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PUBLIC HEALTH & PRIMARY CARE | RESEARCH ARTICLE

Does family involvement in patient education improve hypertension management? A single-blind randomized, parallel group, controlled trial

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Abstract: This study aimed to evaluate the effectiveness of family involvement in patient education on hypertension (HTN) management. This single-blind randomized, parallel group controlled trial was conducted in Sayyed-Al Shohada hospital in Urmia. One hundred participants who met inclusion criteria were selected by convenience sampling and randomly allocated into control, patient-oriented, family-oriented and patient and family-oriented groups. Interactive educational interventions were given to three intervention groups for four months. The control group received routine care. The Hill-Bone Compliance to High Blood Pressure Therapy Scale and a mercury manometer were used to collect data. Data was analyzed using SPSS V20. The results showed a significant difference in the mean scores of the medical treatment compliance (primary outcome) and blood pressure (BP) among four study groups after the intervention ($p < 0.0001$). Tukey's test revealed that medical treatment compliance significantly improved in the patient and family-oriented group compared to other groups after the intervention



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PUBLIC INTEREST STATEMENT

"Hypertension is quite prevalent among the Iranian population. The awareness of hypertension is generally low in Iranians. Despite strong recommendations for prescribed therapy only 40–50% of patients adhered to their treatment. Poor medical treatment compliance prevents the patients from controlling their blood pressure. An uncontrolled blood pressure, in turn, results in frequent visits to medical centers, reduction in the quality of life of patients, and an increase in medical costs. This study aimed to evaluate the effectiveness of family involvement in patient education on hypertension management. In this study, 100 eligible participants, including patients and their family members were investigated in four different groups. The results showed that interactive educational interventions have a beneficial effect on treatment compliance. Patient education with the presence of a family member will promote adopting a healthier lifestyle, better managing blood pressure and eventually reduces the medical cost for patients and healthcare systems".

($p < 0.0001$). Family involvement in patient education had a beneficial effect on treatment compliance and patient outcomes. Patients education with the presence of a family member will promote adopting a healthier lifestyle and better managing BP in patients with HTN. It will eventually reduce the medical cost for patients and healthcare systems.

Subjects: Nursing; Nurse Education & Management; Nursing Research; Primary Care Nursing

Keywords: hypertension management; patient; family members; education; randomized controlled trial; Iran

1. Introduction

Cardiac vascular diseases (CVDs) have been found to be the number one cause of death worldwide. An estimated 17.7 million individuals died from CVDs in 2015, demonstrating 31% of all international deaths (World Health Organization [WHO], 2017). Of these, complications of hypertension (HTN) account for 9.4 million deaths worldwide every year (Lim et al., 2012). Of these deaths, an estimated 7.4 million were due to coronary heart disease and 6.7 million were due to stroke (WHO, 2017). HTN is a worldwide epidemic (Stamler, 2013). Globally, around 20% of females and 24% of males aged 18 and older had a raised blood pressure (BP) in 2015 (World Health Organization [WHO], 2018). Having HTN is defined as blood pressure (BP) which exceeds of 140/90 mm Hg, having a physician telling someone twice that they have HTN or if they take anti-hypertensive medications (Roger et al., 2012). Further, because of weak health systems, the numbers of people with HTN who are undiagnosed, untreated and uncontrolled are higher in low- and middle-income countries compared to high-income countries (World Health Organization [WHO], 2013). HTN is quite prevalent among the Iranian population (Aghaei Meybodi, Khashayar, Rezai Homami, Heshmat, & Larjani, 2014). Estimation of the overall prevalence of HTN in those ages 30–55 of the Iranian population was around 23% and 50%, respectively (Haghdoust, Sadeghirad, & Rezazadeh, 2008). HTN was reported as the most significant risk factor for CVDs in an Iranian population (Sarrafzadegan et al., 2011).

Despite effective pharmacologic and non-pharmacologic therapies, HTN of approximately half of adults remains uncontrolled (Magid & Green, 2013; Mozaffarian et al., 2016). According to available data, the awareness, treatment and control rate of HTN in Iranians are generally low and estimated to be approximately 50%, 35% and, 16%, respectively (Khosravi et al., 2010). Despite strong recommendations for prescribed therapy adherence by caregivers, only roughly 40–50% of those with chronic diseases such as HTN adhered to their medications worldwide (Roberts et al., 2014). Patient compliance to medical treatment can be defined as following through on the dietary, medication and lifestyle changes recommended by the health care providers (Leiva et al., 2010). Poor medication compliance prevents the patients from achieving the goals of their treatment plans and, ultimately, controlling their BP. An uncontrolled BP, in turn, results in frequent visits to medical centers, reduction in the quality of life of patients, and an increase in medical costs (Vervloet et al., 2011).

