

# Investigation of the effect of education based on the health belief model on the adoption of hypertension-controlling behaviors in the elderly

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**Purpose:** Hypertension is one of the risk factors for cardiovascular diseases and stroke, and has a direct relationship with aging. The aim of this study was to investigate the effect of education based on the health belief model (HBM) on the adoption of hypertension-controlling behaviors in the elderly.

**Methods:** The present quasiexperimental study was conducted on 100 hypertensive elderly persons from Qom, Iran. The questionnaire was completed by the participants before, immediately after, and 3 months after the intervention.

**Results:** The results of repeated measure analysis of variance showed a significant difference in the scores of the constructs in the intervention and nonintervention groups before, immediately after, and 3 months after the intervention ( $P < 0.001$ ).

**Conclusion:** Education based on the HBM increases the performance and enhances the health beliefs regarding hypertension in the elderly population with hypertension. Therefore, it is recommended to consider the HBM to enhance self-care behaviors in the elderly.

**Keywords:** elders, hypertension, controlling behaviors, health belief model

## Introduction

Global studies have shown that the elderly population of the world is increasing due to the improvements in the health level.<sup>1</sup> This trend however would provide the world with various challenges.<sup>2</sup> Aging increases the odds of suffering from one or more chronic diseases; most of the elderly individuals aged  $>60$  years suffer from at least one chronic disease.<sup>3</sup> Hypertension is one of the main risk factors for atherosclerosis, heart failure, stroke, and renal disorders in many countries.<sup>4</sup> One of the most prevalent chronic diseases among the elderly is hypertension, which is a hygienic-nutritional disease. Receiving excessive calories in the long term and excessive sodium consumption in the daily diet, obesity, alcoholism, sedentary life, and sociomental stresses are the main causes of hypertension all over the world.<sup>5,6</sup>

The universality and serious consequences of hypertension on various organs make this disease a great health problem in all societies. The prevalence of hypertension in the adult population varies from 6% to 25%.<sup>7</sup> Being asymptomatic is the main barrier to the diagnosis and treatment of this disease. If there is no pain or annoying symptom, the patient may not see the physician, receive the drugs regularly, and tolerate the mild side effects of the drugs, which is why hypertension is known as “the silent killer”.<sup>8</sup> Regular hypertension control prevents or delays its prevalent consequences.<sup>9</sup>

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Studies have revealed that hypertension control reduces the mortality and disabilities resulting from heart diseases.<sup>10,11</sup> In order to develop or change effective behavioral factors, it is necessary to determine and enhance the mentioned behaviors. In this regard, health education experts utilize the models of behavior change.<sup>12</sup> The most frequently used model for investigating behavioral changes and disease prevention in the elderly is the health belief model (HBM).<sup>13</sup> The HBM demonstrates the relationship between health beliefs and health behaviors assuming that preventive behaviors depend on the individual's beliefs.<sup>14</sup> According to this model, in order for the elderly with hypertension to adopt self-care and controlling behaviors, they must feel that they are susceptible and apt to suffer this disease (perceived susceptibility), that the disease has adverse consequences and side effects (perceived severity), that controlling behaviors have some benefits for them (perceived benefits), that there are a few barriers against controlling behaviors (perceived barriers), that TV, media, health care staff, neighbors, and relatives encourage them to adopt controlling behaviors (cues to action), and finally, they should feel that they are able to control hypertension through correct behaviors (self-efficacy).<sup>15,16</sup>

The aim of the present study was to investigate the effect of education based on the HBM on the adoption of hypertension-controlling behaviors in the elderly population of Qom.

## Methods

This interventional and quasiempirical study was conducted on the elderly individuals aged 60–65 years suffering from hypertension in Qom. The sample size was determined to be 45 in each group, using the G Power 3.1 software, considering  $Z_{1-\frac{\alpha}{2}}$ , the critical value of the normal distribution at  $1 - \frac{\alpha}{2}$  (eg, for a confidence level of 95%,  $\alpha$  is 0.05 and the critical value is 1.96),  $Z_{1-\beta}$ , the critical value of the normal distribution at  $\beta$  (eg, for a power of 80%,  $\beta$  is 0.2 and the critical value is 0.84), and mean ( $\bar{X}_1$  and  $\bar{X}_2$ )  $\pm$  standard deviation<sup>17</sup> of  $23.87 \pm 4.64$  and  $26.6 \pm 4.33$  before and after the educational program, respectively.<sup>17</sup> The G Power software calculates the sample size based on the following formula:<sup>18</sup>

$$n = \frac{(s_1^2 + s_2^2) \left( Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right)^2}{(\bar{X}_1 - \bar{X}_2)^2} \quad (1)$$

Considering a probable 10% dropout, it was decided to include 100 subjects in the study.

