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# Predictors of self-care behaviors in patients with hypertension: The integrated model of theories of “planned behavior” and “protection motivation”

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## Abstract:

**BACKGROUND:** Assessment of self-care behaviors in patients with hypertension may provide clinicians and practitioners with important information about how to better control hypertension. Therefore, the present study aimed to explore the predictors of self-care behaviors in patients with hypertension based on an integrated model of theories of planned behavior and protection motivation.

**MATERIALS AND METHODS:** The present cross-sectional study was part of a larger study, conducted in 2022 on 344 hypertensive patients from Khamir County in Hormozgan Province in Iran. The sample was selected through a systematic random sampling. The patients completed a researcher-made questionnaire based on constructs of the theory of planned behavior and protection motivation theory. They also completed, Hypertension Self-Care Activity Level Effects (H-SCALE), Hypertension Knowledge-Level Scale (HK-LS), and a demographic questionnaire. The data were analyzed in SPSS 21 using the Pearson correlation coefficient, independent-samples T test, one-way ANOVA, and linear regression analysis.

**RESULTS:** The participants' mean age was  $47.34 \pm 13.68$  years. Adherence to medication, physical activity, weight management, diet, and nonsmoking scores were 42.7, 27.3, 66.3, 14.2, and 81.1, respectively. The linear regression model showed that behavioral beliefs ( $\beta = 0.366$ ,  $P < 0.001$ ), perceived rewards ( $\beta = -0.248$ ,  $P < 0.001$ ), control beliefs ( $\beta = 0.133$ ,  $P = 0.013$ ), and normative beliefs ( $\beta = 0.143$ ,  $P = 0.025$ ) were the major predictors of self-care behaviors in patients with hypertension.

**CONCLUSION:** In light of the present findings, it can be concluded that it is crucial to change patients' attitudes toward self-care behaviors and improve the social acceptance of behavior and its development in society, and improve patients' control beliefs through goal-oriented education that develops resistance against the perceived rewards of the unfavorable behavior. Considering these constructs can act as strategies to promote self-care behaviors among patients.

## Keywords:

Hypertension, predictions, protection motivation theory, self-care, theory of planned behavior

## Introduction

Hypertension is a serious medical condition that can increase the risk of heart disease, brain stroke, renal, and other

diseases. It is a major cause of premature mortality worldwide, afflicting 1 per 4 men and 1 per 5 women (over a billion people overall).<sup>[1]</sup> As reported by the World Health Organization (WHO), most of these patients live in low- and middle-income countries.<sup>[2]</sup>

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A meta-analysis estimated the prevalence of hypertension at 25% in Iran between 2004 and 2018.<sup>[3]</sup> Hormozgan is the southernmost province located along the coastlines of the Persian Gulf and Oman Sea. The rate of hypertension is 12.1% in this region.<sup>[4]</sup> A coastal town only 75 km away from the southwest of Bandar Abbas, Khamir County, is located in the west of Hormozgan Province. Almost half of the mortality rate in this region was associated with cardiovascular diseases in 2022. As reported in study on the population over 30 years of age in this city, the rate of hypertension became threefold, changing from 5.3% in 2012 to 16.92% in 2022.<sup>[5]</sup> Moreover, the aging population is globally on the rise, and old age is likely to contribute to chronic diseases. Studies show that old age is associated with the prevalence of hypertension.<sup>[6]</sup>

