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Effect of an Educational Program based on Health Belief Model on Medication Adherence in Elderly Patients with Hypertension

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Abstract

Background: Aging population growth is accompanied by the risk of cardiovascular diseases and hypertension. Medication nonadherence is one of the problems affecting patients, especially elderly individuals with high blood pressure.

Aim: The present study aimed to determine the effect of an educational program based on the Health Belief Model (HBM) on medication adherence in older adults suffering from hypertension.

Methods: This randomized controlled clinical trial was conducted on 60-year-old elderly people referring to health centers in Mashhad, Iran, during 2017. To this end, the intervention group received education on medication adherence while the control group was only subjected to typical routine services. The data were analyzed in SPSS Software (Version 20) through the independent t-test, Chi-square test, and Fisher's exact test.

Results: The mean ages of the participants in the intervention and control groups were 69.1 ± 8.3 and 63.9 ± 6.7 years, respectively. The post-test mean score of medication adherence obtained by the intervention group was 6.7 ± 0.5 that was significantly higher than that of the control group (3.7 ± 1.0) ($P < 0.001$). Moreover, the mean score of medication adherence in the intervention group had significantly increased in the post-test phase ($P < 0.001$) based on the within-group results of the paired t-test.

Implications for Practice: The HBM might improve medication adherence in elderly individuals with hypertension by changing their beliefs. Therefore, it was recommended to use this model for teaching self-care to older adults suffering from chronic illnesses and also in other senior healthcare centers.

Keywords: Education, Elderly, Health Belief Model, Hypertension, Medication Adherence

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Introduction

Increased life expectancy and reduced fertility rate have led to aging population growth all over the world. Therefore, the phenomenon of aging is assumed to be the result of medical and health-related advances within the second half of the 20th century (1). As released by the United Nations (UN), the total number of the elderly population across the world in 2009 was about 740 million individuals and it will reach 2 billion people by 2050 (2). According to the general census of population and housing in Iran in 2016, approximately 9.27% of the population included individuals aged over 60 years (3). Furthermore, it has been predicted that by 2025 and 2050, more than 10% and 21-25% of Iran's population will be comprised of older adults (3, 4). Given that increased elderly population is considered as an achievement, it has oriented approaches adopted by researchers and experts towards putting more emphasis on the importance of focusing on the health status of this age group as well as securing the necessary facilities to provide special services in this domain (5). This issue also requires conditions that enable older adults to live a healthy and enjoyable life in these times with minimal side effects (6). This results from numerous illnesses causing disabilities in individuals' performance, especially the elderly, which can make them ask for help and even have a sense of dependency (7). The results of previous studies have indicated that quality of life in old age has reduced due to multiple causes, including physical inactivity and high blood pressure (8, 9). In this respect, hypertension has affected 1.8 billion individuals in the world in a way that 50% of them are not aware of this condition and only 25% of patients are endowed with such awareness. Unfortunately, they lack the necessary information regarding illness prevention and control and this issue has placed 75% of the population affected with hypertension at the risk of cardiovascular disease, heart failure or stroke, kidney failure, liver failure, and even sudden death (10). Related studies in Iran have similarly demonstrated that 48.1% of patients suffering from high blood pressure are undergoing treatments and only 21.3% of them are under control. However, there is the assumption that about half of the patients receiving hypertension medications do not continue their treatments for one year (11).