First, convenience sampling was done through visiting mosques, retirement centers, and parks of Qom. Then, based on the inclusion criteria, the participants were selected and randomly assigned to case and control groups. Inclusion criteria were age 60–65 years, hypertension, no communicative and speaking problems, and lack of cognitive disorders and dementia. The exact birth date of the participants was asked, and their exact age was then calculated. The participants and their families were also asked about cognitive disorders and their possible visit to a psychologist. They were also evaluated for dementia and amnesia through asking some questions about the current week and month. The Joint National Committee (JNC) VII criterion was used to measure the level of hypertension.<sup>19</sup> According to this criterion, hypertension is defined as a systolic blood pressure of 140 mmHg or a diastolic blood pressure of 90 mmHg or higher despite consuming antihypertension drugs during the last 30 days. The subjects were also asked about the drugs they took and the answers were registered. Blood pressure was measured with an aneroid sphygmomanometer after the participants rested for 10 minutes in the sitting position using their dominant hand while it rested against a solid surface at the heart level.

The interviewers were two postgraduates of health education who passed the necessary interview training courses. They interviewed all the elderly participants (literate and illiterate) in order to equalize the research method.

The questionnaire consisted of four sections. Section 1 was related to demographic characteristics (gender, marital status, education, number of children, any specific disease background, smoking, and income). Section 2 included some questions about general knowledge (eg, Can a normal body weight help with hypertension control?).

The third section comprised some questions about the HBM constructs, including the perceived susceptibility (I'll suffer from hypertension if it is not controlled), perceived severity (hypertension may cause heart disease), perceived benefits (hypertension control is effective in stroke prevention), perceived barriers (I do not have enough time to exercise), cues to action (I watch TV programs regarding the importance of hypertension control), and self-efficacy (I can check my blood pressure regularly). The fourth section of the questionnaire included some items about the participants' performance (I have consumed a great amount of salt in the past 10 days). The knowledge section had six questions, each with three items; correct items scored 1 and wrong items or "I don't know" scored zero. The HBM constructs with 16 questions were scored based on a five-point Likert scale: 1) strongly disagree; 2) disagree; 3) neither agree nor disagree; 4) agree; 5) strongly agree.

The self-care performance section consisted of five questions, each with three responses: “Yes”, “No”, “Don’t remember”. The answer “Yes” represented a positive and hygienic performance; therefore, it scored 1 and the other two items scored zero. The scores of all the questionnaire sections were calculated out of 100. Also, for qualitative comparison, the score of each section was classified in percentage into three groups: weak (below 50% of the total score), moderate (50%–75% of the total score), and favorable (over 75% of the total score). The perceived barriers section was scored based on a different classification scale: weak (>50% of the total score), moderate (25%–50% of the total score), and favorable (<25% of the total score).<sup>20</sup>

The validity of the questionnaire was assessed and confirmed by a panel of experts. For this purpose, the questionnaires were distributed among eight health education experts, and their modifications and suggestions were considered in the final questionnaire. Thus, the relative validity and validity indicator of the questionnaires were 0.79 and 0.71, respectively. The reliability of the questionnaire was assessed through a retest; it was distributed among 30 elderly persons aged 60–65 years at a 2-week interval, and a correlation coefficient of 0.68 was achieved. Moreover, a Cronbach’s  $\alpha$  coefficient of 0.85 showed the internal correlation of the knowledge questions. The Cronbach’s  $\alpha$  coefficient for other constructs was as follows: perceived susceptibility (0.76), perceived severity (0.79), perceived barriers (0.76), perceived benefits (0.85), cues to action (0.73), self-efficacy (0.90), and for self-care practice (0.81).

The data of 100 elderly persons who were eligible according to the inclusion criteria were collected. Then, based on the HBM, an educational program and the related contents were planned. Afterward, the subjects were randomly divided into two groups of test and control. The test group subjects were invited to Qom Retirement Center to receive the educational intervention that was composed of two educational sessions, including lecture, educational film, and group discussion. The educational content was designed based on the HBM. Group discussion was held in the form of question and answer to increase the participants’ participation.<sup>20</sup> The control group received no intervention but educational pamphlets. The questionnaires were distributed among the participants immediately and 3 months after the intervention. During the intervention, nine subjects were excluded from the study.

Intraclass correlation (ICC) was used to evaluate the reliability of the repeated measurements of different constructs, and repeated measure analysis of variance was used to determine the difference in the mean score of different constructs

between case and control groups before, immediately after, and 3 months after the intervention.