Self-care is an integral part of hypertension treatment<sup>[7]</sup> and involves some physical care and active engagement in the self-care process by, for instance, adhering to treatment, monitoring symptoms, checking the side effects, and showing positive health-related behaviors such as a healthy diet and regular exercise. These will ultimately improve health and quality of life, increase patient's satisfaction, balance medical services, and reduce healthcare costs.<sup>[8]</sup> Another study revealed low levels of adherence to self-care behaviors, particularly weight management, salt consumption, physical exercise, and drug abuse.<sup>[9]</sup> Despite the availability of several effective medical and nonmedical treatments, hypertension control is lower than favorable on a global scale.<sup>[10-12]</sup> Several factors account for the ineffective control of hypertension,<sup>[13]</sup> mostly due to nonadherence to self-care behaviors in patients with hypertension.<sup>[14-16]</sup> Many factors are assumed to be associated with adherence to self-care behaviors such as socioeconomic status, belief in the therapeutic power of medicine, other diseases, drug availability, access to health care, health literacy level, number of medications, length of treatment, age, sex, cultural background, educational background, and disease and treatment awareness.<sup>[17-20]</sup>

In this study, the two theories of planned behavior and protection motivation were used as an integrated framework to identify the predictors of hypertension self-care behaviors. It provides insights into the complexities of behavior and intention. The theory of planned behavior (TPB) is the most important one among theories of behavior change. Ajzen, who developed TPB, showed that attitude is a strong predictor of behavior. According to this theory, one of the most important determinants of behavior is intention. An individual's intention leads to the actual performance of a behavior and is a combination of attitude toward behavior and subjective norms. TPB is used to predict and understand behavior and behavioral outcomes. It also shows important concepts for health education in assessing

behaviors related to health, intervention, and promotion of prevention programs.<sup>[21]</sup> A theory that adequately explains why people engage in unhealthy behaviors and makes suggestions to change unhealthy behaviors is the protection motivation theory (PMT). This theory suggests that people protect themselves based on threat and coping appraisal. The former is concerned with evaluating the situation, and the latter deals with how to respond appropriately to the situation.<sup>[22]</sup> This theory includes two critical stages of threat appraisal (perceived vulnerability, perceived severity, and perceived rewards) and coping appraisal (perceived self-efficacy, perceived response efficacy, and perceived costs) and the intermediate fear construct.<sup>[23]</sup> According to this integrated model, individuals control their blood pressure when they believe their nonaction poses serious and dangerous threats to their health. In addition, they are motivated to do so when they adequately perceive the benefits.

To the best of our knowledge, the present study pioneers in identifying the predictors of self-care behaviors in patients with hypertension based on an integrated model of TPB and PMT (accurate identification of determinants of self-care behaviors in patients with hypertension based on constructs related to patients' perceptions of self-care behaviors during a qualitative study). The findings can provide useful information for planning, controlling blood pressure, and promoting self-care behaviors.

## Materials and Methods

### Study design and setting

The present cross-sectional study was part of a larger research project entitled "Designing, implementing and evaluating an educational program based on an integrated model of theories of the planned behavior and protection motivation to promote self-care behaviors of patients with hypertension." The research population consisted of hypertensive patients receiving healthcare services at the healthcare centers of Khamir County in Iran.

For illiterate participants, the questionnaire was completed by the researcher to minimize any bias. Each questionnaire took about 35 min to complete. The inclusion criteria were patients with hypertension, diagnosis of over 6 months, age of over 30 years, willingness to participate, communication ability, and informed consent. Showing severe side effects of hypertension was an exclusion criterion.

### Sample size and sampling

Gpower was to analyze data collected from a sample of 255 patients with a 5% margin of error, 80% of test power, effect size of 0.08, and 16 constructs as the predictive

variables. A cluster sampling was used and the effect of design was set at 1.2. With a probability of excluding some participants, the final sample was estimated to be 344. There were six healthcare centers in Khamir County, and in the cluster sampling, the sample was selected according to the number of hypertensive patients in each center. Then, to select participants in each cluster, a systematic random sampling (the list of patients) was used.

