



The effect of educational intervention on the components of PRECEDE model in hypertension patients

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Background and objective: Hypertension is one of the common and dangerous diseases and the most important risk factor of incidence of cardiovascular diseases, stroke, and kidney failure. As with most chronic diseases, this disease is closely associated with the lifestyle of patients. The most useful application of PRECEDE model is interpreting the factors associated with behavior. The aim of this research was to determine the effect of educational intervention on the components of PRECEDE model in hypertension patients. **Materials and methods:** this research was experimental, in which 40 subjects were in the test group and 40 other subjects participated in the control group. The educational intervention was designed based on PRECEDE model and implemented in the test group. The data collection instrument was a researcher made questionnaire including health demographic characteristics as well as the PRECEDE model constructs questionnaire. The data were collected before, immediately after and 45 days after the educational intervention. They were then analyzed by SPSS version 20. **Findings:** the mean scores of the precipitating factors (awareness and attitude), enabling factors (acquiring skill in measuring blood pressure), reinforcing factors (the encouragement and support by friends and acquaintances), and behavioral factors (consumption of fruits and vegetables, fatty and fried foods, smoking) were significantly higher in the test group, compared to the control group ($P>0.05$). **Conclusion:** educational intervention based on PRECEDE model is effective in raising the scores of precipitating factors, enabling factors, reinforcing factors, and behavioral factors in hypertension patients. Therefore, it is suggested that this model be used for educating and determining the factors affecting controlling hypertension in patients.

INTRODUCTION

Hypertension is one of the common and dangerous chronic diseases and the most important risk factor of incidence of cardiovascular diseases, stroke, and kidney failure. As with most chronic diseases, this disease is closely associated with lifestyle, psychological health, and quality of life of patients. If not controlled timely and properly, it causes incidence of different diseases, development of considerable disability and diminished productivity, and finally reduced quality of life (Sotodeh-Asl, et al. 2010). The definition presented about hypertension by the World Health Organization is systolic blood pressure equal to or more than 140 mmHg and diastolic equal to or more than 90 mmHg. Furthermore, systolic pressure between 140 until 159 and diastolic pressure between 90 and 99 have been classified as hypertension grade I (Samavat, 2011). The investigation is performed in the US suggests that

25% of men and 21% of women suffer from hypertension (Newell, et al. 2009). Furthermore, Yoon et al performed a longitudinal study from 1999 until 2014 and reported the overall prevalence of hypertension as 29% in the US (Yoon, Fryar et al. 2015). The results of research performed around the world have indicated that the prevalence of hypertension is increasing across all countries and especially in Iran. In some industrial countries, up to 25% of adults have hypertension, whose level amounts up to 40% at older ages. The World Health Organization (2014) reports the average prevalence of hypertension in the world in 18 years old individuals and above as 22%. However, the prevalence differs from region to region. For example, in Africa, the prevalence of both genders has been reported to be 46%, while in the US it has been reported as 35%. In developed countries, due to early diagnosis and treatment with inexpensive medications, the prevalence and average rate of hypertension is low, causing diminished mortality resulting from hypertension in those countries (World Health Organization 2013). WHO has reported the mortality rate due to hypertension in Iran as 33.44 per every 100,000 people in 2011, whereby Iran stood the 67th in the world (Hakim and Bagheri 2014). The results of research performed in population research database of Tehran University of medical sciences about prevalence of hypertension have indicated rate as 29% in men and 34.8% in women, indicating and proving its growing trend

