to perform self-care behaviors - Ask for help if needed and Interact with others for better performance - Verbal and material encouragement of successful patients in controlling blood pressure - Strengthen patients' belief in their abilities and effectiveness - Enhance positive emotions caused by controlling blood pressure - Using the experiences of successful patients in disease control
Fifth	Self-regulation and promotion of self-care behaviors	- Planning training - Record self-care behaviors in the checklist - Expressing desirable and standard behavior and how to compare your behaviors with the desired level, others and standards - Follow up and pay attention when performing self-care behaviors - Ask yourself - Generate autonomous messages like I can - Encourage yourself if you succeed - Identify potential barriers to self-care behaviors And ways to overcome obstacles
Sixth	Self-assessment and reaction to your behavior	- Final review of program progress and modification of goals if needed and overcome obstacles

Data were analyzed using SPSS 25 software and Chi-square, Fisher's, and Mann-Whitney tests to examine the relationship between contextual variables in the two groups and also T-test and ANCOVA to assess the scores of cognitive-behavioral variables as well as blood pressure before and after the intervention between the two groups. The level of statistical significance was considered less than 0.05.

Findings

In general, 84 patients remained in the study (41 in the intervention group and 43 in the control group) because some participants due to their disease and unwillingness to continue the study left the research. Of remained participants, 70% were female and 30% were male. The mean age of patients before the intervention in the experimental group (58.3±8.3) and the control group (60.2±9.5) and also the duration of the disease in the experimental group (8.7±5.7 years) and the control group (8.5±6.6 years) did not show a significant difference ($p<0.05$).

Also, there was no significant difference between patients in the experimental and control groups in terms of family history of the disease, referral to a doctor or health center, receiving treatment, blood pressure control, and blood pressure control frequency ($p<0.05$; Table 2).

Table 2) Background information of patients in the experimental and control group

Variable	Number (%)		Sig.
	Experimental	Control	
Sex			
Male	14 (34.1)	11 (25.6)	0.39
Female	27 (65.9)	32 (74.4)	
Hereditary history of the disease			
Yes	34 (82.9)	32 (74.4)	0.34
No	7 (17.1)	11 (25.6)	
See a doctor or health center			
Yes	35 (85.4)	38 (88.4)	0.68
No	6 (14.6)	5 (11.6)	
Get treatment			
Yes	39 (95.1)	37 (0.8)	0.148
No	2 (4.9)	6 (14)	
Blood pressure control			
Yes	39 (95.1)	41 (95.3)	0.67
No	2 (4.9)	2 (4.7)	
Blood pressure control sequence			
Daily	3 (7.3)	3 (7)	0.82
Weekly	15 (36.6)	16 (37.2)	
Monthly	22 (53.7)	21 (48.8)	
Annually	1 (2.4)	1 (2.3)	
Never	0	2 (4.7)	

The mean scores of cognitive and behavioral variables related to self-care behaviors before the intervention in the experimental and control groups were not significantly different (p<0.05) while after the intervention, the mean scores of all cognitive variables except outcome expectation and also the mean scores of nutritional behaviors and adherence to treatment in the experimental group had a significant increase (p<0.05; Table 3).

Table 3) Comparison of experimental and control groups in terms of Mean±SD scores of cognitive and self-care behaviors variables before and after the intervention