## Ethical considerations

All the participants took part in the research after receiving necessary information, and the study authorization was obtained from the authorities. This study was approved by the ethical committee of Arak Medical Sciences University and registered under the code of 91-139-3. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The study protocol was registered in the Iranian Registry of Clinical Trials (IRCT code: IRTC2013090314553N1). Written informed consent was obtained from all individual participants included in the study.

## Results

The test and control groups included 45 and 46 participants, respectively. The mean age of the participants in the test group was 62.2 years, and independent *t*-test revealed no significant difference between the mean age of the two groups ( $P=0.7500$ ). Table 1 demonstrates a general picture of the subjects’ demographic variables as well as a separate outline for the test and control groups.

## Results of reliability evaluation in repeated measurements

In the intervention group, ICC showed the acceptable reliability of all constructs, except for self-efficacy and action. All constructs had an acceptable reliability in the control group (Table 2). The results of repeated measure analysis of variance showed a significant difference in the scores of the constructs in the intervention and nonintervention groups before, immediately after, and 3 months after the intervention (Table 3).

## Discussion

The results of the present study showed that the elderly people’s knowledge about hypertension-controlling behaviors was 59% of the total score, in other words, they had a medium level of knowledge in this regard. This finding is in line with the results of a study conducted by Mahmoodi Rad<sup>21</sup> that reported that the hypertensive individuals had weak knowledge of the disease symptoms.<sup>21</sup> On the other hand, the mean score of self-care score was weak (36.5%) in comparison with the total score. The findings of a research by Barati et al<sup>7</sup> demonstrated that the performance of the elderly

**Table 1** Comparison of the subjects' demographic characteristics in the test and control groups before the intervention

Demographic variables	Total n=91		Test group n=45		Control group n=46		Comparison result
	Number	Percent	Number	Percent	Number	Percent	
Gender							
Female	47	51.6	26	57.8	21	44.7	$\chi^2=1.34$
Male	44	48.4	19	42.2	25	56.8	$P=0.2500$
Marital status							
Married	59	64.8	30	66.7	29	63.2	$\chi^2=0.76$
Widow or widower	27	29.7	11	24.4	16	34.8	$P=0.2600$
Divorced	5	5.5	4	8.9	1	2.2	
Single	–	–	–	–	–	–	
Education							
Illiterate	21	23.1	14	31.1	7	15.2	$\chi^2=3.26$
Primary school	31	34.1	14	31.1	17	37.0	$P=0.3800$
Middle and high school	25	27.5	11	24.4	14	30.4	
High school diploma and higher	14	15.4	6	13.3	8	17.4	
Monthly income level							
<5,000,000 Rials	33	36.3	15	33.3	18	39.1	$\chi^2=0.33$
$\geq 5,000,000$ Rials	58	63.7	30	66.7	28	60.9	$P=0.5700$
Specific disease background							
Yes	38	41.8	19	42.2	19	41.3	$\chi^2=0.008$
No	53	58.2	26	57.8	27	58.7	$P=0.9200$
Smoking							
Yes	19	20.9	9	20.0	10	21.7	$\chi^2=0.04$
No	72	79.1	36	80.0	36	78.3	$P=0.8400$
Number of children							
No child	3	3.3	3	6.7	–	–	$\chi^2=0.18$
1–4	44	48.4	22	48.9	22	47.8	$P=0.6700$
$\geq 4$ children	44	48.4	20	44.4	24	52.2	

with hypertension was <50% of the total score. Newell<sup>22</sup> reported that self-care behaviors were moderately adopted by hypertensive people. Many other studies have confirmed that self-care performance is very weak in nonepidemic diseases including hypertension.<sup>23–26</sup> The findings of our study showed an increase in the knowledge and performance scores in the test group after the intervention, which is compatible with the findings of Taghdisi et al<sup>20</sup> on preventive behaviors in patients suffering from urinary infections and with the results of the study by Sharifi Rad et al<sup>27</sup> about healthy nutrition education for patients with type II diabetes.