Medication adherence refers to compliance with prescribed medicines provided to patients by medical staff followed by the use of the full dose of the medication. The amount of non-adherence with antihypertensive medications has been also reported high and one of the main reasons is poor blood pressure control. Moreover, stroke is considered as one of the symptoms of hypertensive failure (12). Researchers have also found that having a strong belief about the necessity of medications can predict reports of higher rates of medication adherence. Education about medications and the number of prescribed ones can significantly help with medication adherence (13). Studies have revealed that proper use of medicines and medication adherence by elderly patients depends on their beliefs about the effectiveness of the medications prescribed. The results of previous investigations have also indicated that the elderly affected with hypertension have a low rate of adherence to the medication regimen. In this respect, Lo et al. (2016) conducted a study on adherence to hypertension medications in the elderly with high blood pressure in Hong Kong. The results revealed that more than half of these individuals (55.9%) reported low rates of adherence to treatment. In this respect, seniority, living alone, and perceptions of treatment control were independently accompanied by greater adherence to treatment. In this study, it was proved that unmarried older adults in China were more likely to adhere to a treatment that could determine the effect of cultural factors on adherence rates (14). Therefore, it was essential to educate these people to be more susceptible to adherence to their treatment program. In another study, it was observed that perceptions of people about an illness, their understanding of illness burden, and their beliefs about medications could play important roles in predicting medication adherence. Therefore, the more the perceptions of the threats of the illnesses, the stronger the rate of medication adherence. Proper understanding of these factors could also contribute to future interventions (15). Accordingly, caregivers were required to provide information on illness conditions for patients receiving healthcare services. Educational interventions could further provide an opportunity to influence patients' attitudes about treatment and increasing their medication adherence (16). It should be noted that medication adherence, especially in patients with chronic illnesses, is of utmost importance since such conditions have a progressive trend and low rate of adherence leads to their progression, reduced quality of life, and ultimately failed treatment. As a result, appropriate educational interventions can increase medication adherence in the elderly as well as patients with chronic illnesses (15). One of the most important models utilized for investigating changes in behaviors and illness prevention in older adults is the Health Belief Model (HBM) which

can prevent behaviors that trace back to individuals' beliefs and is also considered as one of the common theories within research on health-related behaviors (17). According to this model, preventive behaviors are based on individuals' beliefs mostly addressing those who suffer from a health problem. Moreover, individuals' perceptions of these problems are measured and their behaviors are assessed in terms of prevention or management of this problem (18). This model includes the constructs of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, stimulus or cue to action, and self-efficacy (10). In this model, it is necessary to encourage individuals affected with hypertension to become susceptible to the risks threatening their health status and also perceive the severity of the illness in order to change their lifestyle (18). Recent studies have shown that when people are concerned about the negative effects of medications, they are less likely to show medication adherence and this is described with the HBM that illustrates the benefits and barriers of medication use (13). The results of the study by Yue et al. (2014) also revealed that the implementation of educational interventions based on the HBM could improve patients' adherence to hypertension medications (19). Due to suffering from several chronic illnesses as well as simultaneous use of some medications, the elderly are affected by risks and side effects of medicines. Therefore, medication adherence in older adults and attention to prevention and control of complications and different illnesses are of great importance. Based on the results of previous investigations, the most common self-care problems experienced by the elderly have been associated with inadequate education to this population (20). Accordingly, needs-based patient education has been one of the important duties of geriatric nurses (21). However, few studies have been conducted on the role of educational interventions based on a model of health behavior change in the domain of geriatric nursing. Therefore, it seems that appropriate educational interventions can improve medication adherence in the elderly and patients with chronic illnesses. Statistics provided in this respect have also emphasized greater attention to cardiovascular risk factors as well as the importance of primary prevention in Iran more than ever before. Therefore, the present study was to determine the effect of an educational program based on the HBM on medication adherence in elderly patients with hypertension.

Methods

This study was a two-group randomized controlled clinical trial on 60-year-old elderly patients with hypertension referring to health centers located on western parts of Mashhad, Iran, during September 2017. Moreover, all participants met the inclusion criteria. The inclusion criteria were: 1) the age of 60 years or over, 2) reading and writing literacy, 3) history of visits by the elderly at least in the past 6 months, 4) history of hypertension based on self-reports and history of health records, 5) history of at least 6 months of hypertension medication use on a daily basis, and 6) lack of psychological-cognitive disorders approved by a psychiatrist. On the other hand, the older adults who: 1) were unwilling to continue the study, 2) did not attend in more than two educational sessions, and 3) suffered from no acute illnesses or hospitalization were excluded from the study. The participants were then randomly allocated to the intervention or control group using a drawing method. For the purpose of randomized allocation, the words "intervention" and "control" were written on the same pieces of papers and cast in a box. Subsequently, each of the samples meeting the inclusion criteria was asked to choose one of the papers. Accordingly, based on the words written on the selected papers, the elderly were placed in the intervention or control groups. This procedure continued until half of the older adults in each center was put in the study groups. Therefore, the participants were selected equally from both centers and this process continued to complete the sample size in both groups. In order not to distribute the transmission of information between both groups, the intervention group was scheduled to attend the center in the middle of the morning and there was a one-hour interval until the completion of routine programs of the center. Accordingly, the elderly individuals in the control group had left the center and then the intervention group could receive the given education.

