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Psychometric Features of the Persian Version of Self-Efficacy Tool for Patients with Hypertension

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ABSTRACT

Background: Hypertension is one of the causes of mortality that can be prevented. Self-efficacy with regard to patients' performance predicts their abilities to change high-risk behaviors. Positive self-efficacy in patients with hypertension predicts compliance, adherence to medications, diet and exercise regimens, and behavioral self-management.
Objectives: This study aimed to examine the psychometric features of self-efficacy questionnaire in patients with hypertension.
Patients and Methods: In this cross-sectional study, 260 patients with hypertension were selected by multistage cluster sampling in Tehran's public places to complete the Persian version of hypertension self-efficacy questionnaire. Then, face validity, content, and structure of the questionnaire were evaluated. To determine the reliability of the questionnaire, test-retest method with a two-week interval and Cronbach's alpha coefficient were used. All data analyses were performed using the SPSS statistical software, version 18.0.
Results: According to the results of Content Validity Ratio (CVR), three items were eliminated. The results of exploratory and confirmatory analyses identified three factors, including diet regimen, disease management, and adherence to treatment. The goodness of fit of the three-factor self-efficacy model in patients with hypertension was confirmed based on standard indices (RMSEA = 0.082, NNFI = 0.90, CFI = 0.91, IFI = 0.91, and X2/df = 328.35). Besides, internal consistency of diet regimen, disease management, and adherence to treatment based on Cronbach's alpha was 0.849, 0.471, and 0.572, respectively.
Conclusions: The three-factor structure of the self-efficacy questionnaire showed appropriate validity and reliability in patients with hypertension. Thus, this tool can help caregivers and health service providers assess self-efficacy of hypertensive patients and plan and implement educational and clinical interventions.

1. Background

Hypertension is one of the most dangerous diseases, which can cause vision, kidney, brain, and heart problems. In the absence of proper treatment and control, about half of the patients with hypertension will die due to coronary artery disease, one third will die due to myocardial infarction, and 10 - 15% will die due to kidney disease (1). According to the World Health Organization (WHO), hypertension is the third cause of mortality, and one out of every eight deaths occurs due to hypertension (2). About 10 - 20% of people under the age of 50 years and 40 - 50% of those over 50 years old suffer from hypertension (3).

Treating patients with hypertension is challenging because it is not related to the symptoms of the disease. On the other hand, hypertensive patients may not consider

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themselves ill and deny their diagnosis (4). Ideal treatments for heart problems can be achieved by changing lifestyles, including quitting smoking, choosing healthy foods, and using medications according to physician's order (5). Yet, more than half of the patients do not adhere to their treatment regimen and one third of them take less than the recommended dose of their medications (6). Lack of adherence to treatment is one of the major barriers to disease control. In 2007, Risser et al. reported that 18% of patients had not bought their medications during one year before the study, 26% had delayed buying their medications, and 14% had used less than the recommended dose of their medications (7).

Reducing deaths from stroke and heart failure depends on the timely diagnosis and control of hypertension (8). Patients can better control their illness if they believe they have the ability to improve their health through their efforts (9). Self-efficacy is one of the factors that can predict an individual's ability to change high-risk health behaviors with regard to personal performance (10). Self-efficacy refers to self-confidence and self-esteem of individuals in their self-care activities through which the desired outcomes and behavior change are achieved and symptoms of chronic diseases are reduced (8, 11). People with strong self-efficacy beliefs choose more challenging tasks, set themselves larger goals, and are more consistent in different situations (12). Positive self-efficacy in chronic patients is a predictor of compliance with the disease and is associated with adherence to medication, diet and exercise regimens, and behavioral self-management (13). Johnson argues that self-efficacy helps patients have confidence in their ability to adhere to a treatment regimen when facing challenges, such as side effects of drugs, interactions with daily activities, environmental barriers, and depression (14). Patients who have more self-efficacy are more likely to follow treatment recommendations and potentially require less frequent medical visits and medications (15).