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(Fakhrzade, et al. 2003). It is predicted that the rate of incidence reaches 1.5 billion people and death of 9.4 million people annually by 2025 (Mittal and Singh 2010). The main reason of increased hypertension includes factors such as altered lifestyle, increased population, urbanization, and longevity (WHO 2006). Following development of hypertension, controlling it is crucial in order to minimize the chance of development of complications in response to this disease. Nevertheless, the rate of success for controlling hypertension has been only 27% in the US, while in England, France, and Germany, it has been even lower. In spite of the current treatments, the control and treatment of hypertension are not desirable, such that in Tehran 60% of people with hypertension have uncontrolled hypertension despite of being aware about their disease (Azizi, et al. 2002). The results of studies have shown that many patients with hypertension believed that the difficulty and trouble of consuming antihypertensive drugs on a daily basis is far harder than tolerating hypertension symptoms. For this reason, patients did not follow regular consumption of the prescribed medications and their general perception about their health was still negative (Sprangers, et al. 2000). However, health training results in encouragement and empowerment of people to accept and conduct voluntary healthy behavior, reasonable use of available health services, decision-making for advancing and improving their level of health in the environment, promotion of awareness about prevention of diseases, alteration of attitudes and behavior which ease one of the main objectives of health training programs based on model and theories. The programs that are based on scientific models and theories of health training are a great instrument which can empower the target group purposefully, so that they can have a greater control on their health, lifestyle, and personal habits (Motamedi, et al. 2010). It should be stated that there are various models regarding health training. One of these models is PRECEDE model, which involves the constructs of precipitating factors, enabling factors, reinforcing factors, and behavioral factors. It is one of the models for planning in health training, which is used for identifying needs and promoting health (Hosseini, et al. 2014). Currently, this model is the most famous and practical model (Safari, et al. 2009). Indeed, the most useful application of this model is interpretation of factors associated with behavior (Jalili, et al. 2004). Across different studies of PRECEDE model, an effective theoretical model has been known for identifying needs in health training and health promotion. For example, in a study on the effect of training stress relief based on PRECEDE model synthesis as well as perceived self-efficacy theory and health belief model, anxiety and desirable pregnancy outcomes in pregnant women, and Green study on health promotion programs, the efficiency of PRECEDE model has been confirmed, and the researchers reached acceptable educational results. Another study has also indicated the efficiency of this model in controlling pediatric anemia (Afkari, et al. 2013). The role of nurses regarding hypertension has developed over the past 50 years as complementary of physicians' job. It begins with measuring in training patients with hypertension and continues with performing other effective strategies such as examining, diagnosing, following up, assessing, taking drug interventions, and receiving consultation, encompassing all care aspects (Himmelfarb, et al. 2016). As nurses account for over 70% of the members of healthcare team, they have a very significant role in training patients and clients. This is because they have a greater access to the patient and the family and spend a great deal of time to take care of them. Hence, they have great opportunities for training and can assess the effect of trainings. Training patients is one of the most essential and vital care plans in the health care system and is considered the center of gravity of the nurses' tasks

(Jafari, et al. 2015). Considering the progressive growth of the number of patients with hypertension and with regards to the importance of usage of one model as framework to design educational programs, this research was performed with the aim of determining the effect of educational training on the components of PRECEDE model in patients with hypertension in a selected hospital in Urmiah.

FINDINGS

The mean and SD of the age of patients was 56.8 ± 11.11 and 56.75 ± 9.57 in the test and control groups, respectively. From among the subjects in this research, 14 (35%) and 26 (65%) were male and female in the test group, respectively, while 15 (37.5%) and 25 (62.5%) were male and female in the control group, respectively. A total of 32.5% of the test group were illiterate and had third-grade high school degree. In the control group, 40% were illiterate. Only 15% of the people in the test group and 12.5% of the subjects in the control group had bachelor's degree or above. Based on the results, 95% of the subjects in the test group and 80% in the control group were married. The mean and SD of duration of the disease was 8.04 ± 5.34 and 7.34 ± 6.68 years for the test and control groups, respectively. No statistically significant difference was observed between the patients of the test and control group in terms of age, gender, marital status, level of education, duration of disease, and blood pressure ($P > 0.05$).

Considering the precipitating factors, Mann-Whitney test showed that the mean scores of awareness had no significant difference between the control and test group before the intervention ($P = 0.73$). However, immediately after ($P = 0.001$) and 45 days after the educational intervention ($P = 0.001$), the mean scores of awareness were significantly higher in the test group, compared to the control group. Friedman test showed that the difference between the mean scores of awareness at three stages of before, immediately after, and 45 days after the educational intervention was significant ($P = 0.001$) in the test group, but insignificant in the control group ($P = 0.19$). Mann-Whitney test also indicated that the mean scores of attitude had no significant difference between the control and test groups before the educational intervention ($p = 0.425$). However, immediately after ($p = 0.001$) and 45 days after the educational intervention ($p = 0.001$), the mean scores of attitude were significantly higher in the test group, compared to the control group. Friedman test revealed that the difference between the mean scores of attitude at three stages of before, immediately after, and 45 days after the educational intervention were significant in the test group ($P = 0.001$) but insignificant in the control group ($P = 0.632$) (Table 2).

