




## Original Article

# Effectiveness of a Theory of Planned Behavior-Based Intervention for Promoting Medication Adherence among Rural Elderly Hypertensive Patients in Iran

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## ABSTRACT

### Article history

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**Introduction:** Medication adherence is regarded as one of the most important factors in caring for hypertension. This study aimed to investigate the effect of intervention based on the theory of planned behavior (TPB) on medication adherence and its influencing factors on the elderly with hypertension in a rural area, Kerman province, Iran.

**Methods:** This quasi-experimental study of the pre and post-control type was conducted on 109 elderly patients with hypertension. Data were collected using a multistage random sampling and a valid questionnaire based on the TPB. The intervention was an educational program based on TPB constructs using educational videos, pamphlets and booklets approved by the Ministry of Health. The collected data were analyzed by the SPSS 22 using parametric tests (Independent t-test, paired t-test, and regression analysis).

**Results:** The average score of the attitudes, perceived behavioral control, as well as medication adherence behavior constructs increased significantly after the intervention in the intervention group compared to the control group ( $p < 0.001$ ). Multivariate regression analysis in intervention group after intervention showed that 76% of variations in intention were explained by the model. Attitude, subjective norms and perceived behavioral control were independent predictors of intention. The association between subjective norms and intention was of marginal significance ( $B = 0.89$ ).

**Conclusion:** The results of this research showed that an educational program based on TPB can affect medication adherence on elderly rural patients suffering from hypertension.

**Keywords:** Hypertension, Medication Adherence, Theory of Planned Behavior, Aged Patients

## Introduction

The elderly is an important period of a person's life. With age, the risk of developing chronic illnesses increases significantly (1). Studies show that 80% of the elderly have at least one chronic illness which puts them at greater risk of disability and death than others (2, 3). Hypertension (HTN) is one of these chronic diseases that is prevalent in elderly age and may be responsible for changing the quality of life of the elderly (4).

HTN is responsible for at least 45% of deaths caused by cardiac diseases and 51% of deaths due to stroke. Out of about 17 million deaths due to cardiovascular diseases, 9.4 million originate from HTN complications (5). Studies in different countries have reported the prevalence of HTN between 18 and 72 percent among the total population (6, 7). In one study among elderly people in China, HTN was prevalent among 63.7% of them (58.3% in males, 69.0% in females) (7). In Iran, studies showed different prevalence rates of HTN. In this way, the prevalence of HTN among elderly people in Tabriz, Iran was 74.0% in women and 60.7% in men (7, 8). Also in Birjand the prevalence of HTN among > 60 was 51.5% (9). In a cross sectional study in Hormozgan province, the HTN was 45.5% for 60-69 years of age and 59% for > 70 (10). In Kerman province, the prevalence of HTN among rural women reported to be about 22% among total population (11) and the prevalence of HTN in urban population was reported 47.4% among 55-64 years of age and 57.9% among 65-74 years old (12).

In people with HTN; especially the elderly patients, adherence and the control of disease is of special importance so that the chances for its complications come to a minimum (13). Poor adherence to treatment is one of the main causes of insufficient blood pressure (BP) control. Adherence is defined by the World Health Organization as "the extent to which a person's behavior—taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (14).

As the older adults are susceptible to much comorbidity, they are at higher risk of polypharmacy, and therefore may present with higher risk of non-adherence to medications compared to the younger population. This results in decreased therapeutic benefits for the patient, frequent hospital and physician visits due to the deterioration of their medical condition, increased health care costs, and even overtreatment of a condition (2, 3, 15). Studies showed that medication adherence (MA) among the elderly patients is low and has been reported between 24% and 20 % (16).

One of the main aims of health care providers is to identify non adherent elderly patients and educate them about self-care and MA. Their works help prevent and manage chronic diseases such as HTN and reduce the risk of cardiovascular diseases (17). To improve patient adherence, using social cognitive models like theory of planned behavior (TPB) has been recommended both to recognize the predictors

of non-adherence and designing intervention to promote MA (18).

The TPB offers a socio-cognitive structure to explain the engagement of the people in specific voluntary activities. Ajzen offered it as an extension of the theory of reasoned action (19). The theory supposes that behavior can be predicted by intention, which is resulted from personal's attitude towards the behavior, subjective norms (SN), and perceived behavioral control (PBC) (20).

The attitude included beliefs about the behavior (behavioral beliefs) and evaluations of the probable outcomes of the behavior (outcome evaluation). SN involves the perception of a person how others think about one should perform (normative beliefs) and the person's value gives to behaving in line with the expectations of others. PBC is defined as "the person's perceptions about the amount of control one has on the behavior (control beliefs)". However, the other two predictors (attitudes and SN) predict behavior indirectly; PBC predicts behaviors directly (21).

