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Psychometric Analysis of Hypertension Self-Management Behaviors Questionnaire; an Application of Intervention Mapping Approach in Questionnaire Development

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ABSTRACT

Aims High blood pressure is one of the common main preventable risk factors for many diseases. This study aimed to psychometric properties of the cognitive determinants of hypertension self-management questionnaire among Iranian hypertensive patients based on the Intervention Mapping approach.

Instrument & Methods This psychometric study was conducted in Abadan in 2019. Content Validity Ratio and Content Validity Index of the questionnaire were calculated by ten hypertensive patients and 12 experts. Construct validity was investigated using Classical Item Analysis and Exploratory Factor Analysis by the participation of 315 hypertensive patients. The internal consistency was measured by using Cronbach's Coefficient Alpha of the various cognitive determinants of the questionnaire. Data were analyzed by SPSS 16.

Findings The mean age of patients was 57.53±11.30 years, ranging from 30 to 70 years. Five factors (attitude, outcome expectation, self-efficacy, subjective norms, and barriers) and behavior were confirmed. The Kaiser-Meyer Olkin test was generally satisfactory (calculated: 0.817). The factors explained 61.86% of the variance of the hypothesized model. Estimated reliability using alpha Cronbach coefficient for each cognitive determinants were as follows: attitude (α=0.75), outcome expectations (α=0.79), self-efficacy (α=0.80), subjective norms (α=0.85), barriers (α=0.88), behavior (α=0.82).

Conclusions The application of the intervention mapping approach in questionnaire development offers a useful questionnaire to measurement self-management hypertension behaviors, and psychometric analysis shows that it could be useful for related planning programs.

Keywords Self-Management; Hypertension; Psychometrics; Intervention Mapping Approach

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Introduction

Hypertension is a silent killer due to the lack of observed symptoms and numerous cardiovascular complications [1]. High blood pressure is one of the common main preventable risk factors for many diseases [2]. For example, there is a direct link between hypertension and the risk of heart attack, a higher risk of stroke, cardiovascular disease, heart failure, and kidney failure [3]. Based on to the World Health Organization (WHO) report, 33% of the world's adults (in other words, one in three) have high blood pressure, and this rate will increase with age, and estimates suggest that by 2025, about 1.56 billion people in the world have high blood pressure [4, 5]. With the increasing trend of the average age and the rate of obesity in the communities, hypertension is increasing [6]. Various studies indicate a noteworthy increase in the prevalence of hypertension in the Middle East [7, 8]. Hypertension is estimated to account for more than 15% of all deaths; it accounts for 9 million deaths, 7.6 million premature deaths, and 7% of years of life adjusted to disability [9].

Evidence suggests that it can be controlled by lifestyle modification, diet, and improved self-management behaviors [10]. Self-management is the most important form of care in developing and developed countries, including health promotion, lifestyle modification, symptom assessment, disease treatment, and rehabilitation of chronic diseases [11, 12]. In addition to gaining client independence and economic savings, self-management reduces the effects of illness and disability and reduces the length of hospital stay, and ultimately leads to improving the level of health in society; therefore, it is considered the most effective strategy for the prevention and control of chronic diseases [13]. Although the benefits of self-management behaviors in improving high blood pressure are evident [14]; however, a significant percentage of patients do not comply with the recommended behaviors [3]. That could ultimately reduce the quality of life of patients [15]. Determining the factors affecting the performance of health behaviors in high-risk individuals is essential to developing preventive strategies [16]. The Intervention Mapping (IM) approach is one of the most widely used and most practical planning frameworks for the development of health promotion programs [17] and has been used widely in researches, especially in self-management in chronic diseases [18-21].

On the other hand, it should be noted that the first step to identify most important determinants by behavioral scientists, after need assessment is the development of standard scientific questionnaires, with high reliability so that they can develop the necessary research to behavior explanation and planning to modify and change the behavior [22].

The present study aimed to develop a questionnaire about cognitive determinants of hypertension self-management behaviors among Iranian hypertensive patients based on the intervention mapping approach and an evaluation of the questionnaire's psychometric properties.