### Data collection tool

The questionnaire-based data collection instrument consisted of four sections. The first section consisted of demographic information such as age, sex, employment status, marital status, education, height, weight, and systolic and diastolic blood pressure. The second section included the Hypertension Self-Care Activity Level Effects (H-SCALE), to measure adherence to self-care behaviors in hypertensive patients. Developed by Warren-Findlow *et al.*, H-SCALE assessed self-care behaviors in hypertensive patients during the past seven days.<sup>[24]</sup> The third section of the questionnaire was the Hypertension Knowledge-Level Scale (HK-LS), adapted from a 22-item questionnaire measure knowledge of hypertension. HK-LS was employed by Erkok in Turkey in 2012.<sup>[25]</sup> H-SCALE and HK-LS were translated and their validity and reliability were substantiated by Zinat Motlagh *et al.* in the Iranian context. The CVI for these questionnaires—H-SACLE and HK-LS—was found to be 0.86 and 0.82, respectively. Also, the Cronbach's alpha value for these questionnaires was estimated at 72% for knowledge, 91% for adherence to medication, 72% for low-salt diet, 96% for physical activity, 91% for smoking, and 85% for weight management. Therefore, to assess the self-care measures used to tackle hypertension, the Persian version of H-SCALE was used containing 26 items: adherence to medication (3 items), physical activity (2 items), low-salt diet (10 items), smoking (2 items), and weight management (9 items). The final Persian version of HK-LS included 19 items to measure the knowledge of hypertension.<sup>[17]</sup> The fourth section was a researcher-made questionnaire developed based on the findings of the qualitative study.<sup>[26]</sup> To assess the content validity of the tool, the questionnaire was given to five experts in health education, cardiologist and general practitioner, and their comments were used to modify the questionnaire. The questionnaire—a 5-point Likert scale—included the constructs of the theory of planned behavior and the protection motivation theory [Table 1]. To test the internal consistency of the questionnaire, Cronbach's alpha was calculated.<sup>[27]</sup> The test-retest method was used to assess the external reliability of the tool. To this aim, the questionnaire was provided twice to 30 individuals (similar to the main participants of the study), with a 15-day interval.<sup>[28]</sup> The content validity ratio (CVR) was 1 for all items of the questionnaire and

the content validity index (CVI) ranged between 0.83 and 1.

### Ethical consideration and consent to participate

The present study was approved by the ethical committee of Bandar Abbas Medical Science University (IR.HUMS.REC.1399.214). A written informed consent form was signed by all participants and they were assured that participation in the study was voluntary. The participants were also assured of the confidentiality of the information they provided.

### Data analysis

The mean and standard deviation were used to describe interval/ordinal variables, and frequency and percentage to describe categorical variables. A linear regression analysis was used to determine the most important predictors of self-care behaviors. Pearson correlation coefficient was used to measure the associations among model constructs. A significance level of 0.05 was set for all tests. SPSS 21 was used for data analysis.

## Results

Most participants were female (61.33%), married (85.17%), holding diploma (25.58%), and housewives (45.63%). The youngest participant was 30 years old and the oldest was 83 with a mean age of  $47.34 \pm 13.68$  years. The participants' mean systolic blood pressure was  $128.26 \pm 14.25$  mmHg and their mean diastolic blood pressure was  $79.64 \pm 11.16$  mmHg.

T test and one-way ANOVA were used to test the relationship between demographic variables and self-care behaviors [Table 2]. The results showed that age, marital status, employment status, education level, and BMI were significantly correlated with self-care behaviors in hypertensive patients ( $P < 0.001$ ).

The mean, standard deviation, and Pearson correlation coefficient of the constructs of the planned behavior and protection motivation theories, knowledge, and self-care behaviors are presented in Table 3. As the statistical analyses showed, self-care behaviors were positively and significantly correlated with behavioral beliefs, evaluation of behavioral outcomes, normative beliefs, motivation to comply, control beliefs, perceived power, behavioral intention, perceived vulnerability, perceived severity, perceived response efficiency, self-efficiency, fear, protection motivation, and knowledge ( $P < 0.01$ ). Self-care behaviors were significantly and negatively correlated with perceived rewards ( $P < 0.01$ ) and perceived response costs ( $P < 0.05$ ) [Table 3].