Investigating the enabling factors, there was no significant difference between the test and control groups in terms of extent of participation in the educational classes before ($p = 0.874$), immediately after ($p = 0.711$), and 45 days after the educational intervention ($p = 0.081$). On the other hand, Chi-Square test showed that the control and test groups had no significant difference before the educational intervention regarding acquisition of skills in measuring blood pressure ($p = 0.905$). However, immediately after ($p = 0.004$) and 45 days after the educational intervention ($p = 0.001$) in the test group, the extent of skill acquisition in measuring blood pressure was significantly higher in the test group compared to the control group.

With regards to the reinforcing factors, the findings showed that in terms of support and encouragement by the family, there was no significant difference between the control and test groups before ($p = 0.362$), immediately ($p = 0.419$), and 45 days after ($p = 0.515$) the educational intervention. Chi-Square test revealed that there was no significant difference in the support and encouragement by the

Table 1 Cronbach alpha of the questionnaires

No.	title	Alpha coefficient
1	awareness	0.834
2	attitude	0.878
3	Enabling factors	0.768
4	Reinforcing factors	0.719
5	Behavioral factors	0.767

Table 2 Comparing the mean and SD of the scores significance results of awareness and attitude in the test and control groups before, immediately after, and 45 days after the educational intervention

Group variable		Before the intervention		Immediately after the intervention		45 days after the intervention		Friedman test
		mean	SD	mean	SD	Mean	SD	
Awareness	Test group	13.26	3.998	19.67	4.928	18.62	4.076	P=0.001
	Control group	13.57	3.178	13.67	3.496	14.78	3.57	P=0.19
Mann-Whitney test results		P=0.73		P=0.001		P=0.001		
Attitude	Test group	2.9	2.198	6.36	2.345	4.82	2.684	P=0.001
	Control group	2.87	3.212	2.65	3.15	2.87	2.857	P=0.632
Mann-Whitney test results		P=0.425		P=0.001		P=0.001		

Table 3 Comparing the frequency distribution of the enabling factors and reinforcing factors of the test and control groups before, immediately after, and 45 days after the educational intervention

Enabling factors			Before the intervention		Immediately after the intervention		45 days after the intervention	
			Test	Control	Test	Control	Test	Control
Participation in educational classes	Yes	No.	24	21	29	21	30	23
		Percentage	60	52.5	72.5	52.5	75	57.5
	No	No.	16	19	11	19	10	17
		Percentage	40	47.5	27.5	47.5	25	42.5
	Sum	No.	40	40	40	40	40	40
		Percentage	100	100	100	100	100	100
Chi-Square test result			P=0.874		P=0.711		P=0.081	
Skill acquisition in measuring blood pressure	Yes	No.	26	21	25	20	33	22
		Percentage	65	52.5	62.5	50	82.5	55
	No	No.	14	19	15	20	7	18
		Percentage	35	47.5	37.5	50	17.5	45
	Sum	No.	40	40	40	40	40	40
		Percentage	100	100	100	100	100	100
Chi-Square test result			P=0.905		P=0.004		P=0.001	
Reinforcing factors								
Family	Yes	No.	23	21	25	22	29	19
		Percentage	57.5	52.5	62.5	55	72.5	47.5
	No	No.	17	19	15	18	11	21
		Percentage	42.5	47.5	37.5	45	27.5	52.5
	Sum	No.	40	40	40	40	40	40
		Percentage	100	100	100	100	100	100
Chi-Square test result			P=0.362		P=0.419		P=0.515	
Friends and acquaintances	Yes	No.	21	19	26	21	31	20
		Percentage	52.5	47.5	65	52.5	77.5	50
	No	No.	19	21	14	19	9	20
		Percentage	47.5	52.5	35	47.5	22.5	50
	Sum	No.	40	40	40	40	40	40
		Percentage	100	100	100	100	100	100
Chi-Square test result			P=0.513		P=0.046		P=0.033	
Healthcare cadre	Yes	No.	29	22	30	21	33	21
		Percentage	72.5	55	75	52.5	82.5	52.5
	No	No.	11	18	10	19	7	19
		Percentage	27.5	45	25	47.5	17.5	47.5
	Sum	No.	40	40	40	40	40	40

	Percentage	100	100	100	100	100	100
Chi-Square test result		P=0.546		P=0.967		P=0.107	

Table 4 Comparing the frequency distribution of the behavioral factors of the test and control groups before, immediately after, and 45 days after the educational intervention