The minimum sample size was calculated from the formula of "comparing two independent-sample population means". To obtain the mean score of medication adherence, a pilot study was conducted on 20 elderly individuals (10 people in each group). As a result, the sample size with the confidence level of 95% and the test power of 80% was estimated by 26 individuals in both groups. With regard to the sample attrition, 30 people in each group and a total number of 60 individuals were examined with no sample loss in the present study.

The research instruments consisted of a demographic-medical information questionnaire and MMAS-8. The demographic-medical information questionnaire included 8 completion and multiple-choice items about age, gender, level of education, occupation, marital status, and history of hypertension in close family members. Content validity method was used to confirm the validity of the given questionnaire. To this end, after the development of the questionnaire, it was submitted to 10 professors and experts including a supervising professor and specialist advisors as well as faculty members of the School of Nursing and Midwifery for evaluation. The instrument was then administered after considering the necessary suggestions and revisions. The MMAS-8 was comprised of 8 items, with 7 Yes (score one)-No (score zero) items and 1 Likert-type score item ranged from 0 to 8. Accordingly, a score of less than 6 indicated a low rate of medication adherence, scores of 6 to 8 represented a moderate rate of adherence, and score 8 showed a high rate of adherence. Psychometric analysis of the Persian version of this questionnaire was conducted by Moharamzad et al. (2015) and its reliability was confirmed using internal consistency with Cronbach's coefficient alpha of 0.69 (22) which had been frequently used in domestic studies. In addition, the test-retest method was utilized in order to ensure the reliability of this instrument in the present study. Therefore, the questionnaire was given to volunteering for older adults in a pilot study. After one week, the questionnaire was returned to the same participants, and the correlation between two medication adherence measures was calculated using the Pearson correlation coefficient and its reliability was confirmed by $r=0.86$. Before starting the intervention and after obtaining informed consent from the elderly of both study groups, the demographic-medical information questionnaire, and subsequently, the MMAS-8 were completed by the elderly.

The intervention included 8 educational sessions for the intervention group based on the steps of the HBM. Each session was held in Danesh Amooz and Sadaf Health Centers near the elderly people's place of residence for one hour twice a week. The center was equipped with computer systems and projectors, and the sessions were administered by the researcher as the master student of Geriatric Nursing and supervised by the research team.

These two centers were located in the western parts of Mashhad, Iran, and they were considered among the largest senior healthcare centers in this city with thousands of older adults having health records. The educational content was also extracted following the review of accurate texts and the study of valid Persian and English sources based on the constructs of the model and supervised by a research team specializing in the field of Geriatrics and health models. Moreover, content validity was used to approve this intervention by 10 faculty members specializing in Geriatrics and health issues. In all the educational sessions, a specific time was devoted to asking questions and sometimes the elderly could write their questions and then discuss them. The sessions were usually held between the middle hours of the morning in order not to create problems in routine programs of the centers and avoid interruptions with lunch and rest hours of the elderly. For the purpose of reminding classroom timing and further coordination, phone monitoring was performed for the elderly. To show respect to the older adults and also to appreciate and encourage them for their attendance and active participation in the study sessions, they also received some typical gifts such as medication boxes. Table 1 displays the sessions which were held in the group.

Table 1. Educational intervention sessions based on the Health Belief Model for the elderly with hypertension

Sessions	Session topics	Objectives	Teaching methods	Duration	Assignments
First	General introduction and description of activities, explanation of research objectives, the familiarity of patients with hypertension	Susceptibility	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Taking notes and raising questions about taking medications by the elderly participants
Second	Medication regimen and definitions for medication beliefs and adherence in patients, reviewing patients' attitudes on medications and factors affecting medication adherence	Susceptibility	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Raising concerns about taking medications, group discussion, and sharing experiences