It is well known that lifestyle factors play a crucial role in the development of HTN and future steps need to be taken to provide interventions that improve lifestyle factors in economically developed and developing countries (Bromfield & Muntner, 2013). Several reports have documented the importance of lifestyle modifications (exercise, a diet rich in fruits and vegetables and low in fat and sodium, weight control/reduction, restricting alcohol consumption, especially excessive drinking) in the prevention and treatment of high BP (Baena et al., 2014; Khalesi, Irwin, & Sun, 2018; Weber et al., 2014). A clinical practice guideline by the American Society of Hypertension and the International Society of Hypertension for the management of HTN recommend lifestyle modification as an important and effective first-line treatment strategy (Weber et al., 2014). The

current challenge to clinicians is implementing lifestyle changes in the context of routine medical care (N. Huang & Duggan, 2008).

Patient education regarding medication compliance along with teaching healthy lifestyle behaviors is an effective tool for BP management in the hypertensive population (Hacihasanoglu & Gözümlü, 2011). A wide range of different strategies and interventions have been used to support the patients in adherence to treatment plans, although the results are not consistent (Bobrow et al., 2014). Finding better ways of communicating with patients, such as actively listening to the patient and including the patient in the decision-making process has been demonstrated to effectively reduce patient anxiety, along with improving treatment adherence and lifestyle changes (Cobos, Haskard-Zolnierok, & Howard, 2015). A possible strategy to improve HTN management is an extensive education program for the public and people with HTN (Campbell & Sheldon, 2010). Effective change in behavior occurs when learners actively interact with the content to be learned, with the teacher and with each other (Mackeracher, 2004). Group discussion allows for an ideal level of interaction and improves communication skills (Meo, 2013). Westberg and Jason (2004) cite several compelling reasons for using group discussion to promote learning. They believe learners are more likely to learn from each other in a supportive, nonjudgmental environment. All group members can both give and receive peer-oriented feedback and they can practice skills that can be applied later in real-life situations (Westberg & Jason, 2004).

Enhancement of community-wide BP control rates and HTN prevention can only be achieved via multilevel and multicomponent approaches that include families and many other community organizations (Beato, 2004). Family-oriented patient education defines as involvement of family members or significant others in education of patients and may be useful in the control of HTN (Chobanian, 2003). Family members should be involved in training programs to understand and identify the needs of patients and to comply with treatment plans and provide care support (Hinkle & Cheever, 2015). Family involvement plays a significant role in HTN treatment, by encouraging the acceptance of self-care practices such as proper diet, medication adherence and physical exercise. Thus, it was considered as a facilitating agent of adherence to treatment (Barreto & Marcon, 2014). Long-term BP control requires intervention that includes training and reminders about medication, medical appointments and follow-up to support adherence and persistence on treatment (Bobrow et al., 2014). This study primarily aimed to evaluate the effectiveness of interventions (small group discussion) based on a healthy lifestyle on HTN management (medication adherence, low sodium regimen adherence, medical appointments adherence and the overall treatment compliance) in four groups (control, patient-oriented, family-oriented, patient and family-oriented groups). The second objective of the study is to evaluate the effectiveness of interventions on the controlling of systolic and diastolic BP in patients with HTN. Our hypothesis was that the interactive group discussion might have an effect on patients' scores on HTN management and systolic and diastolic BP in three intervention groups.

2. Methods

2.1. Research design and setting

This single-blind randomized, parallel group controlled trial study was conducted at the Urmia clinical-educational center of Sayyed-Al Shohada in Iran between December 2015 and March 2016. The institutional review board of Urmia University of Medical Sciences approved the study (Research ethical code IR.UMSU.ac.ir.2013.284). The study was carried out in accordance with the code of ethics of the world medical association (Declaration of Helsinki). This study was registered in the Iranian Registry of Clinical Trials (Registration number IRCT2015122317059N4).