Behavioral factors			Before the intervention		Immediately after the intervention		45 days after the intervention		Cochran-Q test
			Test	Control	Test	Control	Test	Control	
Salt consumption	decreased	No.	23	21	28	22	26	19	P=0.502
		Percentage	57.5	52.5	70	55	65	47.5	
	Did not decrease	No.	17	19	12	18	14	21	P=0.792
		Percentage	42.5	47.5	30	45	35	52.5	
	Sum	No.	40	40	40	40	40	40	
		Percentage	100	100	100	100	100	100	
Chi-Square test result			P=0.183		P=0.091		P=0.11		
Fruit and vegetable consumption	decreased	No.	21	20	25	22	31	22	P=0.044
		Percentage	52.5	50	62.5	55	77.5	55	
	Did not decrease	No.	19	20	15	18	9	18	P=0.875
		Percentage	47.5	50	37.5	45	22.5	45	
	Sum	No.	40	40	40	40	40	40	
		Percentage	100	100	100	100	100	100	
Chi-Square test result			P=0.068		P=0.001		P=0.001		
Consumption of fatty foods	decreased	No.	26	22	29	21	33	20	P=0.007
		Percentage	65	55	72.5	52.5	82.5	50	
	Did not decrease	No.	14	18	11	19	7	20	P=0.905
		Percentage	35	45	27.5	47.5	17.5	50	
	Sum	No.	40	40	40	40	40	40	
		Percentage	100	100	100	100	100	100	
Chi-Square test result			P=0.3		P=0.001		P=0.001		
Cigarette smoking	decreased	No.	6	20	14	24	19	21	P=0.001
		Percentage	15	50	35	60	47.5	52.5	
	Did not decrease	No.	34	20	26	16	21	19	P=0.646
		Percentage	85	50	65	40	52.5	47.5	
	Sum	No.	40	40	40	40	40	40	
		Percentage	100	100	100	100	100	100	
Chi-Square test result			P=0.1		P=0.001		P=0.001		
Hookah smoking	decreased	No.	3	21	11	23	18	18	P=0.001
		Percentage	7.5	52.5	27.5	57.5	45	45	
	Did not decrease	No.	37	19	29	17	22	22	P=0.53
		Percentage	92.5	47.5	72.5	42.5	55	55	
	Sum	No.	40	40	40	40	40	40	
		Percentage	100	100	100	100	100	100	
Chi-Square test result			P=0.41		P=0.02		P=0.001		
Physical activity and stress	Yes	No.	27	20	26	20	29	22	P=0.764
		Percentage	67.5	50	65	50	72.5	55	
	No	No.	13	20	14	20	11	18	P=0.875
		Percentage	32.5	50	35	50	27.5	45	
	Sum	No.	40	40	40	40	40	40	
		Percentage	100	100	100	100	100	100	
Chi-Square test result			P=0.08		P=0.1		P=0.1		

healthcare cadre between the control and test groups before ($p=0.546$), immediately after ($p=0.967$), and 45 days after the educational intervention ($p=0.107$). According to Chi-Square test, there was no significant difference between the two groups in terms of encouragement and support by friends and acquaintances before the treatment ($p=0.513$). However, in the test group, immediately after ($p=0.46$) and 45 days after the educational intervention ($p=0.033$), the extent of support and encouragement by friends and acquaintances was significantly higher in the test group, than in the control group (Table 3).

Investigating behavioral factors, there was no significant difference between the two groups before ($p=0.183$), immediately after ($p=0.091$), and 45 days after the educational intervention ($p=0.11$), in terms of salt consumption. Based on Cochran-Q test results, in the test group, the difference of salt consumption between the three stages of before, immediately after, and 45 days after the educational intervention