Instrument and Methods

Subjects in the current research were hypertensive patients who were between 30 and 70 years old and had permanent residence in the rural areas of Shadegan in Khuzestan province. Sampling was done in clusters with the proportional to size among different rural. Thus, among the rural areas of Shadegan County, three rural were randomly selected. The sample was assigned to each cluster based on the number of households in each rural. Three hundred fifteen hypertensive patients were selected by systematic random sampling. To select the samples from the patients who record hypertension in each rural's health house (Khane Behdasht), one household was randomly selected from the first five houses using the random number table. Then every third household from that initial house was systematically selected to the complete sample. The number of samples required to perform factor analysis to determine validity is 3 to 10 samples per item [22]. Considering that the number of items studied in our initial questionnaire was 35, we considered nine samples for each item and a total of 315 samples. Finally, 302 questionnaires were analyzed (response rate was 95.8%).

The designed questionnaire consisted of the following three sections:

A. The first part of 6 questions related to demographic information, including age (year), gender, marital status, education level, family member size, and economic status.

B. Part 2 includes five items on hypertension self-management behaviors, including; physical activity, smoking, weight control, proper diet, and medication adherence. Each of them was measured with one item. The score of each behavior was between 0 and 4, and the total score of this scale was between 0 and 20.

C. The third section of the questionnaire also measured items related to the cognitive determinants, which were developed using steps 1 and 2 of the Intervention Mapping Approach and included 30 items. For cognitive determinants questionnaire development, we used an items pool based on standard questionnaires about hypertension self-management behaviors by applying similar studies and steps 1 and 2 of the Intervention Mapping Approach [18-21] and seeking expert panel comments. The expert panel included two health services managers, six health educators and promoters, two health policymakers, and two physicians. Items are carefully written to minimize ambiguity and increase comprehension of items read.

The item pool comprised 30 items.

The psychometrics of the questionnaire was performed through face validity, content validity, and construct validity as follows.

Face Validity Evaluation: The face validity of the psychological determinants of hypertension self-management behaviors questionnaire was evaluated qualitatively. Face-to-face individual interviews were held up with twelve experts, and the comments were taken, and items were modified. Also, the questionnaire was given to ten hypertension patients at this stage.

Content Validity Evaluation: The psychological determinants of hypertension self-management behaviors questionnaire content validity was measured using quantitative and qualitative methods. For this purpose, 12 experts in health services management, health education, and promotion, health policy, physicians were interviewed face to face, and the level of difficulty, relevancy, and ambiguity was examined. The Content Validity Index (CVI) and Content Validity Ratio (CVR) were examined based on expert group comments. The expert comments were used to measure the Content Validity Ratio (CVR) and Content Validity Index (CVI). Based on the Lawshe table, the minimum value for acceptable CVI and CVR items were considered 0.79 and 0.62, respectively [23].

Construct Validity Evaluation: Classical Item Analysis (CIA) and Exploratory Factor Analysis (EFA) by Varimax rotation were applied to assess the construct validity. In this section, the Corrected Item-Total Correlation (CITC) of items were examined. Kaiser-Meyer Olkin (KMO) test was used to show the appropriateness of sample size, and Bartlett's Test of Sphericity (BT) test was used to measure the uniformity of data distribution. Scree Plot diagrams were also used to confirm the power of exploratory factors. It is noteworthy that eigenvalues equal to and greater than 1.3 were considered for determining the factors. The factor load index of at least 0.4 was considered [23].

Reliability Evaluation: Cronbach's alpha was used for reliability evaluation, and the value of 0.7 and above was considered acceptable [23]. All data analysis was performed using SPSS 16 software.

Findings

The mean age of patients was 57.53±11.30 years, ranging from 30 to 70 years. Demographic information of the patients was given in Table 1.

In the part of the qualitative face validity of the instrument, the opinion of the expert group was applied in the questionnaire, and no items were removed from the questionnaire. The results of content validity according to the minimum value set for CVR equal to 0.62 and CVI equal to 0.79 showed that all items had an acceptable CVI and CVR.

The results of construct validity in the item analysis section by the CIA method also showed that all items in different determinants have a CITC above 0.4. No item was removed at this stage, and all items (equal to 35 items) were included in the EFA. In EFA, the KMO value was calculated to be 0.817. The Bartlett-Split test ($p<0.001$) was also significantly acceptable, indicating the appropriateness of the data for factor analysis. At this stage, none of the items in different determinants had a factor load of more than 0.4 with other determinant items.

Based on the results of EFA, six factors or determinants based on eigenvalues ≥1.3 and factor loading levels of 0.4 or higher, including 35 items, were extracted. These six factors including, attitude (5 items), perceived self-efficacy (5 items), subjective norms (8 items), perceived barriers (7 items), outcome expectations (5 items), and behavior (5 items), were recorded. Moreover, the variance percentage for each factor, including the attitude, outcome expectations, self-efficacy, subjective norms, perceived barriers, and behavior, were 5.35%, 6.24%, 4.62%, 11.64%, 26.31%, and 7.68%, respectively. In total, these factors explained 61.86% of the changes in the hypothetical model. Table 2 indicates the findings obtained from EFA.