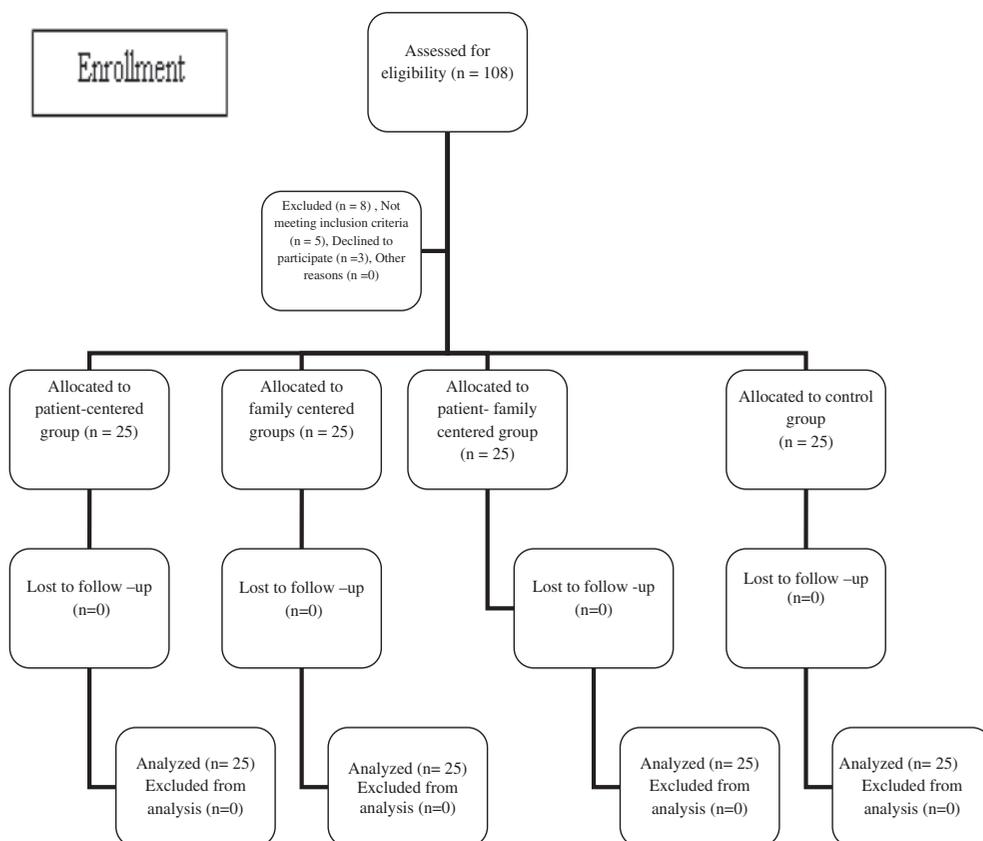
2.2. Participants

Patients with HTN and their family member were considered as participants in this study. Patients referring to the clinical-educational center of Sayyed-Al Shohada, were included in the trial if they met the following criteria: (1) had a known history of HTN for at least a year, (2) aged between 18

and 60 years, (3) had no underlying health problem such as a history of psychological disorders, cognitive impairment, hearing problems, chronic kidney failure, or CVDs, and (4) both the patient and the family member were literate and willing to cooperate in the study. Exclusion criteria consisted of: (1) patients' or family members' failure to participate regularly in the educational sessions, (2) unwillingness to participate further in the study, (3) having underlying health conditions such as CVDs, cognitive impairment, hearing problems, psychological disorders and chronic kidney failure and (4) having no family. After consulting with a statistician and considering the findings of a similar study by Sadeghi et al (SBP = 154.43 ± 16.16 in the intervention group, SBP = 152.62 ± 14.40 in the control group) the sample size was calculated at 100 participants for four groups by using the Power Analysis Software. Considering the probability of attrition in the study, 108 participants were recruited based on the convenience method and assessed for eligibility. Eight participants were excluded due to not meeting the inclusion criteria or not willing to participate in the study (Sadeghi, Mohseni, & Khanjani, 2014).