($p=0.502$) in the test group and with $p=0.792$ in the control group is insignificant. Furthermore, based on Chi-Square test, there was no significant difference between the two groups before the intervention in terms of fruit and vegetable consumption ($p=0.068$). However, in the test group, immediately after ($p=0.001$) and 45 days after the educational intervention ($p=0.001$), the level of fruit and vegetable consumption was significantly different with that of the control group. Cochran-Q test showed that in the test group, the difference of fruit and vegetable consumption between the three stages of before, immediately after, and 45 days after the intervention ($p=0.044$) was significant, while in the control group, it was insignificant ($p=0.875$). Based on the results in terms of consumption of fatty and fried foods, before the intervention, the difference of the two groups was not significant ($p=0.3$). However, immediately after ($p=0.001$) and 45 days after the educational intervention ($p=0.001$), the rate of consumption of fatty and fried foods

was significantly different compared to the control group. Cochran-Q test showed that in the test group, the difference of consumption of fatty and fried foods between the three stages of before, immediately after, and 45 days after the educational intervention was significant ($p=0.007$), while in the control group it was insignificant ($p=0.905$). In terms of cigarette smoking, before the intervention, the difference was not significant between the two groups ($p=0.1$). However, in the test group immediately after ($p=0.001$) and 45 days after the educational intervention ($p=0.001$), cigarette smoking rate was significantly lower compared to the control group. Cochran-Q test revealed that in the test group, the difference of cigarette smoking between the three stages of before, immediately after, and 45 days after the educational intervention was significant ($p=0.001$), while it was insignificant in the control group ($p=0.646$). According to Chi-Square test, in terms of hookah smoking, there was no significant difference between the two groups before the intervention ($p=0.41$). However, in the test group, immediately after ($p=0.02$) and 45 days after the educational intervention ($p=0.001$), hookah smoking rate was significantly lower in the test group, compared to the control group. According to the Cochran-Q test results, the difference of hookah smoking in the test group was significant between the three stages of before, immediately after, and 45 days after the educational intervention ($p=0.001$), while in the control group it was insignificant ($p=0.53$). Furthermore, in terms of physical activity and stress, there was no significant difference between the two groups before ($p=0.08$), immediately after ($p=0.1$), and 45 days after the educational intervention ($p=0.1$). Cochran-Q test indicated that in the control and test groups, the difference of physical activity and stress in the three stages of before, immediately after, and 45 days after the educational intervention was insignificant with $p=0.764$ and $p=0.875$, respectively (Table 4).

DISCUSSION

As the theoretical framework of this research was based on PRECEDE model, precipitating factors, enabling factors, reinforcing factors, and behavioral factors were analyzed as the constructs of this model. One of the constructs of PRECEDE model is precipitating factors including awareness and attitude. In this research, making changes in the awareness and attitude of patients with hypertension toward their disease was of interest to alter their behavior. In this regard, the results showed that after the educational intervention, the awareness scores as the most important disposing factor increased significantly in the test group, compared to the control group. Further, the results of this research showed a significant increase in the mean scores of attitude in the test group compared to the control group after the educational intervention compared to the period before the intervention. These findings are in line with the results of other studies regarding the effect of educational program based on PRECEDE model. One example is the study by (Roopa and Rama Devi 2014). They were examining the effect of educational program on knowledge, attitude, behavior, and management of hypertension in the elderly along with the study by Zendeh Talab (2012) on the effects of implementing a program designed based on PRECEDE-PROCEED model on the mental health of the adolescents and participation of parents. Furthermore, Hosseini et al (2014) studied alteration of lifestyle in patients with hypertension, and Mazloomi et al (2015) predictive control high blood pressure in patients with hypertension based on health belief model.

In the present research, participation in educational classes and acquiring the skill in measuring blood pressure were considered as enabling factors. Based on the results, a significant difference was

observed between the two groups after the educational intervention in terms of acquiring skills for measuring blood pressure. In the research by Doshmangir et al (2014) on the effect of educational intervention based on PRECEDE model on promoting the elderly quality-of-life along with the study by Matin et al (2009) regarding the effect of educational intervention based on PRECEDE model in enhancing the elderly quality-of-life, positive effect of education on enhancing the skill acquisition has been proven, which is in line with the results of the present research. The samples here had no significant difference with regards to participation in educational classes in both test and control groups in the three stages of before, immediately after, and 45 days after the educational intervention. This is not in accordance with the results obtained by Doshmangir et al on enhancing the elderly quality-of-life in 2014. The reason of such a finding can be issues such as the samples' shortage of time, not valuing the education, absence of educational program and a systematic educational class, deficiency of resources and facilities in educational healthcare centers to organize educational classes for the patients, as well as unwillingness of the patients to participate in educational classes. On the other hand, educational classes may be held in a specialized way for the patients, fulfilling their needs. However, the level of education to the elderly is typically lower than the patients.