According to the present study and with regard to demographic factors, it may be concluded that self-care performance was significantly higher in male versus female participants. Perceived barriers were higher in female participants. Barati et al<sup>7</sup> and Baghiyani Moghaddam et al<sup>28</sup> reported that in patients with hypertension, men were more committed to self-regulatory performances than women because of the higher perceived self-efficacy in men due to social factors, roles, and opportunities.<sup>23</sup>

The present study revealed that the participants' knowledge and performance had a significant relationship with

**Table 2** The ICC results of the study constructs in the intervention and nonintervention groups

Construct	Intervention group		Nonintervention group	
	ICC (95% CI)	P-value	ICC (95% CI)	P-value
Awareness	0.72 (0.54, 0.84)	0.001	0.49 (0.16, 0.70)	0.004
Susceptibility	0.82 (0.71, 0.90)	0.001	0.89 (0.82, 0.94)	0.001
Benefit	0.70 (0.51, 0.83)	0.001	0.94 (0.90, 0.96)	0.001
Barrier	0.73 (0.55, 0.84)	0.001	0.99 (0.98, 0.99)	0.001
Practice	0.68 (0.45, 0.81)	0.001	0.91 (0.85, 0.95)	0.001
Self-efficacy	0.23 (–0.26, 0.55)	0.15	0.84 (0.74, 0.91)	0.001
Action	0.36 (–0.06, 0.62)	0.04	0.98 (0.97, 0.99)	0.001

**Abbreviation:** ICC, intraclass correlation.

**Table 3** A descriptive summary of the construct scores at different time points in the study groups according to the results of repeated measure analysis of variance

Construct	Mean (SD)		P-value
	Intervention group (n=45)	Nonintervention group (n=45)	
Awareness			0.013
Before	59.26 (26.72)	58.89 (24.77)	
Immediately after	72.63 (20.80)	59.24 (24.45)	
After 3 months	74.44 (21.79)	58.52 (20.91)	
Susceptibility			0.041
Before	55.33 (25.55)	53.26 (24.59)	
Immediately after	64.78 (24.07)	53.48 (23.68)	
After 3 months	69.11 (18.93)	57.83 (19.99)	
Benefit			0.001
Before	47.11 (19.11)	48.44 (17.79)	
Immediately after	58.09 (17.74)	48.62 (17.76)	
After 3 months	63.11 (19.65)	49.51 (14.12)	
Barrier			0.001
Before	54.89 (17.01)	50.89 (14.74)	
Immediately after	45.78 (16.72)	51.11 (14.96)	
After 3 months	44.44 (14.07)	50.44 (14.61)	
Practice			0.001
Before	34.67 (25.01)	38.26 (24.88)	
Immediately after	62.44 (15.83)	38.48 (24.76)	
After 3 months	53.78 (18.98)	38.26 (25.93)	
Self-efficacy			0.010
Before	39.44 (15.20)	36.11 (12.47)	
Immediately after	49.44 (20.40)	36.22 (12.44)	
After 3 months	52.89 (12.45)	38.33 (13.61)	
Action			0.001
Before	47.11 (17.66)	49.11 (17.17)	
Immediately after	59.78 (17.90)	49.22 (17.38)	
After 3 months	56 (16.15)	47.56 (16.94)	

**Abbreviation:** SD, standard deviation.

their educational level. Other studies have also demonstrated that self-care behaviors in nonepidemic diseases, including hypertension, are in direct relationship with the patients' educational level.<sup>15,23,28,29</sup> An increase in the educational level is accompanied by higher awareness, more sense of responsibility, self-efficacy improvement, and an increase in judgment and decision-making ability. More knowledge and awareness would lead to a better practice. The study of Zhang et al<sup>29</sup> has introduced awareness about being hypertensive as factor that contribute to the control of blood pressure. A systematic review has also showed that inadequate knowledge about cardiovascular disease impairs the adherence to medicine intake.<sup>30</sup>

Another demographic factor that was related to the self-care performance was the marital status. Our study showed better self-care among married individuals, which is congruent with the findings of the study performed by Barati et al.<sup>7</sup> According to previous studies, married individuals are more concerned with self-care and self-regulatory behaviors

due to the vital role of family in informational, value, and emotional support.<sup>7,31</sup>

The HBM constructs are among the most crucial and effective factors in self-care behaviors. Health behaviors including self-care practices are rooted in the individuals' health beliefs, the accuracy of which has been confirmed through many studies.<sup>12,19,20,32</sup>

The present research demonstrated that none of the HBM constructs had a favorable status before the intervention in the control and test groups. Perceived susceptibility was the only construct in the moderate level because with aging, the elderly naturally consider themselves more susceptible to diseases. As a result, the perceived susceptibility score was higher than other constructs.<sup>33</sup>

Perceived susceptibility is one of the important factors affecting health behaviors. Aghamolai<sup>34</sup> introduced perceived susceptibility as an effective factor in behavioral changes among diabetic patients. In order for the elderly to adopt self-care behaviors, they should know they are susceptible

to the complications of uncontrolled hypertension.<sup>15</sup> We found that educational intervention increased the perceived susceptibility score by 15%. Many other studies have reported that the HBM-based education increases perceived susceptibility.<sup>35–38</sup>