Primarily these 100 selected participants were invited to a meeting with researchers. All of them were given informed consent to sign and participate in the study. At the introductory meeting, the researchers introduced the objectives of the study and explained the steps involved in the research process, and recorded participants' telephone numbers. In the next step, 100 selected participants were randomly allocated into 4 equal, 25-member groups: control group, patient-oriented group, family-oriented group and patient and family-oriented group by using four different-colored envelopes. Patient-oriented group included patients with HTN. Family-oriented group included designated family members. Patient and family-oriented group included both patients and designated family members. The participants in the three interventional groups (patient-oriented, family-oriented and patient and family-oriented groups) were invited to attend another meeting to select an appropriate time for their interactive educational sessions (Figure 1).

Figure 1. The sampling framework of the study.



2.3. The primary outcome measures

All study variables were measured twice: at baseline and after the intervention. The primary outcome measure was the Hill-Bone Compliance to High Blood Pressure Therapy Scale, as developed by Kim et al in 2000 (Kim, Hill, Bone, & Levine, 2000). The questionnaire consists of 14 questions which fall into three categories: medication adherence, low sodium regimen adherence and medical appointments adherence. Nine of 14 questions measured medication adherence such as “How often do you forget to take your HBP medicine?”. Two items asked about medical appointments-keeping such as “ How often do you miss scheduled appointments?”. Three questions calculated low sodium regimen adherence, for example “How often do you eat salty food?”. Each item was a four-point Likert scale: never (1), occasionally (2), often (3) and always (4); the maximum and minimum possible scores were 56 and 14, respectively. Higher scores indicate lower adherence. In the questionnaire, there was also a section for participants’ demographics including age, gender, marital status, number of children, level of education, place of residence, employment status, level of income (for patient and family member), how long they have had the disease, history of HTN in the family, and whether or not the patient has any other major underlying health problems. In both phases of the study, three researchers interviewed all the participants face-to-face, going through each question and completing the questionnaires themselves. Interviewing researchers had been already briefed about and oriented to the questionnaires by the lead researcher.

This scale has been validated in many investigations, one of which was in a South African primary health care setting. Lambert et al. verified the criterion validity and internal consistency of the Hill-Bone Scale; their results were compared favorably with those from an urban African-American setting (Standardized Cronbach’s alpha was 0.74–0.84) (Lambert, Steyn, Stender, Everage, & Fourie, 2006). In Iran, Taher et al. confirmed the validity of the scale based on the content validity approach and under the supervision of 12 faculty members at the Shahid Beheshti School of Nursing. Moreover, the reliability of the scale was confirmed by calculating the Cronbach’s alpha coefficient of the scores of 20 patients with HTN; the alpha was found to be 0.80 (Taher, Abredari, Karimy, Abedi, & Shamsizadeh, 2014). In the present study, the content validity of the scale was verified by 10 nursing faculty members and 5 cardiovascular specialists, and the reliability of the instrument was calculated to be 0.87, 0.94, 0.79, 0.88, respectively for total treatment, medication, low sodium regimen and medical appointments adherence using Cronbach’s alpha.

2.4. The secondary outcome measures

In addition to our primary outcome measures, we also calculated means and standard deviations (SD) of the six measured BPs. BP was measured by using a mercury manometer (MA-166) which was fixed on the left arm of participants. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) measurement were taken while the participants were seated with their right arm at heart level. In the test session, SBP and DBP were taken three times in the morning and three times in the evening within 5 minutes apart (Jade, 2018). The average of six measured SBP and DBP was considered. The same instruments were used for the baseline and follow-up measures.

2.5. Procedure

The content of group discussion was about eating healthy food and decreasing the salt in the diet, maintaining a healthy weight, increasing physical activity, managing stress, quitting smoking, monitoring BP at home, adhering medical appointments and adhering medication regime. In this study, the same educational content was used to educate the three interventional groups. The participants in the patient-oriented, family-oriented and patient and family-oriented groups, were subsequently scheduled to attend the educational classes held at the clinical-educational center of Sayyed-Al Shohada in Urmia.

After consulting with the cardiologist and considering educational content volume, the research team decided to hold 48 training sessions during the following 4 months. After

conferring with the participants, the classes were scheduled as follows: The classes were held four times a week in the first month. They were held three times a week in the second and third month and twice a week in the fourth month. These interactive educational classes were held between 8 A.M. and 2 P.M. during working days. Patients and their designated family members in family-oriented and patient and family-oriented groups (one fixed member for each patient) chose an appropriate time according to their convenience. These classes lasted around 50 minutes. In each 50 min session, in addition to group discussion, a combination of didactic methods such as a short lecture, eliciting experience of individual participants, small group work, experiential exercises and individual work is also used. The last session included action planning by writing a “letter to oneself”, which every participant received 4 months after education. Didactic materials included overhead transparencies, flip charts, handouts and worksheets. The aims of this program included providing information regarding lifestyle and health, initiating self-reflection on healthy lifestyles, changing attitudes, enhancing positive emotions regarding lifestyle changes and encouraging action planning. All interactive educational group discussions were led by three researchers who had been trained and coordinated by a research group leader before the intervention. They had also involved in developing the intervention and used peer supervision for any difficulties while conducting the intervention.