The results of a study in Iran indicated that patients with hypertension had moderate levels of self-efficacy and a high self-efficacy perception in behaviors like adherence to medication regimen and low self-efficacy perception in non-medicinal behaviors such as weight loss and diet (8). Currently, there is no specific tool for measuring the self-efficacy of hypertensive patients in Iran and the world. Existing tools, such as Medication Adherence Self-Efficacy Scale (16), Self-Efficacy for Appropriate Medication Use Scale (7), Long-term Medication Behavior Self-Efficacy Scale (17), Self-Efficacy for Eating Behavior Scale, Self-Efficacy for Exercise Behavior Scale (18), and Chronic Disease Self-Efficacy Scale (19), are more focused on specific behaviors in the general population. Self-efficacy of hypertensive patients can be measured by Hypertension Self-Care Profile (HTN-SCP) questionnaire, which was designed by Han and colleagues in 2014. This 20-item questionnaire focuses on self-care behaviors of hypertensive patients, such as low fat and salt diets, alcohol use restrictions, smoking cessation, self-monitoring of blood pressure, weight control, frequent physician visits, and stress reduction. HTN-SCP questionnaire asks the respondents to determine (in a Likert scale) how confident they are in complying with recommendations. The correlation of items with each other in this questionnaire is between 0.20 and 0.63. The correlation of the questionnaire with Hill-Bone and Morisky treatment adherence questionnaire is also -0.493 and -0.393, respectively ($P < 0.001$), which confirms the concurrent validity of the questionnaire (20). Han and his colleagues' self-efficacy questionnaire is a short but simple and clear tool that can specifically measure the self-efficacy of patients with hypertension.

2. Objectives

This study aims to translate and review the psychometric features of the self-efficacy tool in patients with hypertension.

3. Patients and Methods

3.1. Participants and Study Setting

This methodological research with a cross-sectional design was conducted on patients with hypertension in Tehran and Saghez, Kurdistan in 2017. The minimum sample size required for factor analysis was 3 to 10 subjects per item (21). Accordingly, a total of 260 patients with hypertension were selected through multistage cluster sampling from public places in 22 regions of Tehran. In so doing, 3 regions were selected among all regions (clusters) in Tehran. Then, the list of public places was prepared in each region and convenience sampling was carried out in those regions. Saghez was also divided based on regions and three regions (three clusters) were randomly selected. Convenience sampling was conducted in these regions, as well. Suffering from hypertension and having the ability to provide information or complete the information contained in the questionnaire were a part of the criteria for entering the study.

3.2. Instrument

The study data were collected using a demographic information form and HTN-SCP questionnaire that was designed based on a four-option Likert scale (I am absolutely sure (4), I am sure (3), I am somewhat sure (2), and I am not sure (1)). This one-dimensional questionnaire (single domain) consisted of 20 items. The questionnaire was translated from English to Persian by two translators who were familiar with Persian and English languages using forward/backward method. Then, the translations were compared and the questions were matched in terms of meaning and concept. Afterwards, in order to ensure full satisfaction by the translation of the Persian version, the translated version was back translated to the original language by two different translators. The final version was subsequently verified by the original designer. To evaluate the psychometric features of this tool, face validity, Content Validity Index (CVI), and construct validity (factor analysis and differential validity) were used as follows.

3.3. Face Validity

To ensure the qualitative face validity of the questionnaire, it was given to 10 patients with hypertension. Then, the patients' opinions about proportion, problems, revelance, and ambiguity of the questions were collected and necessary

corrections were made.

3.4. Content Validity

At this stage, the Persian version of the questionnaire was given to 10 experts (7 nurses and 3 psychologists) who had written some articles on self-efficacy to provide feedbacks on Persian language grammar, correct use of phrases, and sentencing. At this point, item No. 17; i.e., "buy your medications", was changed into "buy the medications prescribed by your doctor".

Considering the fact that the questionnaire had a cultural aspect, according to Polit and Beck (2017), CVI was used (22). Question No. 13 in the main version of the questionnaire was related to "alcohol consumption", which was changed into "consumption of non-alcoholic beverages with high sugar content" due to the religious and cultural structure of the Iranian society after coordination with the designer of the questionnaire. Also, in question No. 3 "How confident are you to read the nutrition label on foods regarding their sodium content?", "sodium content" was changed into "salt content". In addition, question 11 ("How confident are you to get your daily intake of calorie from fat to less than 65 grams?") was changed into "How confident are you to get the most of your daily calories from diets other than fat?" which was more tangible. All changes were reported to and confirmed by the designer of the questionnaire.