In this study, an educational intervention was investigated using TPB among rural elderly patients with HTN to promote attitude, intention, SN, PBC in order to increase MA in intervention group.

## Methods

### *Study design and participants*

This quasi-experimental intervention was carried out from November 2016 to July 2017 on 109 elder patients (60-year-old and above) with HTN (56 cases in the intervention and 53 in the control group). The participants were randomly selected from two Rural Centers for Comprehensive Community Healthcare (Centers for the provision of public health services in rural areas in Iran) in two villages in Kerman, southeast of Iran, as intervention and control groups (22). The main researcher (first author) of the study referred to selected patients' houses and the patients were invited to participate in the study. Rural Centers for Comprehensive Community Healthcare (Centers for the provision of public health services in rural areas in Iran) in two villages in Kerman, southeast of Iran, as intervention and control groups (22). The main researcher (first author) of the study referred to selected patients' houses and the patients were invited to participate in the study.

### *Instrument*

The questionnaire consisted of demographic variables (age, sex, marital status, educational level and occupation status) and the items related to constructs of the TPB on MA included: attitude (9 items, for example: regular MA can prevent heart attack), SN (8 items, for example: to what extent do your family members agree to regular MA?), PBC (11 items, for example: how easy is it for you to take regular MA?), behavioral intention (2 items, for example: I decided to use my prescribed medications

regularly.), and the behavior (4 items, for example: how did you follow the prescribed medication in the last week?). The items were scored using a 5-point Likert scale (scores 1-5).

The items pool was performed by in-depth review of the literature and the available questionnaires based on TPB, in addition to one focus group discussion held with HTN patients based on assumptions of TPB constructs ( $n = 7$ ). Content validity was done by an expert panel made up of two nurses, two specialists in health education and promotion, one epidemiologist and one general practitioner. They reviewed the questionnaire and provided comments on 30% of the items (23). Then, that was modified according to their proposed comments and 100% consensus was reached on the end version (23). The face validity, and cultural appropriateness of the items was also evaluated. For doing that, the questionnaire was completed by seven rural hypertensive patients with different socio-demographic characteristics. Generally, the final questionnaire was approved and there was no problem in reading and understanding the items by patients. The average response time in final version of questionnaire was about 15 minutes (range 10 to 20 minutes).

The internal consistency of the questionnaire was determined by Cronbach's coefficient alpha in a pilot study on 30 patients. The Cronbach's alpha was 0.86 for attitude, 0.70 for SN, 0.73 for PBC, 0.86 for intention and 0.71 for behavior.

#### *Procedures and intervention*

The venue for holding the intervention was the Rural Center for Comprehensive Community Healthcare of the villages under study. After verbal informed consent, the information on how to run the plan, confidentiality of the information, and also the purpose of the study was explained. Then the pre-test was given to both the intervention and control groups simultaneously. Then the designed educational interventions were implemented on the intervention group for six sessions. Also, because pre-tests and post-tests were given to determine the effect of the intervention, to observe the principle of confidentiality, participants were given a code.

Educational interventions was designed using the results of the pre-test score. Intervention was carried out for the intervention group and their families weekly for 45 days. The intervention was lasting around 75 minutes. We did the focus of the intervention on the constructs with lower scores. The training was done using presentations, group discussion, question and answer, and distributing pamphlets and booklets about self-care on hypertension and cardiovascular disease. The pamphlets and booklets were approved by the Minister of Health & Medical Education of Iran (MOHME). At the beginning of the sessions, educational clips on HTN were showed. To change the SN construct in the intervention based on TPB, patients with one family member attended in educational sessions. The post-test was conducted one

month after the intervention (24). The questionnaire was self-administered for literate patients and interviewer-administered for illiterate patients. The interviewer was the instructor in this study (the first author).

#### *Ethical considerations*

The ethical code of IR.KMU.REC.1397.519 was obtained from the Ethics Committee of Kerman University of Medical Sciences for the present study. After explicating the objectives of the study as well as ensuring privacy, verbal informed consent was obtained from the participants. Questionnaires were also designed anonymously with a private identification code.

#### *Statistical analysis*

The data were described using descriptive statistics. To compare the pre-test and post-test within and between the groups, the paired t-test and independent sample t-test were run. Logistic regression tests were used to investigate the predictability of the constructs of TPB on outcome. SPSS 22 was used to analyze the data. The  $P < 0.05$  was considered to be statistically significant.

### **Results**

The mean age of participants was  $72.72 \pm 9.42$  (range: 60 to 91 years of age). Over 74.3% of the total participants were female. In the intervention and control group 76.8% and 90.6% were illiterate respectively ( $p = 0.03$ ). The groups under study did not differ significantly in frequency distribution of variables in terms of gender ( $p = 0.32$ ), age ( $p = 0.71$ ), and occupation ( $p = 0.59$ ). But the frequency of literate people ( $p = 0.03$ ) and married people ( $p = 0.01$ ) was significantly higher in the intervention group (Table 1).