According to Table 4, nonsmoking behavior had the highest frequency (81.1%) and adherence to a healthy

**Table 1: Description of researcher-made questionnaires**

Determinant	Number of items	Cronbach's alpha	ICC	Item example
Behavioral beliefs	5 items	0.852	0.529	I prefer to eat low-fat and low-salt food to control my blood pressure
Evaluations of behavioral outcomes	5 items	0.830	0.590	Fruit and vegetables help control blood pressure
Normative beliefs	5 items	0.787	0.631	My spouse recommends to eat more fruit and vegetables
Motivation to comply	5 items	0.834	0.665	I accept my friend's suggestion to join me in daily walks
Control beliefs	5 items	0.698	0.756	Healthcare centers are within reach to obtain training regarding blood pressure and its measurement
Perceived power	5 items	0.669	0.662	If gyms or exercise equipment are available, I'll do exercise to lose weight
Behavioral intention	5 items	0.857	0.764	To control blood pressure, I'll never smoke hookah from now on
Perceived vulnerability	4 items	0.918	0.699	If I follow self-care behavior, it's less likely that I experience insomnia or sleep disorder
Perceived severity	5 items	0.947	0.723	High blood pressure might cause premature death
Perceived rewards	8 items	0.910	0.688	I like to eat local dessert and food such as Souragh or Mahyawa
Perceived response efficiency	6 items	0.866	0.583	Keeping a balanced weight can help control my blood pressure
Perceived response costs	10 items	0.909	0.631	I can't exercise because of my hectic lifestyle
Self-efficacy	6 items	0.827	0.757	I carry and take my medicine under any circumstances
Fear	6 items	0.908	0.729	I'm worried that long-term consumption of medicine can affect my body
Protection motivation	7 items	0.949	0.787	I follow self-care behavior because I don't want to have a stroke and become disabled

**Table 2: Self-care behaviors in patients with hypertension according to demographic features**

Variable	Categories	Frequency n (%)	Mean±SD	Test
Age group	<40	130 (37.8)	96.6±19.07	<i>F</i> =22.424, <i>P</i> <0.001
	41–50	101 (29.4)	106.9±17.14	
	51–60	42 (12.2)	115.95±14.91	
	>61	71 (20.6)	113.81±14.92	
Sex	Female	211 (61.33)	106.07±18.34	<i>t</i> =0.665, <i>P</i> =0.507
	Male	133 (38.66)	104.69±19.5	
Marital Status	Single	17 (4.94)	97.29±17.21	<i>F</i> =2.954, <i>P</i> =0.033
	Married	293 (85.17)	105.16±19.05	
	Divorced	2 (0.85)	117.5±21.92	
	Widowed	32 (9.3)	112.59±14.72	
Employment Status	Employed	113 (32.08)	101.82±19.1	<i>F</i> =2.972, <i>P</i> =0.032
	Retired	29 (8.43)	110.06±18.41	
	Housewives	157 (45.63)	106.01±18.72	
	Unemployed	45 (13.08)	109.97±17.1	
Education level	Illiterate	60 (17.44)	112.05±14.5	<i>F</i> =4.879, <i>P</i> <0.001
	Primary School	73 (21.22)	111.24±16.62	
	Intermediate 1	34 (9.88)	98.73±20.56	
	Intermediate 2	14 (4.06)	106.71±19.71	
	Diploma	88 (25.58)	99.67±19.77	
	Bachelor's Degree	62 (18.02)	104.14±18.34	
BMI	Master's Degree and higher	13 (3.77)	106.38±19.25	<i>F</i> =7.779, <i>P</i> <0.001
	>18.5	13 (3.8)	94.15±17.48	
	18.5–25	120 (34.9)	109.8±16.21	
	25–30	122 (35.5)	107.18±17.94	
	>30	89 (25.9)	99.2±21.14	

diet had the lowest frequency (14.2%) among patients [Table 4]. The mean score of adherence to self-care behaviors was 105 (R = 9–164), which is interpreted to be average [Table 3].