Constructs	Experimental group	Control group	p-value	
Knowledge				
Before intervention	16.54±2.83	15.84±2.42	0.226**	<0.001†
After intervention	18.27±1.02	15.88±2.37	<0.001**	
p-value	<0.001*	0.73*	-	-
Self-efficacy				
Before intervention	40.05±9.31	40.51±9.92	0.83**	<0.001†
After intervention	43.19±7.22	39.51±9.43	0.048**	
p-value	<0.001*	0.002*	-	-
Outcome expectation				
Before intervention	49.58±5.73	49.21±4.95	0.748**	<0.001†
After intervention	50.85±5.22	48.90±4.89	0.08**	
p-value	<0.001*	0.03*	-	-
Outcome expectations evaluation				
Before intervention	63.71±6.81	61.93±7.88	0.273**	<0.001†
After intervention	66.12±4.91	61.65±7.94	0.003**	
p-value	0.001*	0.057*	-	-
Self-regulation				
Before intervention	44.32±12.00	43.84±13.68	0.87**	<0.001†
After intervention	48.90±9.95	41.84±12.96	0.006**	
p-value	<0.001*	0.059*	-	-
Adherence to treatment				
Before intervention	20.01±3.46	18.39±5.91	0.07**	0.18†
After intervention	20.31±3.34	17.81±6.26	0.025**	
p-value	0.162*	0.69*	-	-
Nutritional behaviors				
Before intervention	21.80±10.23	25.12±11.39	0.165**	<0.001†
After intervention	27.24±9.61	23.53±9.84	0.104**	
p-value	<0.001*	0.165*	-	-
Weight control				
Before intervention	26.61±7.77	23.56±7.41	0.07**	<0.001†
After intervention	21.51±7.08	24.88±6.56	0.03**	
p-value	<0.001*	0.002*	-	-
Physical activity				
Before intervention	5.93±5.44	5.93±5.56	0.998**	0.62†
After intervention	5.56±5.19	5.14±5.60	0.722**	
p-value	0.535*	0.266*	-	-

Continue of Table 3) Comparison of experimental and control groups in terms of Mean±SD scores of cognitive and self-care behaviors variables before and after the intervention

Constructs	Experimental group	Control group	p-value	
Total intervened self-care behaviors (Adherence to treatment and nutritional behaviors)				
Before intervention	41.90±11.57	43.25±13.07	0.617**	<0.001†
After intervention	47.34±1.69	41.34±11.02	0.014**	
p-value	<0.001*	0.237*	-	-
Systolic blood pressure				
Before intervention	129.51±19.00	138.02±20.07	0.053**	0.009†
After intervention	125.97±15.54	140.46±23.03	0.001**	
p-value	0.142*	0.392*	-	-
Diastolic blood pressure				
Before intervention	75.00±11.98	77.20±11.14	0.384**	0.368†
After intervention	77.78±16.68	81.74±12.14	0.21**	
p-value	0.188*	0.014*	-	-

*Paired t-test; ** Independent t-test; † ANCOVA

The mean pre-test scores of all cognitive and behavioral variables showed a significant relationship with the mean post-test scores of cognitive-behavioral variables (p<0.001). The main effect of the intervention on all cognitive variables was significant (p<0.001) and indicated that the mean scores of cognitive variables after the intervention in the experimental group were significantly higher than the control group (Table 3). Also, after the intervention, the mean scores of nutritional behaviors were significantly different compared with the scores of the control group ($F_{(81, 1)}$=20.270; p<0.001; ES=0.2) and the mean scores of nutritional behaviors in the intervention group were significantly higher than the control group; however, the mean scores of physical activity and adherence to treatment in the experimental group were not significantly different from the control group (p<0.05; Table 3).

Before the intervention, there was no statistically significant difference in systolic and diastolic blood pressure in the experimental group and the control group (p<0.05), whereas after the intervention, systolic and diastolic blood pressure levels in the experimental and control groups changed and systolic blood pressure (14.49mmHg) showed a significant difference ($F_{(81, 1)}$=7.093; p<0.009; ES=0.81; Table 3).

Discussion

The aim of the present study was to improve self-care behaviors and control blood pressure. In general, the results of this study showed that training based on cognitive-behavioral factors improves cognitive and

behavioral variables and consequently controls blood pressure in patients with hypertension.

The mean age of participants was 59.27±8.91 years with an age range of 36-85 years, which indicated that with increasing age, the risk of developing hypertension increases and is consistent with the results of other studies [11-14]. Most of the subjects had a family history of hypertension, which indicated the high impact of genetic factors on hypertension. More than 90% of the subjects controlled their blood pressure at intervals of one month or less, which was a significant increase compared with the results of the study by Zinat Motlagh (31.2%) [16]. Also, almost 90% of the studied patients had regular drug use and adherence to treatment, which according to the results of the studies by Zinat Motlagh (74.8%), Warren-Findlow (58.6%), and Hu (51.9%) [16, 26, 36] showed a significant increase and indicates more adherence to treatment. Perhaps this increase in blood pressure control and adherence to treatment is due to the implementation of the Health Reform Plan and integrated care for non-communicable diseases, including hypertension in Iranian health centers in recent years, which may be a reason to reduce the effect of our intervention on treatment adherence behavior.