Third	Education and emphasis on the proper use of medications, as well as awareness of concerns about medication use and incidence of medication-related complications	Perceived severity and susceptibility	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Writing down the names of hypertension medications during educational sessions along with repetitions and practices to know them
Fourth	Understanding complications of poor blood pressure control as a result of medication non-adherence	Teaching perceived severity and susceptibility	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Discussing teaching experiences about medications by the treatment team in the past
Fifth	Teaching about barriers, such as concerns about medication dependence and side effects, no use of medication alternatives	Patient's familiarity with perceived benefits and barriers	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Group discussion by the elderly, writing questions, reviewing the names of medications and their complications, talking about the experiences of the elderly about the past adverse effects of medications
Sixth	The familiarity of patients with consequences of intentional changes in medication regimen, complications and consequences of arbitrary treatment	Patient's familiarity with perceived benefits and barriers	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Group discussion of the elderly people about early interventions in the event of hypertension, discussion of barriers to adherence
Seventh	How to adapt and manage patients with hypertension, extracting participants' attitudes about blood pressure	Promoted self-efficacy	Lecture, question and answer, group discussion, use of desirable role behavior model using supplementary tools and guide sheets	60 minutes	Reviewing medications, talking about ways to cope with medication-related anxiety
Eighth	Reviewing the content, reaching general conclusions about the topics of the previous sessions, distributing pamphlets and booklets, showing respect and expressing gratitude to the elderly for their participation in the study sessions with the donation of medication boxes	Stimulus or cue to action	Lecture, question and answer, group discussion, use of desirable role behavior model use of supplementary tools and guide sheets	60 minutes	Raising all remaining questions

In the first session, education was started based on the steps of the HBM. First, a general overview and a description of the related activities were provided, patients' knowledge about blood pressure was examined and the patients were given a brief explanation of the research. Subsequently, the familiarity of the patients with hypertension was evaluated along with the patients' perceptions of blood pressure. In the second session, the concepts of medication burden and adherence were defined and the patients were provided with education about medication regimen. Afterward, the patients' viewpoints about medications and factors influencing adherence were examined with the aim of familiarizing them with the definitions of medication adherence and medication burden.

In the third session, education was provided aimed at raising susceptibility. To this end, proper use of medications was discussed as well as awareness of the concerns about medication use and the incidence of medication-related complications. Furthermore, the patients were also taught about different methods to remind the time of using types of medication with the goal of making patients susceptible. The issues which were further discussed included daily challenges of the participants and their awareness of the illness, severe complications of the illness, high importance of controlling the illness by medications, and the point that lack of illness control could have grave consequences. The fourth session aimed to teach perceived severity and susceptibility. The patients were also familiarized with complications due to inadequate control of blood pressure (perceived severity and susceptibility) as a result of medication non-adherence as well as the impact of medication adherence and medication burden on blood pressure control and the consequences of medicine abuse. Moreover, unwillingness to discontinue the use of medications, no doubt about continuing treatments, trust in doctor's prescriptions, and awareness regarding the fact that medications and non-natural substances were not harmful was discussed in the fourth session. The fifth session was associated with patients' familiarity with perceived benefits and barriers. During this session, barriers such as concerns about

medication dependency and complications, lack of medication substitutes (high-cost and chronic illnesses due to lack of medication use, awareness of illnesses caused by lack of hypertension control such as kidney failure and stroke), and familiarity with factors affecting medication adherence, such as family, radio and television, and health centers were delineated. Moreover, the other issues discussed in this session included benefits and barriers of medication adherence, achievement to satisfactory results, a sense of physical well-being and mental health, absence of long-term and hidden risks, as well as improvement of blood pressure. The sixth educational session was designed with the aim of familiarizing patients with perceived benefits and barriers. The content of this session included familiarity of patients with consequences of intentional changes in medication regimen, complications and consequences of arbitrary treatment, as well as the side effects of timely medication use. The seventh educational session was to improve self-efficacy. How to adapt and manage patients with hypertension, extraction of their attitudes about high blood pressure, informing them of viewpoints regarding medications, achievement to good results, and proper use of medications were then discussed in this session. The purpose of raising these issues was to increase awareness in the elderly and help them have their regular use of medications and check their blood pressure. Eventually, the eighth session was held as a stimulus or cue to action. In this session, the content was reviewed, overall conclusions were reached on the topics of the previous sessions, group discussions were held, and then educational pamphlets and manuals were distributed.