To determine the predictability of the constructs of the planned behavior and protection motivation to follow or not follow self-care behaviors, linear

regression analysis was run to develop a number of hypothetical models. In the final model, the factors of behavioral beliefs, perceived rewards, control beliefs, and normative beliefs were found to be associated with performing self-care behavior, all explaining 34.8% of variance (*P* < 0.05) [Table 5]. Table 5 shows the results of stepwise linear regression with variables of the model.

**Table 3: The matrix of Pearson correlation coefficient of the TPB and PMT constructs and self-care behaviors**

Variable	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Behavioral beliefs	1									
Evaluations of behavioral outcomes	0.681**	1								
Normative beliefs	0.685**	0.531**	1							
Motivation to comply	0.776**	0.612**	0.807**	1						
Control beliefs	0.480**	0.337**	0.505**	0.486**	1					
Perceived power	0.565**	0.435**	0.527**	0.585**	0.580**	1				
Behavioral intention	0.656**	0.567**	0.532**	0.629**	0.376**	0.622**	1			
Perceived vulnerability	0.653**	0.674**	0.538**	0.625**	0.421**	0.534**	0.739**	1		
Perceived severity	0.589**	0.706**	0.502**	0.569**	0.360**	0.481**	0.636**	0.791**	1	
Perceived rewards	-0.002	0.106	0.134*	0.035	0.207**	0.125*	0.042	0.116*	0.151**	1
Perceived response efficiency	0.586**	0.668**	0.509**	0.598**	0.391**	0.514**	0.624**	0.754**	0.777**	0.144**
Perceived response costs	-0.049	-0.108*	0.011	-0.046	-0.021	-0.030	-0.102	-0.115**	-0.091	0.472**
Self-efficacy	0.578**	0.532**	0.527**	0.569**	0.482**	0.534**	0.565**	0.596**	0.605**	0.088
Fear	0.338**	0.393**	0.344**	0.382**	0.307**	0.268**	0.311**	0.422**	0.480**	0.266**
Protection motivation	0.609**	0.554**	0.503**	0.608**	0.444**	0.503**	0.578**	0.692**	0.639**	0.027
Knowledge	0.282**	0.426**	0.161**	0.210**	0.153*	0.159**	0.305**	0.364**	0.419**	-0.109*
Self-care behaviors	0.528**	0.359**	0.427**	0.447**	0.329**	0.345**	0.344**	0.356**	0.262**	-0.202**

  

Variable	F11	F12	F13	F14	F15	F16	Mean±SD	Range of score
Behavioral beliefs							22.05±3.22	5-25
Evaluations of behavioral outcomes							22.5±3.01	5-25
Normative beliefs							20.49±3.49	5-25
Motivation to comply							21.74±3.35	5-25
Control beliefs							18.7±4.05	5-25
Perceived power							20.22±3.61	5-25
Behavioral intention							22.09±3.71	5-25
Perceived vulnerability							17.98±2.78	4-20
Perceived severity							22.20±3.58	5-25
Perceived rewards							25.52±7.66	8-40
Perceived response efficiency	1						26.22±3.86	6-30
Perceived response costs	-0.019	1					27.3±9.69	10-50
Self-efficacy	0.639**	0.006	1				25.02±4.3	6-30
Fear	0.484**	0.164**	0.373**	1			24.22±4.94	6-30
Protection motivation	0.727**	-0.103	0.616**	0.502**	1		31.39±4.67	7-35
Knowledge	0.398**	-0.196**	0.316**	0.217**	0.364**	1	14.3±3.94	0-19
Self-care behaviors	0.301**	-0.127*	0.348**	0.167**	0.352**	0.244**	105.54±18.78	9-164