Abasi et al<sup>39</sup> reported a significant relationship between perceived severity and regular drug consumption in hypertensive patients. Various studies have confirmed a significant relationship between perceived severity and adopting health behaviors in diabetic patients; the fear of the related consequences drives them to control their blood sugar regularly.<sup>7,34</sup> Hence, there is a positive relationship between perceived severity and self-care behaviors in the elderly people with hypertension, which leads to performance enhancement. In the present study, the score of perceived severity in the test group before the intervention was 45.3% of the total score, which was a weak score, but it showed a dramatic increase (20%) after the intervention, changing its status to a moderate score; however, the construct did not change in the control group. This finding is also congruent with other studies.<sup>35–38</sup> Therefore, those who take care of the elderly may encourage them to adopt self-care behaviors and increase perceived severity through proper education.

Perceived benefits and barriers are other constructs related to health behaviors. Studies have shown that perceived barriers are among the most prominent factors concerning self-care behaviors in the elderly with hypertension,<sup>40</sup> and it is considered the main reason to refrain from observing the physicians' orders.<sup>6</sup> Robinson<sup>40</sup> introduced perceived barriers as the most powerful predictor of self-care behaviors in the hypertensive elderly persons. Tan<sup>41</sup> demonstrated that perceived barriers prevented the individuals from following the physician's orders such as taking drugs regularly.<sup>41</sup> Chao et al<sup>42</sup> reported an inverse relationship between perceived barriers and health behaviors including hypertension control; ie, the fewer the perceived barriers, the higher the possibility of adopting health behaviors. Many other studies have shown a significant inverse relationship between perceived barriers and self-care behaviors.<sup>9,43–46</sup> Moreover, perceived benefits are effective in predicting the behaviors. Studies have also shown that awareness and proper perception of self-care behaviors stimulate the people to adopt such behaviors.<sup>20,46–48</sup> Taghdisi and Nejad Sadeghi<sup>20</sup> also explained that the HBM-based educational intervention increased perceived benefits and promoted preventive behaviors in females suffering from urinary infections.

According to previous investigations, perceived benefits and barriers are very effective in adopting self-care behaviors in the elderly people with hypertension. In the present study,

the HBM-based educational intervention led to an increase in the score of perceived benefits (15.4% increase) and a reduction in the score of perceived barriers (9.5% reduction). In other words, the test group, which had a weak performance before the intervention, improved to a moderate situation after the intervention. Therefore, HBM-based educations may increase the health care performance in addition to enhancing perceived benefits and removing perceived barriers. Further studies are recommended to investigate perceived barriers in the elderly with the aim of evaluating these barriers in detail in males and females.

Perceived self-efficacy was the last HBM construct. Many studies have confirmed a direct relationship between perceived self-efficacy and self-care behaviors in various aspects of non-epidemic diseases.<sup>20,21,34,41,45,49</sup>

Self-efficacy, which was introduced by Bandura for the first time, refers to the individual's self-confidence in conducting a specific behavior.<sup>50–55</sup> It is also a powerful predictor of health behaviors and hypertension-controlling behaviors.<sup>51,52</sup> Many studies have considered this item as the most important determining factor of the adults' and elderly's physical activity.<sup>52–55</sup>

Therefore, self-efficacy plays a crucial role in adoption of hypertension-controlling behaviors. In the present study, educational intervention increased the self-efficacy score by 15.2% in the test group, while no significant change was observed in the control group. In other words, the HBM-based education led to the promotion of self-efficacy in the elderly.

To increase self-efficacy, elderly people's experience in blood pressure control should be expressed, and they should be informed of hypertension prevention behaviors.<sup>56</sup>

## Conclusion

There is a relationship between individuals' health beliefs and their health behaviors; thus, attempts should be made to promote their beliefs. The results of this study revealed that the educational intervention based on the HBM increased the mean score of health beliefs in the elderly as well as their awareness and practice. There were no significant changes in the control group. Therefore, it is highly recommended to consider educational interventions based on the HBM in promoting health behaviors and beliefs of the elderly people with hypertension.

## Limitations

Due to the lack of similar studies in Iran, we could not compare our findings with other studies. Another limitation

of this study is that the participants were all selected from urban areas; thus, it is recommended to conduct other studies in rural populations. In addition, as self-care behaviors had a weak quality among the divorced and widows, future studies are suggested to focus on these groups with the aim of studying their barriers.

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## Disclosure

The authors report no conflicts of interest in this work.

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