In all the educational sessions, the educational programs were presented in the form of lecture, question and answer, and group discussions using a good role behavior model combined with educational tools and guide sheets. Each session lasted 60 minutes. All the study participants (in the intervention group) attended the study sessions.

The control group only received typical routine services provided by the centers, including routine visits by physicians, monthly check-ups, psychological services, educational classes related to the elderly, and ceremonies held on special occasions. Following the last session, the rate of medication adherence in the elderly was measured in both groups before the intervention. To observe ethical considerations and to meet the interests of the elderly, the same educational session was also held for the control group following the completion of the intervention and the post-test phase for both groups. The study protocol was approved by the Ethics Committee of Mashhad University of Medical Sciences, Mashhad, Iran (IRCT code: 1396.250) and written informed consent was obtained from the participants. After determining the normal distribution of the quantitative variables of the study using the results of Kolmogorov-Smirnov test and Shapiro-Wilk test, the objectives of the present study were met via independent t-test for between-group comparisons and paired t-test for within-group ones. The homogeneity of the variables in both groups was additionally examined through Chi-square test, Fisher's exact test, and Mann-Whitney U test. P-value less than 0.05 were considered statistically significant. The data were analyzed in SPSS Software (Version 20).

Results

The mean ages of the individuals in the intervention and control groups were 69.1 ± 9.7 and 63.6 ± 9.7 years, respectively. The results of the Mann-Whitney U test also showed no statistically significant difference between both groups ($P=0.12$). According to the results of Chi-square test and Fisher's exact test, no significant difference was revealed between the two groups in terms of marital status, level of education, occupation, and close family members with hypertension (Table 2). In addition, Table 3 summarizes the results of comparing the items of the MMAS-8 in both control and intervention groups.

Table 2. Comparison of demographic-medical characteristics of the elderly in intervention and control groups

Variable	Intervention frequency (percentage)	Control frequency (percentage)	Test results	
Age (Year) Mean±Standard Deviation	69.1±8.3	63.9±6.7	***P=0.12	
Gender	Male	9 (30.0)	8 (26.7)	
	Female	21 (70.0)	22 (73.3)	*P=0.77
Marital status	Single	0 (0.0)	1 (3.3)	**P=0.32

	Married	27 (90.0)	24 (80.0)	
	Deceased spouse	2 (6.7)	5 (16.7)	
	Divorced	1 (3.3)	0 (0.0)	
Table2 Continued.				
Level of education	Primary school degree	18 (60.0)	19 (63.3)	**P=0.10
	High school degree	8 (26.7)	10 (33.3)	
	Higher education	4 (13.3)	1 (3.3)	
Occupation	Employed	0 (0.0)	1 (3.3)	**P=0.20
	Unemployed	8 (26.7)	2 (6.7)	
	Retired	17 (56.7)	13 (43.3)	
	Other	5 (16.7)	14 (46.7)	
Close family member with hypertension	Yes	9 (70.0)	13 (43.3)	*P=0.07
	No	21 (30.0)	17 (56.7)	

*Chi-square test, **Fisher's exact test, ***Mann-Whitney U test

Table 3. Comparison of MMAS-8 items for the elderly in intervention and control groups