F1=Behavioral beliefs, F2=Evaluations of behavioral outcomes, F3=Normative beliefs, F4=Motivation to comply, F5=Control beliefs, F6=Perceived power, F7=Behavioral intention, F8=Perceived vulnerability, F9=Perceived severity, F10=Perceived rewards, F11=Perceived response efficiency, F12=Perceived response costs, F13=Self-efficacy, F14=Fear, F15=Protection motivation, F16=Knowledge. \*Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed)

### Discussion

The present study aimed to explore the predictors of self-care behaviors in hypertensive patients using an integrated model of TPB and PMT. The participants received 64% of the score for self-care behaviors, showing these behaviors to be average level among these patients. Examining diabetic and hypertensive lifestyle and self-care behaviors among the patients, Khosravi *et al.*,<sup>[29]</sup> Newell *et al.*,<sup>[30]</sup> and Barati *et al.*<sup>[31]</sup> found results similar to the current study.

Nonsmoking and weight management behaviors showed to have the highest frequency among the self-care behaviors. On the contrary, adherence to a healthy diet had the lowest frequency (14.2%). The

patients reported that their nonadherence to a healthy diet is due to the pleasure they take in the salty and greasy taste of local cuisine. Hu *et al.* showed that 81% of Chinese hypertensive patients did not avoid consuming salt, which was consistent with the present findings.<sup>[20]</sup> WHO suggests that every adult should consume less than 5 grams (2000 mg) of sodium a day.<sup>[32]</sup> However, in most countries, the average daily amount of salt consumed per person is between 9 and 12 grams.<sup>[33]</sup> Iran is not an exception, which is also in line with the present study. Thus, there is a need to implement necessary educational interventions to limit salt consumption in traditional foods and increase the consumption of fruits and vegetables instead. Health service providers should set guidelines to encourage people to improve their diets.

**Table 4: Adherence to self-care behaviors as measured via H-SCALE**

Self-care behaviors	Adherent n (%)	Nonadherent n (%)
Adherence to medication	147 (42.7)	197 (57.3)
Adhering a low salt diet	49 (14.2)	295 (85.8)
Physical activity	94 (27.3)	250 (72.7)
Nonsmoking	279 (81.1)	65 (18.9)
Weight management	228 (66.3)	116 (33.7)

**Table 5: Prediction of self-care behaviors in patients with hypertension according to the linear regression modeling\* (n=344)**

Variable	B	Std. error	Beta	t	Sig.	R <sup>2</sup>
(Constant)	46.827	6.401		7.316	<0.001	0.348
Behavioral beliefs	2.132	0.365	0.366	5.845	<0.001	
Perceived rewards	-0.608	0.112	-0.248	-5.446	<0.001	
Control beliefs	0.616	0.246	0.133	2.506	0.013	
Normative beliefs	0.766	0.339	0.143	2.258	0.025	

\*The results of stepwise linear regression modeling

In the present study, 42.7% of the participants adhered to medication protocols, which was consistent with the results of a study (45.8%) conducted in the Republic of Congo.<sup>[34]</sup> However, it is lower than the rate reported in two studies conducted by Warren-Findlow *et al.* (59.8%)<sup>[24]</sup> and Hu *et al.* (51.9%).<sup>[20]</sup> However, this finding was higher than the reported adherence to medication in India (24.1%) and South Africa (35%).<sup>[35,36]</sup> Considering the low level of adherence to medication among the present participants, it is essential to implement medical programs to focus on health, promote the importance of medication adherence, and maintain a close relationship between patients and clinicians to control high blood pressure.