Regarding the relationship between the TPB constructs and demographic variables, the results also showed that only SN were significantly different in terms of the education construct in a way that people with higher level of education obtained higher scores in SN ( $p = 0.01$ ) (Table 2).

#### *Intervention*

After the intervention, in the intervention group the average scores of the attitude ( $p = 0.001$ ), PBC ( $p = 0.001$ ), and behavior ( $p < 0.001$ ) were significant increased (Table 3).

Multivariate regression analysis in intervention group after intervention revealed that attitude, SN, PBC are independent predictors of intention. Also, 76% of variations in intention were explained by the model. One unit increase in attitude score was associated with 0.74 increases in intention. Association between SN and intention was of marginal significance ( $B = 0.89$ ). Also the predictability of the behavior through the constructs of the TPB was 68% (Table 4).

Table 1. Demographic characteristics of subject in the theory of planned behavior

Variables	Category	Intervention N (%)	Control N (%)	p-value
Gender	Male	14(25.0)	14(26.4)	0.32
	Female	42(75.0)	39(73.6)	
Education level	Illiterate	43(76.8)	48(90.6)	0.03
	Literate	13(23.2)	5(9.4)	
Matrimony status	Married	40(71.4)	27(50.9)	0.01
	Unmarried	16(28.6)	26(49.1)	

Table 2. Comparison of the scores of the TPB constructs in the two groups before the intervention in terms of demographic variables using independent sample t-test (N = 109).

Variables	Category	Attitude	Subjective norms	Behavioral control	Behavioral intention	Behavior
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
Gender	Male	3.55 $\pm$ 0.60	3.67 $\pm$ 0.76	3.14 $\pm$ 0.97	4.50 $\pm$ 1.04	3.92 $\pm$ 0.94
	Female	3.62 $\pm$ 0.51	3.60 $\pm$ 0.83	2.97 $\pm$ 0.95	4.50 $\pm$ 0.85	3.89 $\pm$ 0.88
** Education	Literate**	3.60 $\pm$ 0.63	3.97 $\pm$ 0.71**	3.93 $\pm$ 1.20	4.47 $\pm$ 0.93	3.93 $\pm$ 0.96
	Illiterate	3.62 $\pm$ 0.49	3.54 $\pm$ 0.80	3.75 $\pm$ 1.16	4.41 $\pm$ 0.23	3.75 $\pm$ 0.87
Matrimony status	Married	3.65 $\pm$ 0.57	3.70 $\pm$ 0.77	3.07 $\pm$ 1.23	4.52 $\pm$ 0.77	3.99 $\pm$ 0.83
	Unmarried	3.58 $\pm$ 0.43	3.44 $\pm$ 0.86	2.93 $\pm$ 1.02	4.36 $\pm$ 1.08	3.76 $\pm$ 0.76
Occupation status	Employed	3.58 $\pm$ 0.64	3.86 $\pm$ 0.82	3.05 $\pm$ 0.89	4.45 $\pm$ 1.22	3.62 $\pm$ 1.05
	Unemployed	3.61 $\pm$ 0.51	3.59 $\pm$ 0.79	2.72 $\pm$ 1.18	4.58 $\pm$ 1.11	3.93 $\pm$ 0.87

\*\* p - value &lt; 0.01

Table 3. Comparison of the mean scores of the constructs of theory of planned behavior before and after the intervention in both studied groups

Constructs	Intervention group		p -value	Control group		p -value	Comparison (p-value)
	Mean ± SD			Mean ± SD			
	Before	After		Before	After		
Attitude	3.97 ± 0.22	4.19 ± 0.29	0.001	3.43 ± 0.54	3.29 ± 0.54	0.08	< 0.001
Subjective norms	4.13 ± 1.15	4.16 ± 0.64	0.76	3.23 ± 0.58	3.37 ± 0.63	0.43	< 0.001
Perceived behavioral control	2.98 ± 1.15	4.14 ± 0.64	< 0.001	3.03 ± 0.80	2.93 ± 0.59	< 0.21	< 0.001
Behavioral intention	4.70 ± 0.76	4.63 ± 0.58	0.38	4.12 ± 1.31	3.80 ± 1.04	< 0.001	0.02
Behavior	3.68 ± 0.74	4.04 ± 0.56	< 0.001	3.75 ± 0.85	3.60 ± 0.79	0.04	0.01

IA with CA: Intervention group After with Control group After

Table 4. The relationship between the behavior and other constructs of the theory of planned behavior in the intervention group using linear regression analysis

Variables and constructs	Crude			Multivariate regression		
	$\beta$	CI 95%	p-value	$\beta$	CI 95%	p-value
Attitude	0.56	0.06 - 1.01	0.02	0.74	0.47 - 1.00	0.001
Subjective norms	0.89	0.71 - 1.05	0.001	0.41	0.20 - 0.37	0.001
Perceived behavioral control	0.63	0.49 - 0.76	0.001	0.20	0.07 - 0.33	0.003



## Discussion

This study aimed to examine the effect of an intervention based on the TPB on MA of elderly patients with HTN. Educational intervention improved attitude, PBC and MA behavior in an elderly rural population with low literacy. These results are consistent with the results of interventional studies based on TPB or similar theories such as social cognitive theory, trans theoretical model of behavior change and health belief model (25, 26).