MMAS-8 items		Pre-test		Post-test	
		Intervention Frequency (percentage)	Control Frequency (percentage)	Intervention Frequency (percentage)	Control Frequency (percentage)
1- Sometimes I <u>forget</u> to take the prescribed cardiac medications.	Yes	27(90)	26(86.6)	4(14.4)	24(80)
	No	3(10)	4(14.4)	26(86.6)	6(20)
2. Is there a day in the past two weeks when you <u>have failed to receive</u> cardiac medications?	Yes	18(60)	20(66.7)	3(10)	23(76.7)
	No	12(40)	10(33.3)	27(90)	7(23.3)
3. Have you ever <u>stopped</u> the use of cardiac medications without consulting a doctor after feeling worse?	Yes	3(10)	2(6.7)	4(14.4)	22(73.3)
	No	27(90)	28(93.3)	26(86.6)	8(26.6)
4. Have you ever forgotten to carry your cardiac medications while <u>traveling</u> or while you have been away?	Yes	18(60)	26(86.6)	2(6.7)	22(73.3)
	No	12(40)	4(14.4)	28(93.3)	8(26.6)
5. Did you <u>take</u> your cardiac medications yesterday?	Yes	16(53.3)	11(36.7)	23(76.7)	9(30)
	No	14(46.7)	19(63.3)	7(23.3)	21(70.0)
6. Have you ever stopped your <u>cardiac medications</u> as you have felt that you have controlled your heart disease?	Yes	16(53.3)	18(60)	6(20)	19(63.3)
	No	14(46.7)	12(40)	24(80.0)	11(36.7)
7. Have you ever felt <u>bothered</u> with your treatment program?	Yes	19(63.3)	17(56.7)	5(16.7)	18(60)
	No	11(36.7)	13(43.3)	25(83.3)	12(40)
8. I have had problems with <u>recalling</u> the use of medications prescribed for my heart disease?	Never	6(20.0)	5(16.7)	19(63.3)	4(13.3)
	Rarely	10(33.3)	10(33.3)	10(33.3)	18(60)
	Sometimes	10(33.3)	10(33.3)	1(33)	5(16.7)
	Always	4(13.3)	5(16.7)	-	3(10.0)

The results of the independent t-test demonstrated that the mean scores of medication adherence were 3.8 ± 1.1 and 4.2 ± 0.8 among the elderly before the intervention in the control and intervention groups, respectively. However, it was not statistically different ($P=0.16$). After the intervention, the mean scores of the medication adherence in the control and intervention groups were 3.7 ± 1.0 and 6.7 ± 0.5 ,

Table 4. Comparison of the mean and standard deviation of medication adherence in the elderly before and after the intervention in both intervention and control groups

Medication adherence score	Intervention	Control	Paired-t test P-value
	Mean±Standard Deviation	Mean±Standard Deviation	
Before intervention	4.2±0.8	3.8±1.1	P=0.17
After Intervention	6.7±0.5	3.7±0.1	P<0.001
Changed after the intervention, compared to those before it	2.6±0.8	-0.1±0.1	P<0.001
Independent t test P-value	P<0.001	P=0.56	

respectively and the results of the independent t-test showed a statistically significant difference ($P<0.001$). The results of the paired t-test comparing within-group difference also showed that the mean score of medication adherence in the elderly had significantly increased after the intervention by 6.7 ± 0.5 , compared to that before the intervention (4.2 ± 0.8) ($P<0.001$); however, such a difference was not statistically significant in the control group ($P=0.56$) (Table 4). Moreover, the results of two-way ANOVA showed a significant difference between the mean scores of medication adherence in terms of demographic characteristics (i.e., age, gender, level of education, marital status, and close family members suffering from hypertension) in both study groups ($P>0.05$).

Discussion

This clinical trial was to determine the effect of an educational program based on the HBM on medication adherence in older adults with hypertension. The results suggested that the implementation of the educational program based on this model for the elderly with hypertension referring to health centers could increase the rate of medication adherence by approximately 59%. Whereas, the rate of medication adherence in individuals in the control group during the same period had been reduced by 2.6%. Therefore, in the post-intervention phase, the mean score of medication adherence by the elderly in the intervention group was significantly higher than that in the control group. Moreover, in the within-group comparison, the mean score of medication adherence by the elderly of the intervention group had significantly improved after the intervention, compared to that before it. However, there was no significant difference in the control group. Therefore, the present study demonstrated the positive effect of the educational program based on the HBM on medication adherence in the elderly affected with hypertension.

In this respect, Yue et al. (2014) conducted a study aimed at using the HBM on improving perceptions of adherence to hypertension medications in Chinese patients. The results of this study showed that the HBM could predict 48.8% of changes in medication adherence by 82.8% accuracy. After moderating the risk factors, the HBM could also predict 50.5% of the changes in medication adherence with an accuracy equal to 86.2%, which meant that the HBM could significantly affect medication adherence in patients with hypertension (23). Although the present study was of analytic type, it was in agreement with the results of this study because it examined and confirmed the role of the HBM on medication adherence. Since intervention studies investigating the effect of a factor controlled by most of the intervening variables can have more credibility than non-intervention studies, the present study provided stronger evidence for the role of the HBM on medication adherence. Among the reasons behind the impact of the given intervention were the constructs of the HBM. According to this model, older people with high blood pressure required to feel that they were susceptible to the illness (perceived susceptibility) for compliance with self-care and behavior control. Moreover, they had to know that the illness could lead to harmful results and side effects (perceived severity). In this case, they could better adopt health measures, such as taking medications.