Experts were asked to determine the cultural relevance of the items (it is very culturally related, it is culturally related, it is somewhat culturally related, and it is not culturally relevant). Then, the ratio of experts who had chosen the first two items to the total number specialists (CVI) was determined. If the score of each item was more than 0.79, that item remained in the questionnaire. If the score was between 0.70 and 0.79, the item was reviewed. Finally, if the score was less than 0.70, the item was considered unacceptable and had to be removed (23).

3.5. Construct Validity

At this stage, first latent factors were extracted using exploratory factor analysis. Then, Kaiser Meyer Olkin (KMO) index and the Bartlett's test of sphericity were calculated. KMO indices of 0.70 - 0.80 and 0.81 - 0.90 were considered good and large, respectively (24). Sampling adequacy index was 0.819 and Bartlett's sphericity test was significant (P = 0.0001). Therefore, it can be concluded that application of factor analysis was justifiable based on the sampling adequacy and the correlation matrix in the sample group. The main factors were extracted using KMO index, varimax rotation, and scree plot in PASW software. The cut-off point intended to determine the variables loaded by each factor was at least 0.30 (loading factor was 0.30 and any higher value was considered acceptable). The construct validity of the questionnaire was evaluated using confirmatory factor analysis in order to determine whether the questions that intended to introduce the dimensions of the questionnaire were really reflecting those dimensions and how accurately they were introducing them. Then, among 200 patients with hypertension, the extracted factors were examined by means of confirmatory factor analysis and common fit indices of the model, such as Goodness of Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Normative Fit Index (NFI), and Adjusted Goodness of Fit Index (AGFI), using Lisrel software (version 8.8) (23). The accepted threshold of fit indices has been presented in Table 1.

Table 1. The Accepted Threshold of Indexes and Fitting of the Confirmatory Factor Analysis Model

Fitting Indexes	Acceptable Range
X2 P value	> 0.05
RMSEA	Good < 0.08, medium < 0.08 to 0.1, and weak < 0.1
CFI	> 0.9
NFI	> 0.9
AGFI	> 0.8
CMIN/DF	Good > 3 and acceptable > 5
PNFI	> 0.5
PCFI	> 0.5

Abbreviations: RMSEA, root mean square error of approximation; CFI, comparative fit index; NFI, normed fit index; AGFI, adjusted goodness of fit index; CMIN/DF, minimum discrepancy function by degrees of freedom divided; PNFI, parsimonious normed fit index; PCFI, parsimonious comparative fit index

3.6. Reliability

To verify the reliability of the questionnaire, two internal consistency methods, including Cronbach's Alpha and McDonald's omega coefficients, were used. Cronbach's alpha coefficient of 0.70 was considered to be appropriate. The stability of the questionnaire was also tested over time by test-retest method and Intraclass Correlation Coefficient (ICC) with two-way mixed effects model and absolute agreement with a confidence interval of 95%. In this context, any value above 0.75 was considered acceptable. Moreover, McDonald's omega coefficient was calculated based on the following formula where "a" was the number of factor's questions, " "was the sum of the communality, and "b" was the total loading factor of the items of that factor. The omega coefficient, like alpha coefficient, was between zero and one (25). The floor-ceiling effect was studied, as well.

3.7. Data Analysis

Normal distribution of the data was evaluated using Kolmogorov-Smirnov test. In order to analyze the collected data, descriptive statistics, exploratory factor analysis, ICC, Cronbach's alpha, and McDonald's omega coefficient were employed. All data analyses were carried out using the SPSS statistical software, version 18.0 (also known as PASW Statistics 18).

3.8. Ethical Considerations

The present study was approved by the Ethics Committee of Kurdistan University of Medical Sciences (code of ethics: Muk. Rec 1395/397). Before beginning of the study, the main objectives were explained to the patients participating in the study and their consent was obtained. Indeed, the participants were assured that their information would remain confidential.