Attitude is interpreted as a mental process determining the potential and actual practices which are behavior predictors. In fact, people ponder upon their decisions and evaluate them before deciding to follow or abandon them. Attitude is considered the first determinant of behavioral intention predicted by a combination of values and expectations derived from behavioral consequences (27). Accordingly, hypertensive elderly patients had desirable attitudes to MA (>3.29 from 5 score), in this study, it means that MA was pleasant, helpful or enjoyable, and they have appropriate judgments of MA. The findings about attitude to MA of this study is in line with those of other studies based on TPB on health education intervention programs (30-32). The intervention resulted in significant improvement in PBC. PBC refers to people's perceptions of their power to perform a recommended behavior, so based on TPB assumptions (20). Training can lead to learning self-management and self-care techniques and promote the control and ability of patient to MA. Our results showed that PBC is a very strong predictor of MA behavior. A similar study has shown that taking and eating the drug does not require prior planning and intent, and it may be one of the reasons for its strong and direct effect (31).

Since PBC along with the individual's perception on to what extent they can or cannot control the behavior can affect making the right decision, the more elderly patients with HTN feel that they are controlling their MA, the more it will be likely that they will follow the behavior. This must be taken into account in educational programs, health communication with health care providers, and especially when people are uncertain about their ability to comply with drug (31, 32).

In our study, the intervention did not increase the intention score significantly in the intervention group but increased MA. This can be due to the direct effect of PBC on the behavior (18,36). Despite the precise validation of the questionnaire, this seems to be a fundamental finding since the concept of intention may appear differently in different cultures and individuals of different ages and also literacy levels, requiring more detailed studies in Iran (18). Since the behavioral intention is a behavior determining factor being predicted by three factors (attitude to behavior, SN, and PBC) (27), this should be taken into consideration in interventions to change or modify MA behavior of patients with HTN.

According to a review of the application of TPB to elderly patients with HTN, the subjective norm construct frequently did not achieve significance. This may be because of that participants in this study were the elderly and the effect of SN and more influenced by others at

younger age, especially in adolescence than in old age (21).

The most important finding of this study was that the average of MA (behavior) before and after the intervention showed a significant increase. Similar studies also showed increased self-care and hypertensive diet compliance in patients after educational interventions (37, 38). Improving MA after the intervention in this study also suggests the positive role of theory-based educational interventions in behavior change that can be used in health education programs. It seems that educating such people with characteristics such as being old, having low literacy and living in rural environments has led to good results through a short-term intervention. Such interventions can increase the costs of the efficiency of medical interventions and reduce disease complications.

In this study, the predictability of the behavior through the constructs of the TPB was 68%. Similar studies also found that this theory is helpful to predict patients' MA and self-care in chronic HTN (39, 40). In general, the use of different theories, including the TPB can play a positive role in patients' MA (41). The study also found that the theory of planned behavior is a proper predictor for health behaviors. So far, many studies have been done to identify effective factors in the self-care practices in patients with HTN, and evidence suggests that hypertensive self-care is affected by various factors, thus focusing solely on the TPB variables to predict and develop interventions to alter adherence may be insufficient (38). Accordingly, theory-based education based on this theory can, in addition to helping the elderly patients with HTN with self-care practices and MA, contribute to the prevention and management of HTN and help decreasing cardiovascular diseases (18).

## Conclusion

The findings of this study emphasize the role of attitude, SN, PBC and behavioral intention in MA behavior of elderly patients with HTN. Moreover; the results suggest the efficiency of educational interventions in improving MA. It seems that using the TPB in the designation of training programs in elders will lead to the creation of more focused and successful programs for this population.

## Study limitations

The tool of this study was a self-report instrument and patient's behavior cannot be directly observed that could lead to less valid results. Also, this was a short-term interventionist study, and booster training sessions could not be held for patients. In TPB the SN is an important construct and we couldn't educate their families completely. Due to the small sample size and the limited intervention, the results of this research have limited generalizability.

## Conflict of interest

The authors declare no conflict of interest in this study

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## Authors' contributions

All authors have participated in the design and implementation of the study. E. J performed the intervention and collected the data. H.S and A.I performed analysis and interpretation of data. All authors have participated to draft or modify the manuscript, read and approved the final version of the article.

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