To assure the treatment integrity, samples from all courses at each site were observed by external judges using a structured observational sheet. It contained a checklist regarding contents, the didactic methods sequence, and duration of each of the sessions as well as the proportion of patients participating actively. These checks confirmed that the intervention was delivered as prescribed by the manual. It showed that the majority of the participants was actively taking part during a session. The participants in the control group were given routine education. The control group received the paper-based educational materials and all participants completed the Hill-Bone Scale and their BP was measured six times at the end of the intervention.

2.6. Data analysis

Analysis was performed on 100 participants who completed both the baseline and 4-month follow-up assessments (Figure 1). We used the Shapiro–Wilk test to determine the normal distribution of the data. The analysis of variance (ANOVA) was used in the case of normal distribution. Whenever there were significant differences among four groups with regard to normal distribution, we used Tukey’s test to make statistical comparisons among intervention groups. The alpha level of significance for all inferential statistics was set at 0.05. Data was analyzed by the researcher who was blinded to the data using IBM SPSS software (version 20.0 SPSS Inc., Chicago, IL, USA).

3. Results

3.1. Demographic characteristics

Chi-square and Fisher exact test showed no significant difference in the patients’ demographic characteristics (gender, education, marital status, employment status, and smoking). ANOVA test showed that the difference in the mean number of age, disease duration and BMI was not statistically significant ($p < 0.05$) (Table 1).

3.2. Primary outcomes(treatment compliance)

The ANOVA analysis showed no significant differences among the four study groups regarding the medication adherence score in the pre-intervention period ($p = 0.352$). However, there were significant differences among the four groups’ mean medication adherence scores at the end of the study (control group: 21.72 ± 2.20 , family-oriented group: 13.44 ± 3.26 , patient-oriented group: 16.64 ± 2.59 and patient and family-oriented group: 12.36 ± 2.36 ; $p < 0.0001$). At the beginning of the study, the results of ANOVA showed no significant differences among the four groups in mean scores of low sodium regimen adherence. However, after the intervention, analysis showed a significant difference in mean low sodium regimen adherence scores of control group

Table 1. Demographic characteristics of participants in the four study groups

Variable		Control, N (%)	Family-oriented group, N (%)	Patient-oriented group, N (%)	Patient-and-family-oriented group, N (%)	p Value
Gender	Female	10(40)	(64) 16	14(56)	15(60)	$p = 0.341^*$
	Male	15(60)	9(36)	11(44)	10(40)	
Marital status	Married	24(96)	25(100)	25(100)	25(100)	$p = 0.287^{**}$
	Single	1(4)	0(0)	0(0)	0(0)	
Employment status	Currently unemployed	8(32)	6(24)	5(20)	1(4)	$p = 0.212^{**}$
	Employed	16(64)	18(72)	18(72)	23(92)	
	Retired	1(4)	1(4)	2(8)	1(4)	
Education level	Primary and secondary school	21(84)	21(84)	24(96)	25(100)	$p = 0.071^{**}$
	High school & University	4(16)	4(16)	1(4)	0(0)	
Smoking	Yes	5(20)	2(8)	6(24)	7(28)	$p = 0.622^*$
	No	20(80)	28(92)	19(76)	18(72)	
Age Mean(SD)		53.20 ± 10.05	51.88 ± 8.58	54.28 ± 8.82	49.96 ± 8.27	$p = 0.363^{***}$
BMI(SD)		24.77 ± 2.9	24.92 ± 3.18	24.10 ± 2.1	24.64 ± 3.03	$p = 0.104^{***}$
Disease duration Mean(SD)		5.33 ± 1.66	5.67 ± 2.89	5.26 ± 1.47	5.62 ± 1.11	$p = 0.322^{***}$

* Chi-square. ** Fisher exact test. *** Analysis of variance.