In this research, the encouragement and support by the family, encouragement and support by the friends and acquaintances, and encouragement and support by the healthcare center personnel were considered as reinforcing factors. The results suggested significant increase in the encouragement and support by the friends and acquaintances after the educational intervention. It has been in line with the study by Hosseini et al (2014) on altering the lifestyle of patients with hypertension as well as the study by Matin et al (2009) regarding promotion of the elderly's quality of life. However, the difference of the scores of encouragement and support by the family and healthcare centers personnel was not found to be significant between the two groups. It is in line with the study by Matin et al (2009) regarding promotion of quality of life of the elderly. Possibly, one of the reasons of its insignificance could be lack of focus on changes in awareness and attitude of family members regarding the disease in this research, constancy on the supportive behavior of family members as well as healthcare personnel, and not involving them in the educational program. In this regard, it can be pointed out that presenting family-oriented education seems to be essential to have effective training. Although friends and acquaintances were not involved in the educational program, the effects of peers, the multiplicity and variety of friends and acquaintances can be among its significance reasons in encouraging and supporting the patients.

In this research, factors such as consumption of salt, fruits and vegetables, fatty and fried foods, smoking cigarette and hookah, as well as alcohol, along with physical activity and the stress were considered as controllable behavioral factors. The results suggested a significant increase in the mean scores of behavioral factors after the intervention in the test group. However, no significant difference was observed in the mean scores of behavioral factors in the control group before and after the educational intervention. This finding is in accordance with the results obtained by Hosseini et al (2014). Nevertheless, there is content difference between these studies regarding the type of behavior and subset of behavioral factors. In this regard, one of the behavioral factors is rate of salt consumption. In the present study, no significant difference was observed between and after the educational intervention in its regard in the two groups, which is not in line with the results obtained

by Hosseini et al. this result could be due to the high mean age of the samples, a reduction of sense of taste in them, not recognizing the extent of food saltiness, as well as cultural factors regarding the manner and amount of salt consumption. The second behavioral factor is increasing fruit and vegetable consumption. The results of the present research show a significant growth before and after the educational intervention in the test group, compared to the control group, suggesting the positive effect of the educational intervention. It is in accordance with the results obtained by Hosseini et al (2014) and Khani Jeihooni et al (2017). Reduced consumption of fatty and fried foods had been considered as the third behavioral factor of hypertension. Based on the results, a significant difference was observed between and after the educational intervention in the test group, compared to the control group, which is in accordance with the results obtained by Hosseini et al. Here, hookah and cigarette smoking after the educational intervention decreased significantly in the test group. However, it had no significant change in the control group, which is in line with the study by Hosseini et al (2014). Although the rate of cigarette smoking was higher among men than women, based on the results, women also smoked cigarette and hookah, which can be an alarming factor towards altering people's lifestyle, further highlighting the need to educate health across the society. Regarding alcohol consumption, no data were not found for investigation and analysis. According to the results, apart from one person, none of them consumed alcohol. With regards to having physical activity and controlling stress, the results of the present study showed some growth in the test group after the intervention, compared to the control group. However, this difference was not significant, which is in line with the study by Hosseini et al (2014). One of the reasons of its insignificance could be the unwillingness of patients to perform physical activity, the motivations and personal interests of the patients, limited studied population, prohibition of heavy physical activity by the cardiologist due to heart diseases and its impact, shortage of resources and facilities, and deprivation in this part of the country and its effects.

CONCLUSION

Based on the results obtained from this research, it can be concluded that educational intervention was effective on the variables of PRECEDE model. In this research, educational intervention was able to alter the precipitating, enabling, reinforcing, and behavioral factors. The efficiency and effectiveness of this educational intervention can be due to usage of PRECEDE model, which plays a significant role as a conceptual framework in promoting education quality. Although making changes in enabling and the reinforcing factors only through education is difficult, and in addition to longer time it also needs other kinds of support, the role of educational intervention in enhancing awareness, attitude, and behavioral factors is considerable in this research.