Farrahani Dastjani et al. (2014) carried out a study on determining the effect of education based on the HBM on medication adherence in diabetic patients. The results of this investigation showed that the constructs of perceived susceptibility, perceived benefits, self-efficacy, and performance in medication adherence had significantly increased after the educational intervention, compared to those before the intervention (24). This result was consistent with the results of the present study. It was also revealed that the HBM could encourage people with hypertension to change their lifestyle. Moreover, this model was seeking to make individuals susceptible to the risks threatening their health status and help them perceive the deterioration of their illness (18). In this study, older adults mostly

required to be educated regarding the constructs of perceived benefits and barriers. Therefore, it seemed that the elderly with hypertension in the present study taught based on this standard model had more medication and treatment adherence according to the significant increase in medication adherence following the intervention, compared to that before the intervention.

Moreover, Alhalaiqa et al. (2010) examined treatment adherence in non-compliant patients with hypertension in a clinical trial. The results indicated that lower blood pressure and adherence to treatment in patients receiving medication had significantly increased by 37%, compared to the group provided with routine education (25). The obtained findings were in line with the results of the present study. This investigation was conducted on hypertensive patients with medication non-adherence in Jordan within three teaching hospitals. The present study was also conducted at two health centers and each person had his/her own health records who had also received an education. Among the probable reasons behind the consistency of the studies was the similarity of the intervention programs (i.e. an educational program for medication adherence which was in the group) research procedure, multiple centers, and study population.

In another study, Kamran et al. (2013) determined factors affecting medication adherence in patients with hypertension based on the HBM. This cross-sectional study was conducted on 671 patients with hypertension referring to three health centers in Ardabil, Iran (26). The results of this study demonstrated that medication adherence in people aged over 60 years was by 27%. The findings of the study could be also examined and justified through the HBM. The elderly who had higher levels of perceived severity, perceived susceptibility, and perceived benefits on the basis of the HBM had a better rate of medication adherence than participants with lower perceived severity, perceived susceptibility, and perceived benefits. According to this model, the perceived threat was a construct which was highly correlated with behaviors and its functioning was induced by perceived severity and perceived susceptibility. However, the relationship between risk and severity in the perceived threat is not always clear. Therefore, medication adherence in this population required understanding the value and the importance of treatment. The results of this investigation were also consistent with the findings of the present study. In this study, the patients mostly required education regarding the constructs of perceived benefits and barriers. Of the possible reasons behind this consistency were similarities in the use of the MMAS-8 and the educational intervention based on the HBM, multiple centers in the study, and statistical populations.

Among the limitations of this study were differences in the demographic characteristics of the participants that could affect the way they had responded to the questionnaire items. Since the participants were elderly individuals and the dependent variables in this study was medication adherence of self-report type, the mental and psychological conditions of the older adults could have an effect on the way they had answered the questionnaire items. Accordingly, there were attempts to complete the questionnaires at a time and place wherein the elderly could feel maximum comfort. Due to the limitations of this model, it did not seem appropriate to change behaviors in a long-term manner.

Implications for Practice

Considering the positive effect of the educational program based on the HBM on the increase of medication adherence on elderly patients with hypertension and the results of the pre-intervention phase, there was low rate medication adherence. This value was moderate and high following education. Therefore, this program might help the elderly change their beliefs and improve their medication adherence. The results of this study were effective in terms of controlling self-care behaviors and one of the significant points of this study was the use of the community-based procedure of the model. The recommended educational program and the active role of the elderly in the self-care process were also fulfilled by this intervention. Given that this study was conducted on elderly patients with hypertension referring to health centers, the results of this study could be of importance in strengthening the role of community-based nurses. Therefore, it was recommended to use this program for educating the elderly in health centers and other senior healthcare centers. It was also suggested to conduct further studies on the use of this model to promote medication adherence over a longer period and on ischemic heart disease.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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