4. Results

4.1. Sample Characteristics

The study patients' mean age was 57.05 ± 16.07 years. In

addition, most of the patients were female (55%), married (66.9%), homemaker and retired (60%), and had high school diploma or above degrees (32.7%). Moreover, 34.6% of the patients reported their financial status as poor. More details can be found in Table 2.

4.2. Validity

In qualitative content validity, grammar of phrases was verified. In CVI review, three items; i.e., "How confident are you to read the nutrition label on foods regarding their salt content?", "How confident are you to get your daily calories from foods other than fats?", and "How confident are you to buy the medications prescribed by your doctor?" did not obtain the required scores. Thus, they had to be removed.

4.3. Factor Analysis

Exploratory factor analysis was carried out twice; once without deleting the above-mentioned three items and once after their removal. After removing these items, a better model was extracted. Therefore, the study results were reported with 17 items.

The KMO index indicated that the number of samples was sufficient for analysis (0.819). Additionally, the results of Bartlett's test showed that the correlation matrix between the items of the questionnaire was not difficult to analyze (X2 = 1281.2370 and P = 0.0001). In exploratory factor analysis, three factors (diet regimen, disease management, and adherence to treatment) were extracted, which had Eigenvalues of 5.015, 1.632, and 1.415, respectively, explaining 47.42% of the total self-efficacy variance in the patients with hypertension. The factors were labeled based on item and content. The dietary factor included 9 items with loading factor of 0.47 to 0.74. Additionally, disease management included 8 items with loading factor of 0.36 to 0.68. Finally, adherence to treatment had 8 items with loading factor of 0.56 to 0.63 (Table 3).

To perform confirmatory factor analysis, 200 patients with hypertension were selected in Tehran. In confirmatory factor analysis, first the results of chi-square goodness of fit test were obtained (P = 0.01, X2 = 328.35). To evaluate the model's fitness, other indices were examined. According to Table 1, all indices, including NNFI = 0.90, CFI = 0.91, IFI = 0.91, and RMSEA = 0.082, confirmed the appropriateness of fit for the final model (figure 1).

4.4. Reliability

The internal consistency of diet regimen, disease management, and adherence to treatment dimensions based on Cronbach's alpha was 0.849, 0.471, and 0.572, respectively. The overall Cronbach's alpha coefficient of the questionnaire was also 0.822. The reliability of these dimensions based on McDonald's omega coefficient was 0.831, 0.717, and 0.716, respectively. Besides, ICC for the whole questionnaire was 0.932. Moreover, analysis of the floor-ceiling effect revealed that the floor effect was zero in all domains and the whole questionnaire. Yet, the ceiling effect was 2% in diet dimension, 1% in disease management domain and the whole questionnaire, and 13% in adherence to treatment domain.

5. Discussion

The results of this study showed that self-efficacy questionnaire for patients with hypertension was a three-factor scale (diet regimen, adherence to treatment, and

Table 2. Self-Efficacy Scores based on Demographic Variables

Variable		Number	Mean	Standard Deviation
Gender	Male	117	45.54	8.83
	Female	143	46.72	8.19
Marital status	Married	174	46.40	8.80
	Deceased spouse	60	45.36	9.10
	Single	26	46.73	9.09
Income	Below 10 million Rials	99	46.14	7.96
	10 - 20 million Rials	86	46.87	8.49
	20 - 30 million Rials	51	47.45	10.03
	Above 30 million Rials	24	41.33	10.12
Financial satisfaction	High	13	45.30	8.35
	Moderate	88	46.42	8.78
	Low	90	45.80	7.78
	Never	69	46.59	10.46
Education	Illiterate	37	42.97	8.12
	Elementary to high school	74	46.54	7.99
	Diploma	64	46.39	8.88
	University	85	47.15	9.72
Job	Unemployed and homemaker	156	46.38	8.02
	Employee	32	44.75	8.94
	Self-employed	47	48.10	9.45
	Other	25	43.28	11.89
Duration of disease	< 2 years	69	46.72	8.04
	2 - 5 years	92	46.01	9.65
	5 - 10 years	56	45.23	9.68
	> 10 years	43	47.00	7.36