81.1% of patients in this study avoided smoking; similar results had been found in Ethiopia and Nigeria.<sup>[37,38]</sup> In addition, this result seems to be a higher incidence compared to other studies. The different findings can be explained by social and cultural differences between Iran and other countries.<sup>[20,34]</sup>

In the present study, 27.3% of the participants had regular physical activity. Similar to the results obtained in Ethiopia and Jordan, this level of physical activity was quite low,<sup>[18,39]</sup> and in fact much lower than Chinese participants (51.9%).<sup>[20]</sup> Zinat Motlagh *et al.*<sup>[17]</sup> found that 24.5% of their hypertensive participants did physical activity, even lower than found in the present study. A body of research has shown that the low level of physical activity is associated with hypertension.<sup>[40,41]</sup> At least 30 min of physical activity five days a week is suggested by WHO to prevent and control high blood pressure.<sup>[42]</sup> These findings highlight the need for and the significance of physical activity in hypertensive patients.

As the findings showed, 66.3% of the participants managed their weight, which was higher than the rate reported by Warren-Findlow and Seymour.<sup>[24]</sup> There is research evidence that losing weight leads to a greater decrease in blood pressure than mere pharmacological treatment.<sup>[43-46]</sup> In addition, losing about 5–10% of one's body weight can have a positive effect on controlling blood pressure.<sup>[43]</sup> Thus, interventions should be carried out with hypertensive patients to reduce weight.

The findings showed that the integrated model could account for 34.8% of the frequency of self-care behaviors in hypertensive patients. This finding is similar to what Sharifirad *et al.* found about protective behaviors against the flu among students<sup>[47]</sup> and what Baghianimoghaddam *et al.* found about skin cancer among students.<sup>[48]</sup> The predictability of the protection motivation theory in protective behaviors was estimated at 34% and 41% in the above-mentioned studies, respectively. Therefore, this integrated model can be an appropriate framework to predict self-care behaviors. It is suggested that future studies use this model to investigate groups with different demographic features and different medical issues.

As the present findings showed, perceived rewards, control beliefs, and normative beliefs were the major predictors of self-care behaviors in hypertensive patients. As the results of regression analysis showed, the patients' positive behavioral belief toward self-care was a factor that encouraged them to perform this behavior. In fact, people tend to adopt and maintain a particular behavior when they feel these behaviors promote health (such as weight loss, fitness, reduction of drug therapy, hypertension control, and better health and life quality). Van Ryn *et al.* showed that diabetic women who held a positive attitude toward physical activity actually did more physical activity compared to those without a positive attitude.<sup>[49]</sup> In addition, Pattama *et al.* concluded that there is a significant positive relationship between patients' attitude and diabetic self-care behavior.<sup>[50]</sup> Ozkan *et al.* reported that attitudes can be influenced by cultural contexts including values and norms.<sup>[51]</sup> Therefore, other effective variables such as cultural/environmental factors should not be ignored in changing attitude.

The second factor in predictive behavior is the rewards that an individual gains from an improper behavior or from neglecting a recommended behavior, which can affect the maintenance of protective behavior. Reduced perceived rewards can increase self-care behaviors, which is consistent with Hoseini *et al.*'s introduction of rewards as a predictor of preventive behavior in the destructive effects of sunshine on male students.<sup>[52]</sup> Baghianimoghaddam *et al.* also found a

negative correlation between protective behaviors against skin cancer and the construct of perceived rewards.<sup>[48]</sup> The significant negative correlation between rewards and protective behaviors shows that the more internal and external rewards attributed to incompatible behaviors, the less the probability of showing protective behaviors.

Control beliefs were another predictor of self-care behaviors among patients. The frequency of this behavior was higher among patients with higher levels of control beliefs. Those who think they have little control over their health, compared to those who have a stronger sense of control, have poorer health habits and consequently more diseases. They are less likely to take active measures to treat the disease.<sup>[53]</sup> Self-care behaviors require different levels of knowledge, skills, and resources. Despite the existing restrictions, the patient should know when and how to act properly, and to do so, s/he also needs the required skill and resources. According to Ajzen, perceived behavioral control has to do with perceived task difficulty. This researcher also believes that if an individual has a firm intention to follow behavior, the efficiency of this construct will be greater than other constructs.<sup>[54]</sup> Rezabeigi Davarani *et al.* came up with the conclusion that perceived behavioral control was the strongest correlated of intention.<sup>[55]</sup>