METHOD

This study is part of an extensive interventional study. The population of this research consists of all patients with hypertension in Urmia. The inclusion criteria were having a file in the clinic of the selected hospital and definite diagnosis of hypertension by physician, having primary hypertension, not having any disease apart from hypertension as well as cardiovascular diseases, being a resident in Urmia and the country, and having hypertension for at least three months. The sampling method was systematic random sampling on patients with hypertension. Considering the objective and type of the research and regarding the time for training the samples in the test group and using formula, the sample size was obtained as 76 individuals, with 38 subjects in each group. Considering

the probability of 15% attrition in the samples along with the study, the sample size was specified as 88 subjects, with 44 people in each group of patients with hypertension. After preparing the list of patients with the inclusion criteria, in morning and evening shifts who were under treatment, in order to prevent exchange of information between the patients of the two groups, the patients visiting the clinic in the morning time were assigned into the test group through tossing a coin, while the evening patients were assigned in the control group. Thereafter, 44 patients were chosen through systematic random sampling from the list from each group. Based on attrition of eight subjects due to relocation and unavailability for the rest of the research, incomplete filling of questionnaire, not participating in the educational classes and lack of effective cooperation, the number of samples was chosen as 40 subjects in each group, totally amounting to 80 people. After receiving consent form, the data collection instrument which was a researcher made questionnaire was provided to them. This questionnaire consisted of the following sections:

- A) Demographic-health characteristics questionnaire with two sections and 26 statements: the demographic and health characteristics which had nine statements (age, gender, marital status, occupation and level of education, body mass index, blood pressure, family history of hypertension, and the duration of having the disease). The second section had 17 statements including the status of physical activity with four statements as well as the status of diet, smoking had 13 statements.
- B) "PRECEDE" model constructs questionnaire consisted of four sections including 1- "precipitating factors questionnaire" including two parts of awareness (13 statements) with the minimum score of zero and maximum score of 25 along with attitude (12 statements) with the minimum score of -12 and maximum of +12, 2- "the reinforcing factors questionnaire" including seven statements with the minimum score of zero and maximum of 21, 3- "enabling factors questionnaire" including 15 statements with the minimum score of zero and maximum of 15, and 4- "behavioral factors questionnaire" including 12 statements with the minimum score of -12 and maximum score of +12.

To investigate the validity of the questionnaires, face validity (with the help of 15 specialists and 15 samples) and content validity (including content validity index and content validity ratio) were examined according to the opinions of 15 specialists. The content validity index with a score of 0.7 and content validity ratio with a score of 0.49 were confirmed. Furthermore, the face validity score of the questionnaire (the item impact) in the specialists and samples (3.65) and (3.57), respectively, which were above 1.5 was confirmed. To examine the reliability, Cronbach alpha was used to determine internal consistency while test-retest method was employed to determine the consistency reliability. To perform the test-retest method, the questionnaire was completed twice by a 15-person group as with target samples with a two week interval. The correlation coefficient between the scores obtained from the two times of testing was then calculated. The correlation coefficient between the responses of patients under investigation showed a high level of correlation, confirming consistency of the questionnaire. Moreover, the Cronbach alpha coefficient was estimated for 80 samples (Table 1). Having presented the necessary explanations about the research and its objective and emphasizing confidentiality of the responses, one of the researchers provided the subjects with the research instruments to be completed by them. For convenience of the patients and to prevent disturbance in completion of the instruments, a quiet room was considered in the clinic, whereby the pretest was

administered. The questionnaire of illiterate patients was completed through interview by the researcher. Thereafter, the educational content was prepared based on the research objectives and according to credible resources and structure of PRECEDE model, and was then presented in the test group. On the other hand, no intervention was applied in the control group. For better effect of the training, improving participation of the samples, and preventing chaos and better management of the sessions, the test group was categorized into four 11-person subgroups. The training was then offered through lecture, distributing educational booklet, group discussion, and based on the contents of the educational package during three 1.5-h sessions for each subgroup, and totally 12 sessions in educational class of the same hospital. To prevent exchange of information between the two groups, all of the educational sessions were held during morning hours. Immediately after completion of the educational intervention along with 45 days after it, the information was collected and then completed by the selected samples through the same questionnaire in a written form. Along the intervention, four subjects left the study, and thus in each of the two groups, the data of 40 patients were analyzed. After data collection, they were examined three times and then analyzed by SPSS version 20. To summarize the data and give a descriptive report about the data, mean, SD (SD), percentage, and frequency were used. On the other hand, for data analysis in the inferential statistics part, independent t-test, Mann-Whitney, Wilcoxon, Cochran Q, Friedman, and Chi-Square tests were used. In this research, all of the ethical principles were followed, and an ethics code was received with the number of IR.SBMU.PHNM. 1396. 809.

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Conflict of Interest

We have no conflict of interest.

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