Estimated reliability using alpha Cronbach coefficient for each psychological determinants were as follows: attitude (α=0.75); outcome expectations (α=0.79); barriers (α=0.88); subjective norms (α=0.85); self-efficacy (α=0.80) and behavior (α=0.82).

Figure 1 shows the fraction of total variance in the data as predicted by each factor.

Table 1) Demographic information of the patients

Variable	Number	Percent
Gender		
Women	141	46.7
Men	161	53.3
Marital Status		
Single	38	12.6
Married	264	87.4
Education		
Illiterate	70	23.2
Elementary school	131	43.4
Secondary school	33	10.9
Diploma	46	15.2
Academic	22	7.3
Family Member Size		
1-2 number	46	15.2
3-5 number	229	75.8
More than 5 number	27	9
Economic Status		
Poor	54	17.9
Medium	204	67.5
Good	44	14.6

Table 2) Findings obtained from EFA

No		Perceived barriers (1)	Subjective norms (2)	Behavior (3)	Outcome expectations (4)	Attitude (5)	Perceived self-efficacy (6)
	Attitude (5)						
	I believe that … can help me control my blood pressure.						
1	taking the medication prescribed at the specified time					0.561	
2	not smoking or quit smoking					0.690	
3	Adherence to the instructions of diet					0.646	
4	regular weight control					0.727	
5	regular physical activity					0.687	
	Outcome expectations (4)						
	… it helps for control my blood pressure						
1	If I adherence to recommended physical activity, …				0.702		
2	If I adhere to medication, …				0.599		
3	If I adherence to the instructions of diet, …				0.738		
4	If I don't smoke or quit smoking, …				0.739		
5	If I adherence to regular weight control, …				0.685		
	Perceived barriers (1)						
1	I forget the correct time to take medicine.	0.790					
2	I do not adherence physician instructions for taking medicine.	0.611					
3	It is difficult for me to don't smoke.	0.714					
4	My family does not support me in adherence to the instructions of diet, …	0.788					
5	I'm embarrassed if people see me doing physical activity.	0.773					
6	Regular weight control is annoying to me (I do not like it).	0.845					
7	I do not know what foods are suitable for patients with hypertension	0.766					
	Subjective norms (2)						
1	My physician thinks that I should have regular physical activity.		0.650				
2	My physician thinks that I should follow a proper diet.		0.704				
3	If I don't smoke, my friends will confirm it.		0.742				
4	Most of the people who are important to me think that I should have regular weight control.		0.770				
5	When taking medication for hypertension treatment and control exactly as prescribed, I would be approved by my family.		0.830				
6	When taking medication for hypertension treatment and control exactly as prescribed, I would be approved by my physician.		0.709				
7	My friends will approve of me if I follow a proper diet.		0.493				
8	How many hypertension patients are important for you to have regular physical activity?		0.652				
	Perceived self-efficacy (6)						
1	How confident are you that you can do the recommended physical activity (30 minutes a day for five days a week)?						0.595
2	How confident are you that you cannot smoke?						0.631
3	How confident are you that you can control your weight regularly?						0.744
4	How confident are you that you can take the medication prescribed by your physician to control your blood pressure as recommended and on time?						0.472
5	How confident are you that you can follow a proper diet for patients with high blood pressure?						0.760
	Behavior (3)						
1	Do you follow the recommended physical activity (30 minutes a day for five days a week)?			0.733			
2	How is your smoking status?			0.716			
3	Do you control your weight regularly?			0.871			
4	Do you take medications prescribed by your physician to control your blood pressure as recommended and on time?			0.901			
5	Do you follow a proper diet for patients with high blood pressure?			0.865			
	Variance (%)	26.31	11.64	7.68	6.24	5.35	4.62