This finding is consistent with Schouten *et al.*, who reported teenagers' beliefs and subjective norms as strong predictors.<sup>[56]</sup> Dormaneh *et al.* also identified subjective norms as the strongest factor in a study entitled "the application of TPB to hemodialysis" dietary behaviors and physical activity'.<sup>[57]</sup> There is research evidence that social norms are the weakest predictor of intention in all behaviors, and normative beliefs have always been the most problematic variable in this model.<sup>[58]</sup> These differences can be somehow due to different research populations, statistical methods, and geographic/cultural factors that govern different populations. Arguably, the majority of present participants may have had relatives (family and friends) who adhered to self-care behaviors. Therefore, to promote healthy behaviors, it is necessary to pay close attention to patients' family and friends.

In this research, age, marital status, employment status, education level, and BMI were found to be significantly associated with self-care behaviors; however, sex was not significantly correlated. A study by Ong *et al.*, similarly, showed no difference between men and women in their hypertension control.<sup>[59]</sup> Bell *et al.* showed that female diabetic patients had better self-care behavior than their male counterparts.<sup>[60]</sup> Higher education and greater knowledge of hypertension complications as well as understanding the severity of the situation can change an

individual's attitude and have the person take better care of him/herself, which can promote a particular behavior. This finding is compatible with the results reported by Shaw *et al.*,<sup>[61]</sup> Barati *et al.*,<sup>[31]</sup> Moghaddam *et al.*,<sup>[62]</sup> and Shojaei *et al.*<sup>[63]</sup> They all concluded that the education level is positively correlated with self-care behaviors. However, Zinat Motlagh *et al.* did not find a significant relationship between education level and self-care behaviors in hypertensive patients.<sup>[17]</sup> These findings are also consistent with the reported findings by Seow *et al.* who found that the single had more uncontrolled hypertension.<sup>[64]</sup> Adopting health-promoting behaviors is seen more often among people who are in close contact with their partners. These behaviors are usually internalized through direct social control such as reminder, encouragement, monitoring, or even threats.<sup>[65,66]</sup> It seems as people get older, they become more sensitive about their disease and begin to take medicine in a regular manner to control it, which is also found in other studies.<sup>[46,67-69]</sup> Similar to the present study that found a significant relationship between employment status and self-care behaviors, some research shows that employment condition can positively affect physical activities.<sup>[70]</sup>

Self-report as the data collection procedure can be considered as a limitation of the study. The researcher tried to minimize this shortcoming by focusing on the confidentiality of data and preventing any form of bias. This study was conducted on hypertensive patients in the County of Khamir; therefore, generalizations should be made only with caution. To increase generalizability, attempts were made to include patients from different geographical areas with diverse sociodemographic information. This study also had some strengths. For instance, to develop an appropriate psychometric instrument, in-depth qualitative interviews were conducted to determine the contributing factors to self-care behaviors. Also, patients with over 6-month diagnosis were included in this study, which provided more realistic results. Future researchers are recommended to consult hypertension experts to shed light on all determinants of self-care behaviors and to identify the self-care predictors among adherents. It is also suggested to identify environmental predictors of self-care behaviors (organizational, social, and political factors).

## Conclusion

According to the present findings, an average level of adherence to self-care behaviors was seen in hypertensive patients. Behavioral beliefs, perceived rewards, control beliefs, and normative beliefs managed to predict self-care behaviors in hypertensive patients. It is crucial to change patients' attitudes toward self-care

behaviors through social acceptance of the behavior, its development in society, and to improve patients' control beliefs via goal-oriented education that fosters resistance against perceived rewards of unfavorable behavior. Therefore, considering these constructs can act as strategies to promote self-care behaviors among patients. In addition to individual factors, more intervention seems to be required to take into account external factors contributing to self-care behaviors.

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### Conflicts of interest

There are no conflicts of interest.

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