The results of this study showed that before the intervention, there was no significant difference in the mean score of cognitive variables in the experimental and control groups, whereas the educational intervention caused a significant increase in the mean scores of all cognitive variables in the experimental group compared with the control group, which indicates the effect of cognitive-behavioral educational intervention in improving cognitive domains related to self-care behaviors in patients with hypertension. In this regard, Meinema and Behzad showed similar results on the effect of educational intervention on increasing self-efficacy in adherence to drug use and self-care behaviors [32, 37]. Therefore, the present study using educational strategies for analysis of task characteristics as well as determination of performance criteria and also other mentioned studies showed that an appropriate training program can improve patients' self-efficacy in performing self-care behaviors in controlling high blood pressure. Consistent with the present study, the results of the study by Chou *et al*. also showed an increase in self-regulation and post-intervention self-care behaviors in patients with hypertension [38]. Our used educational program could increase self-regulation in patients using strategies, such as self-evaluation and external evaluation, self-monitoring and comparison, self-enhancement, etc. The used educational intervention had a significant effect on the mean scores of outcome expectations and evaluation of outcome expectations in patients, which are consistent with the results of Anderson and Zinat Motlagh [16, 28]. Wu reported that an educational intervention based on the self-efficacy model was effective in improving patients' expectations of self-care behaviors. Therefore, the results of all three studies show that cognitive interventions can improve outcome expectations and assessment of patients' outcome expectations for self-care behaviors to control hypertension. Regarding knowledge, many authors, including Genita and Meinema, also indicate an increase in knowledge after educational intervention [31, 32]. Based on the results of the present study regarding the cognition domain, the intervention had the greatest effect on self-efficacy and the least effect on outcome expectations.

Based on the results of the present study, the mean scores of all self-care behaviors before the intervention were not significantly different between the two groups, while after the intervention, the mean scores of the eating behaviors were significantly different between the two groups. In this regard, Golshahi showed that self-care education improved lifestyle determinants, such as improving nutritional behaviors, such as increasing vegetable consumption, reducing salt consumption in patients, which is consistent with the results of this study [30]. Warren-Findlow also showed that blood pressure self-care intervention increased following a low-salt diet by the subjects [39]. Based on the results of this study, after the intervention, patients in the experimental group were able to adopt healthier eating behaviors than the control group. Also, regarding the domain of self-care behaviors, the present intervention had the greatest impact on nutritional behaviors and the least impact on weight control behavior, which may be due to the short follow-up period of one month for patients as well as the lack of assessing social support, such as support of relatives, nutritionist, and so on.

Systolic blood pressure after the intervention was significantly different between the two groups. The mean systolic blood pressure in the control group increased from 138.02 mm Hg to 140.46 mm Hg, whereas systolic blood pressure in the experimental group increased from 129.51 mm Hg to 125.97 mm Hg, which indicates the effect of cognitive-behavioral educational intervention on reducing systolic blood pressure in hypertensive patients. However, in the study by Zinat Motlagh, both systolic and diastolic blood pressures before and after the intervention were significantly different between the two groups. Perhaps the reason for this difference can be attributed to the assessment of other domains, such as social support and also a longer follow-up of patients (6 months) compared with the present study. Consistent with these results, Golshahi and Moreno showed that the educational intervention on self-care behaviors reduced systolic and diastolic blood pressure in the experimental group after the intervention [30, 31].

One of the limitations of the present study is the lack of considering environmental and social support domains affecting hypertensive self-care behaviors, the limited number of patients studied, and the short-term follow-up to measure the effect of training classes on self-care behaviors and blood pressure control. Therefore, it is recommended to conduct more studies considering these limitations and also using other populations.

Conclusion

Programmed and principled training appropriate to the target group and affecting the cognitive-behavioral factors associated with self-care behaviors in hypertension improve self-care behaviors as well as blood pressure control in patients.

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References

1- Bakhtiari A, Neshat Doost HT, Abedi A, Sadeghi M. Effectiveness of group therapy based on cognitive models of the mind and consciousness of separation anxiety and blood pressure in women with hypertension. Clin Psychol Person. 2013;20(8):47-62. [Persian]

2- James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: Report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA. 2014;311(5):507-20.

3- NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in blood pressure from 1975 to 2015: A pooled analysis of 1479 population-based measurement studies with 19.1 million participants. Lancet. 2017;389(10064):37-55.

4- Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006;3(11):e442.

5- Forouzanfar MH, Liu P, Roth GA, Ng M, Biryukov S, Marczak L, et al. Global burden of hypertension and systolic blood pressure of at least 110 to 115 mm Hg, 1990–2015. JAMA. 2017;317(2):165-82.

6- Kamran A, Azad Bakht L, Sharifirad G, Mirkarimi K, Iranpur S. Relationship between illness perceptions and nutritional knowledge with eating behaviors among Ardabil rural hypertensive patients. Health Syst Res. 2014;10(2):295-305. [Persian]

7- Eghbali M, Khosravi A, Feizi A, Mansouri A, Mahaki B, Sarrafzadegan N. Prevalence, awareness, treatment, control and risk factors of hypertension among adults: a cross-sectional study in Iran. Epidemiol Health. 2018;40:e2018020. [Persian]

8- Feng XL, Pang M, Beard J. Health system strengthening and hypertension awareness, treatment and control: Data from the China health and retirement longitudinal study. Bull World Health Org. 2014;92(1):29-41.

9- Baghianimoghadam MH, Rahaee Z, Morowatisharifabad MA, Sharifirad G, Andishmand A, Azadbakht L. Effects of education on self-monitoring of blood pressure based on BASNEF model in hypertensive patients. J Res Med Sci. 2010;15(2):70-7. [Persian]

10- Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM, et al. Heart disease and stroke statistics--2011 update: A report from the American Heart Association. Circulation. 2011;123(4):e18-209.

11- Kibria GMA, Swasey K, Sharmeen A, Sakib MN, Burrowes V. Prevalence and associated factors of pre-hypertension and hypertension in Nepal: Analysis of the Nepal demographic and health survey 2016. Health Sci Rep. 2018;1(10):e83.

12- Rush KL, Goma FM, Barker JA, Ollivie RA, Ferrier MS, Singini D. Hypertension prevalence and risk factors in rural and urban Zambian adults in western province: a cross-sectional study. Pan Afr Med J. 2018;30:97.

13- Kumar Khanal M, Dhungana RR, Bhandari P, Gurung Y, Paudel KN. Prevalence, associated factors, awareness, treatment, and control of hypertension: Findings from a cross sectional study conducted as a part of a community based intervention trial in Surkhet, Mid-western region of Nepal. PloS one. 2017;12(10):e0185806.

14- Bhise MD, Patra S. Prevalence and correlates of hypertension in Maharashtra, India: A multilevel analysis. PloS one. 2018;13(2):e0191948.

15- Asresahegn H, Tadesse F, Beyene E. Prevalence and associated factors of hypertension among adults in Ethiopia: a community based cross-sectional study. BMC Res Notes. 2017;10:629.

16- Zinat Motlagh F. Evaluation of education program based on social cognitive theory in promoting self-care behaviors of hypertension. [Dissertation]. Esfahan: Isfahan University of Medical Sciences; 2016. [Persian]

17- ErdemY, Arici M, Altun B, Turgan C, Sindel S, Erbay B, et al. The relationship between hypertension and salt intake in Turkish population: SALTURK study. Blood Press. 2010;19(5):313-8.

18- Kawamura A, Kajiya K, Kishi H, Inagaki J, Mitarai M, Oda H, et al. Effects of the DASH-JUMP dietary intervention in Japanese participants with high-normal blood pressure and stage 1 hypertension: An open-label single-arm trial. Hypertens Res. 2016;39(11):777-85.

19- Rocha-Goldberg MDP, Carsino L, Batch B, Volic Cl, Thorpe CT, Bosworth HB, et al. Hypertension Improvement Project (HIP) Latino: Result of a pilot study of lifestyle intervention for lowering blood pressure in Latino adults. Ethn Health. 2010;15(3):269-82.