(7.48 ± 1.12), family-oriented group (4.68 ± 1.18), patient-oriented group (5.24 ± 1.16) and patient and family-oriented group (3.80 ± 0.81) ($p < 0.0001$). With regard to the medical appointments adherence scores, the results of the ANOVA indicated no significant differences among the four study groups in the pre-intervention period ($p = 0.608$). Nevertheless, there were significant differences among the four groups' mean medical appointments adherence scores after the intervention (control group: 5.16 ± 0.80, family-oriented group: 3.12 ± 0.88, patient-oriented group: 3.80 ± 0.81 and patient and family-oriented group: 3.48 ± 0.71; $p < 0.0001$). No significant differences were observed among the four groups in mean scores of the overall treatment compliance before the intervention. However, a significant difference was observed in mean the overall treatment compliance scores of (control group: 34.36 ± 2.78, family-oriented group: 21.24 ± 3.62, patient-oriented group: 25.68 ± 3.59 and patient and family-oriented group: 19.46 ± 2.73) ($ES = 1.8, p < 0.0001$), (Table 2).

3.3. Secondary outcomes

The results of the ANOVA showed that means and SDs of SBP and DBP were not different among the four study groups before the intervention. The interventions decreased mean of SBP (5.00 ± 4.53 mmHg in the family-oriented group, 7.32 ± 2.54 mmHg in the patient-oriented group and 8.40 ± 6.11 mmHg in the patient and family-oriented group). After the intervention means and SDs of SBP were significantly different among the four study groups ($p < 0.0001$). Similar results were observed for DBP values (4.84 ± 2.77 mmHg in the family-oriented group and 8.72 ± 6.20 mmHg in the patient-oriented group and 8.76 ± 6.20 mmHg in the patient and family-oriented group). After the intervention means and SDs of DBP were different among the four study groups ($p < 0.0001$) (Table 3).

Tukey's test revealed that medication adherence ($p < 0.0001$), low sodium regimen adherence ($p < 0.0001$), medical appointments adherence ($p < 0.019$) and treatment compliance ($p < 0.0001$) significantly improved in the patient and family-oriented group compared to other groups after the intervention (Table 4).

Table 2. Comparison of treatment compliance and its domains among the four groups at the beginning and at the end of the study

Variable		Control group	Family-oriented group	Patient-oriented group	Patient-and-family-oriented group	p Value ANOVA
		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Medication adherence	Pre-intervention	19.40 ± 2.02	18.64 ± 1.52	18.96 ± 1.54	19.68 ± 2.03	F = 1.856 p = 0.142
	Post-intervention	21.72 ± 2.20	13.44 ± 3.26	16.64 ± 2.59	12.36 ± 2.36	F = 74.658 p < 0.0001
Low sodium regimen adherence	Pre-intervention	7.76 ± 1.85	7.20 ± 1.19	7.48 ± 1.26	7.60 ± 1.15	F = 0.625 p = 0.601
	Post-intervention	7.48 ± 1.12	4.68 ± 1.18	5.24 ± 1.16	3.80 ± 0.81	F = 52.983 p < 0.0001
Medical appointments adherence	Pre-intervention	5.24 ± 0.87	4.96 ± 0.88	4.76 ± 0.83	5.16 ± 1.17	F = 1.270 p = 0.289
	Post-intervention	5.16 ± 0.80	3.12 ± 0.88	3.80 ± 0.81	3.48 ± 0.71	F = 30.617 p < 0.0001
Treatment compliance	Pre-intervention	32.40 ± 3.60	30.80 ± 2.06	31.20 ± 2.02	32.44 ± 3.30	F = 0.58 p = 0.981
	Post-intervention	34.36 ± 2.78	21.24 ± 3.62	25.68 ± 3.59	19.46 ± 2.73	F = 26.129 p < 0.0001

Table 3. Comparison of systolic and DBP among the four groups at the beginning and at the end of the study