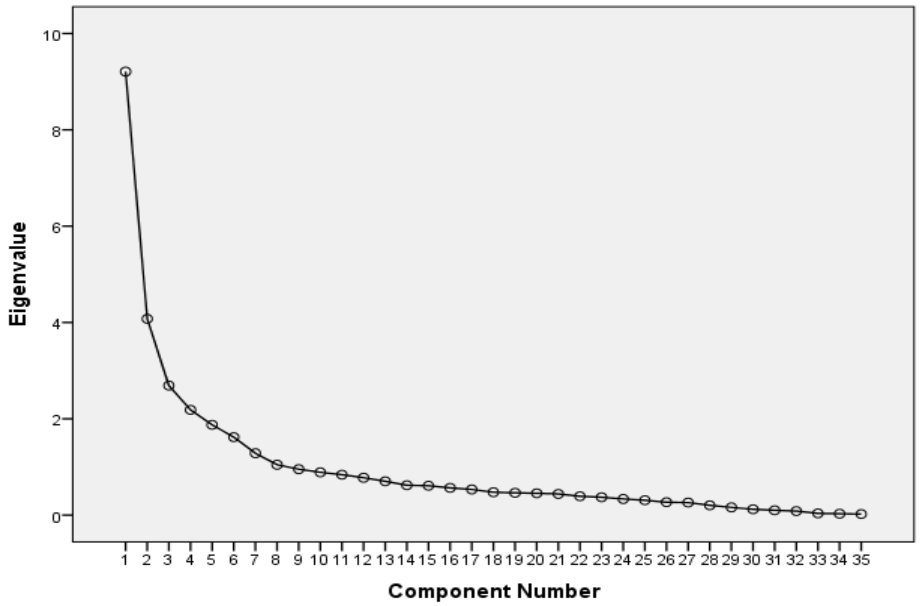

Figure 1) The scree plot of the factors studied

Discussion

Our factor analysis indicated that the cognitive determinants had an acceptable item correlation, indicating that these factors can be an acceptable questionnaire for measuring the cognitive determinants of hypertension self-management behaviors. It is noteworthy that the precise design of expressions that measure particular determinants without error is difficult; because the beliefs and perceptions of individuals often do not occur unaffected by their other beliefs, or in other words, the beliefs of individuals are formed in their cultural context [22]. For example, people's beliefs about the positive consequences of performing hypertension self-management behaviors may affect other beliefs about their control over their behaviors, such as perceived self-efficacy.

The present study's findings showed that the perceived barriers predicted the highest variance of the hypothetical model. The role of perceived barriers in reducing self-management of chronic diseases or adherence to treatment among hypertension patients has been shown in several studies. In this regard, Ma indicated the perceived barrier was the key factor affecting self-care behaviors in hypertensive patients in China [24]. Obirikorang *et al.* also researched 678 hypertensive patients in Ghana and reported perceived barriers as one of the strongest factors influencing non-adherence to treatment among these patients [25]. Identifying barriers to hypertension self-management behaviors can be very helpful in promoting these behaviors. Findings from Lewis *et al.* among African Americans indicated behavioral outcomes associated with treatment adherence. Still, they viewed the side effects and lifestyle changes they had to make to treatment adherence as a barrier [26].

Fongwa *et al*. [27] indicated that financial resources and stressful environments cited as barriers to treatment in women with hypertension.

Finally, our findings showed that the studied factors predicted 61.87% of the variance of the hypothetical model. This finding is largely consistent with other studies. For example, Ma conducted a study among hypertensive patients in China and showed that their questionnaire estimated 62.54% of the hypothetical model [28]. Furthermore, Wicaksana *et al.* in their study indicated that factors such as perceived behavior control, attitude, and subjective norms with 35.5%, 190.3%, and 9.4%, respectively, were good predictors of dietary sodium restriction among hypertensive patients in Indonesia and in total, these factors have been able to predict 64.2% of the hypothetical model [29]. The study carried out by Broström *et al.* regarding the psychometric measurement of healthy lifestyle scale among hypertensive patients in Sweden showed that the studied factors could estimate 54% of the hypothetical model, and in general, the questionnaire had good validity and reliability [30].

Our study had several strengths, such as using the IM approach to assess needs and developing a standard questionnaire to measure the cognitive determinants of hypertension self-management behaviors in Iranian society but also have limitations such as data collection just among the sample of hypertensive patients in Shadegan rural in southwestern of Iran. This could make it difficult to generalize the results to the community. In addition, the study participants were mostly poorly educated and lived in rural areas and generally did not represent hypertensive patients in Iran. Their experiences may not reflect the experiences of other Iranian hypertensive patients.

Conclusion

Applying the intervention mapping approach in questionnaire development offers a useful questionnaire to measure self-management hypertension behaviors. Psychometric analysis shows that it could be useful for related planning programs.

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Ethical Permissions: The present study was approved by the ethics committee of Abadan university of medical sciences (ethics code: IR.ABADANUMS.REC.1395.038).

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