20- Hidari H, Bolurchifard F, Yaghmaei F, Naseri N, Hamadzadeh S. The effect of short-term aerobic exercise on the blood pressure in elderly clients with hypertension. Med Surg Nurs J. 2014;3(1):45-51. [Persian]
21- Bosworth HB, Dudley T, Olsen MK, Voils CI, Powers B, Goldstein MK, et al. Racial differences in blood pressure control: potential explanatory factors. Am J Med. 2006;119(1):e9-15.
22- Webber D, Guo Z, Mann S. Self-care in health: We can define it, but should we also measure it?. Self-care J. 2013;4(5):101-6.
23- Niriayo YL, Ibrahim S, Kassa TD, Asgedom SW, Atey TM, Gidey K, et al. Practice and predictors of self-care behaviors among ambulatory patients with hypertension in Ethiopia. PLoS one. 2019;14(6):e0218947.
24- Boima V, Ademola AD, Odusola AO, Agyekum F, Nwafor CE, Cole H, et al. Factors associated with medication nonadherence among hypertensives in Ghana and Nigeria. Int J Hypertens. 2015;2015:205716.
25- Rezvan S, Besharati M, Khodadadpoor M, Matlabi M, Fathi A, Salimi A, et al. Self-care assessment of patients with hypertension in Qom city. Qom Univ Med Sci J. 2018;12(4):72-80. [Persian]
26- Warren-Findlow J, Seymour RB. Prevalence rates of hypertension self-care activities among African Americans. J Natl Med Assoc. 2011;103(6):503-12.
27- Lee JE, Han HR, Song H, Kim J, Kim KB, Ryu JP, et al. Correlates of self-care behaviors for managing hypertension among Korean Americans: A questionnaire survey. Int J Nurs Stud. 2010;47(4):411-7.
28- Anderson ES, Winett RA, Wojcik JR. Self-regulation, self-efficacy, outcom expectations and social support: Social cognitive theory and nutrition behavior. Ann Behav Med. 2007;34(3):304-12.
29- Hosseini Nodeh Z, Pooreh SH. Impact of education based on theory of planned behavior: An investigation into hypertension-preventive self-care behaviors in Iranian girl adolescent. Iran J Public Health. 2015;44(6):839-47.
30- Golshahi J, Ahmadzadeh H, Sadeghi M, Mohammadifard N, Pourmoghaddas A. Effect of self-care education on lifestyle modification, medication adherence and blood pressure in hypertensive adults: Randomized controlled clinical trial. Adv Biomed Res. 2015;4:204.
31- Moreno MB, Contreras DR, Martínez NS, Araya PG, Livacic-Rojas P, Vera-Villarro P. Effects of a cognitive-behavioral intervention on blood pressure of hypertensive elderly subjects. Rev Med Chil. 2006;134(4):433-40. [Spanish]
32- Meinema JG, van Dijk N, Beune EJAJ, Jaarsma DADC, van Weert HCPM, Haafkens JA. Determinants of adherence to treatment in hypertensive patients of African descent and the role of culturally appropriate education. PLoS One. 2015;10(8):e0133560.
33- Lee E, Park E. Self-care behavior and related factors in older patients with uncontrolled hypertension. Contemporary Nurs. 2017;53(6):607-21.
34- Baliz Erkoc S, Isikli B, Metintas S, Kalyoncu C. Hypertension knowledge-level scale (HK-LS): A study on development, validity and reliability. Int J Environ Res Public Health. 2012;9(3):1018-29.
35- Samwat T, Hojjatzadeh E. Educational text for health care providers in national program for prevention and control of hypertension [Internet]. Isfahan: Isfahan University of Medical Sciences; 2015 [Cited 2020 Sep 18]. Available from: yun.ir/qcndg5. [Persian]
36- Hu G, Barengo NC, Tuomilehto J, Lakka TA, Nissinen A, Jousilahti P. Relation of physical activity and body mass index to the risk of hypertension: A prospective study in Finland. Hypertension. 2004;43(1):25-30.
37- Behzad H, Bastani F, Haghani H. Impact of empowerment program based on telenursing on self-efficacy on self-care behaviors in elderly with hypertension. Nurs Midwifery J. 2016;13(11):1004-15. [Persian]
38- Choo HI, Kim GS. Effects of a self-regulation program on blood pressure control and self-care in patient with essential hypertension. J Korean Acad Rural Health Nurs. 2011;6(1):33-43.
39- Warren-Findlow J, Seymour RB, Brunner Huber LR. The association between self-efficacy and hypertension self-care activities among African American adults. J Community Health. 2012;37(1):15-24.