Variable		Control group (Mean ± SD)	Family-oriented group (Mean ± SD)	Patient-oriented group (Mean ± SD)	Patient-and-family-oriented group (Mean ± SD)	ANOVA
(SBP)	Pre-intervention	132.28 ± 152.48	143.08 ± 11.01	8.83 ± 147.32	14.18 ± 146.80	73. F = 7 062.0 = p
	Post-intervention	154.68 ± 13.27	138.08 ± 9.70	140.00 ± 9.12	138.40 ± 11.43	03. F = 24 p < 0.0001
	Pre minus post	-2.20 ± 2.06	5.00 ± 4.53	7.32 ± 2.54	8.40 ± 6.11	36. F = 60 p < 0.0001
(DBP)	Pre-intervention	85.48 ± 7.51	81.48 ± 9.93	88.32 ± 6.83	83.96 ± 10.24	71. F = 7 0.057 = p
	Post-intervention	86.88 ± 8.00	76.64 ± 9.63	79.60 ± 6.75	75.20 ± 8.35	14. F = 22 p < 0.0001
	Pre minus post	-1.40 ± 2.12	4.84 ± 2.77	8.72 ± 6.20	8.76 ± 6.20	82. F = 56 p < 0.0001

4. Discussion

Study results were discussed in three separate sections: first, interactive group discussions had a significant affect on treatment compliance (medication, low sodium regimen and medical appointments adherence) of patients with HTN. Second, the affect of interactive educational intervention on medical treatment compliance was more significant in patients and family-oriented group compared to others. Third, family-oriented patient education resulted in improving BP control and ultimately reduced systolic and DBP in patients with HTN.

In line with our results previous studies have confirmed that educational interventions improved patients' knowledge about their disease, general comprehension of medications and their beliefs about medicines and ultimately would increase their active participation in treatment (Magadza, Radloff, & Srinivas, 2009; Rubin, 2005). Similar to our findings, Kayima et al. mentioned one of the ways to improve treatment compliance in patients with high BP is to educate patients (Kayima,

Table 4. Pairwise comparison of self-care and its domains among the four groups at the beginning and at the end of the study

Variable	Groups	Control	Patient-oriented	Patient-and-family-oriented	Family-oriented
Medication adherence	Family-oriented	$p < 0.0001$	$p = 0.476$	$p < 0.0001$	–
	Patient-oriented	$p < 0.0001$	–	$p < 0.0001$	$p = 0.476$
	Patient-and-family-oriented	$p < 0.0001$	$p < 0.0001$	–	$p < 0.0001$
	Control group	–	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$
Low sodium regimen adherence	Family-oriented	$p < 0.0001$	$p = 0.025$	$p = 265$	–
	Patient-oriented	$p < 0.0001$	–	$p < 0.0001$	$p = 0.025$
	Patient-and-family-oriented	$p < 0.0001$	$p < 0.0001$	–	
	Control group	–	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$
Medical appointments adherence	Family-oriented	$p < 0.0001$	$p = 0.394$	$p = 0.019$	–
	Patient-oriented	$p < 0.0001$	–	$p = 0.499$	$p = 0.394$
	Patient-and-family-oriented	$p < 0.0001$	$p = 0.499$	–	$p = 0.019$
	Control group	–	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$
Treatment compliance	Family-oriented	$p < 0.0001$	$p = 0.298$	$p < 0.0001$	–
	Patient-oriented	$p < 0.0001$	–	$p = 0.001$	$p = 0.298$
	Patient-and-family-oriented	$p = 0.007$	$p = 0.001$	–	$p < 0.0001$
	Control group	–	$p < 0.0001$	$p = 0.007$	$p < 0.0001$
(SBP)	Family-oriented	$p < 0.0001$	$p = 1.000$	$p = 0.926$	–
	Patient-oriented	$p < 0.0001$	–	$p = 0.956$	$p = 1.000$
	Patient-and-family-oriented	$p < 0.0001$	$p = 0.956$	–	$p = 0.926$
	Control group	–	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$
(DBP)	Family-oriented	$p < 0.0001$	$p = 0.926$	$p = 0.585$	–
	Patient-oriented	$p < 0.0001$	–	$p = 0.241$	$p = 0.926$
	Patient-and-family-oriented	$p = 0.013$	$p = 0.241$	–	$p = 0.585$
	Control group	–	$p < 0.0001$	$p = 0.013$	$p < 0.0001$

*Tukey's test

Wanyenze, Katamba, Leontsini, & Nuwaha, 2013). Through patient education, all misunderstandings that patients have about their treatment can be explained. This can improve patients' adherence to treatment (Saounatsou et al., 2001) and may then possibly lead to improved BP control (Gwady-Sridhar et al., 2013; Park et al., 2011).

The results also showed that patients' treatment compliance has promoted more in the patient and family-oriented group compared to other intervention groups. Consistent with our findings, a study result indicated that poor family support along with other factors as causes of poor treatment compliance among patients with HTN (Olowookere et al., 2015). Shen et al. revealed that the family member-based educational intervention has positive effects on patients' adherence to BP monitoring and hypertensive medications (Shen et al., 2017). Implementing of a family member-based management in patients with HTN in rural China shows satisfactory effects with respect to improved treatment compliance and BP control (S. Huang, Chen, Zhou, & Wang, 2014). Thus, family caregivers need information and training to ensure that patients' needs are met and this requires developing patient/family education materials and training programs (Houts, Nezu, Nezu, &

Bucher, 1996). A systematic review reported that interventions including patients and families education through individual and group discussion improved patients' knowledge of medications, anti-hypertensive therapy and BP control (Gwady-Sridhar et al., 2013). Similar to our findings, the positive effect of family-based education on appointment-keeping behavior, BP monitoring in patients with HTN has been confirmed in an earlier study (Morisky, DeMuth, Field-Fass, Green, & Levine, 1985). Barreto and Marcon reported that the family facilitates patients' adherence to treatment. Patients perceive the family as a safety, sympathetic and supportive sources. Thus, recognizing the strengths and weaknesses of patients' families can help nurses to adopt proper strategies in their care in a therapeutic process (Barreto & Marcon, 2014). Miller et al. confirmed that family support had an important impact on treatment adherence in patients with chronic diseases. They also, reported that non-adherence to medical treatment increased in patients, when there were no family members involved in patient education and daily care (Miller & DiMatteo, 2013).

In this study, interactive educational group discussions in all intervention groups (family-oriented, patient-oriented and patient and family-oriented groups) led to decreased systolic and diastolic BP in patients. Talking to patients and their families about changing lifestyle and encouraging them to have a healthy lifestyle, exercising appropriately for their age, consuming proper nutrition with a low salt diet was an effective step in reducing BP. An experimental evidence has suggested that support from family can help patients take their anti-hypertensive medications correctly and their systolic or diastolic BP were decreased significantly after 6 months intervention (Shen et al., 2017). Consistent with our result, Morisky et al. revealed that the family member support educational program had significant effects on decreasing in DBP variability (Morisky et al., 1985). A recent study in Iran, investigated the effects of group discussion with mail high school students on their parents' lifestyle and HTN control showed positive effects of the intervention on patients regarding controlling HTN, decreasing BP, adhering to diet and anti-hypertensive medications (Ezzati, Anoosheh, & Mohammadi, 2012). Implementation of the family-centered empowerment model for elderly people with HTN has been associated with controlling and improving the BP (Keshvari, Hedayati, Moeni, & Alhani, 2015). This fact can also be observed in the present study, as family involvement in patient education was reported as facilitating BP management in patients with HTN.

Our study has several possible limitations. First, our study population was limited to a select group of patients with HTN and their family members living in Urmia, and these patients may not represent all other hypertensive patients. Second, our sample size calculated 100 patients for four groups that are relatively low. Therefore, our study findings should be generalized to the clinical situation with caution. Third, patients selected one family member to participate in educational sessions, and it is more likely that family members participating in the groups were more supportive of patients than family members not participating. There was also a possibility of confounding variables, including uncontrollable variables, such as the psychomental characteristics and the cultural background of patients and their families, as well as their motivation to learn that could affect their learning ability.

5. Conclusion

The results revealed that family involvement in patient education plays a significant role in HTN management, by encouraging the patients to adhere to medication, low sodium diet and medical appointments. The results also indicate that interactive educational interventions based on a healthy lifestyle with the patient or family are effective in increasing treatment compliance and reducing systolic and diastolic BP. However, if education is held with the presence of both the patient and the family, the greater effect on treatment compliance and BP control will be observed.

5.1. Implication for practice

Therefore, it is suggested that interactive educational interventions such as small group discussions to be held with the presence of a family member to promote adopting a healthier lifestyle and better managing BP in patients with HTN. Health system managers and policy makers can include

and mandate family-oriented education in the routine nursing care and clinical services in order to promote HTN management. It ultimately reduces the medical cost for both patients and health-care systems.

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Competing interest

The authors declare no conflicts of interest.

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