Table 3. Exploratory Factors Extracted from the Self-Efficacy Questionnaire in Patients with Hypertension

Factor	Item	Loading Factor	Communalities	Variance Percentage	Eigen Value	Reliability	
						Cronbach's alpha	Omega coefficient
Diet regimen	7. How confident are you to take less foods that are high in fat (such as red meat, vegetable butter, solid vegetable oil, and sweets)?	0.739	0.630	29.5	5.015	0.849	0.831
	8. How confident are you to use grilling, boiling, and steaming instead of frying?	0.716	0.545				
	13. How confident are you not to consume non-alcoholic drinks with high sugar content?	0.710	0.504				
	5. How confident are you to limit the use of salt?	0.707	0.581				
	6. How confident are you to take less than a teaspoon of salt a day?	0.689	0.559				
	11. How confident are you to limit the consumption of fats?	0.684	0.546				
	4. How confident are you to replace high-salt foods (such as canned and fast foods) with low salt products (home-cooked soups and vegetables)?	0.552	0.348				
	9. How confident are you to read the nutrition labels on high fat foods (such as red meat, vegetable butter, vegetable oil, and sweets)?	0.497	0.391				
	12. How confident are you to eat 5 or more fruits and vegetables a day?	0.471	0.433				
Disease management	1- How confident are you to regularly attend physical activities (for example, 4 to 5 times walking a week 30 minutes each time)?	0.688	0.503	9.60	1.632	0.471	0.717
	19. How confident are you to try to avoid anything that causes you to stress?	0.644	0.418				
	18. How confident are you to keep your weight down?	0.548	0.461				
	2. How confident are you not to eat processed foods (such as salami and canned food)?	0.361	0.223				
Adherence to treatment	15. How confident are you to control your blood pressure at home?	0.368	0.497	8.32	1.415	0.572	0.716
	14. How confident are you not to smoke?	0.614	0.450				
	20. How confident are you to regularly go to the doctor?	0.580	0.471				
	16. How confident are you to take your blood pressure medication?	0.562	0.503				

disease management). According to the reported indices, fitting of the model was considered appropriate. In addition, most loading factors were above 0.50, indicating that they had at least an acceptable level of loading factor. In the original version, a factor was extracted by exploratory factor analysis, which revealed 36.8% of the variance of self-efficacy in patients with hypertension (20).

Ogedegbe et al. (2013) studied the development and evaluation of self-efficacy tool regarding adherence to treatment in African Americans with hypertension. In the first phase, an interview was conducted with qualified patients and an item pool was formed. In the second phase, its validity and reliability were determined, which ultimately led to two classes of facilities and barriers to adherence to treatment. The exploratory factor analysis identified five factors that explained 93% of the total variance (16). The first extracted factor was "diet regimen" that explained most of the variance of self-efficacy in patients with hypertension and accounted for about half of the items. The psychometric results of the 39-item self-management tool in patients with hypertension led to extraction of 6 factors, namely eating, exercising, stress, alcohol, cigarette, and medicine. Factor "eating" was the first factor of the questionnaire that contained 8 items with loading factors of 0.51 to 0.80 and was similar to the first loading factor in the present study (26). The results of various studies have shown that blood pressure management is related to eating (diet regimen) (27, 28). The second identified factor was "disease management" that focused on physical activity, avoidance of stress, and weight control, which was consistent with factors stress and exercise extracted from psychometric tools of self-management of patients with hypertension (26). The second item of this factor was "How confident are you not to eat processed foods (like canned food and salami)?" which was rationally related to the first factor. Based on the principle of pragmatism (and not fundamentalism), this item was transferred to a factor that had scientific justification and the basis of the loading factor was ignored in this case. The third identified factor was "adherence to treatment", which consisted of items 14, 15, 16, and 20 and was focused on controlling blood pressure, taking anti-hypertensive medications, smoking cessation, and visiting a doctor. In the original version of the questionnaire, items 14, 15, and 16 had a low loading factor.

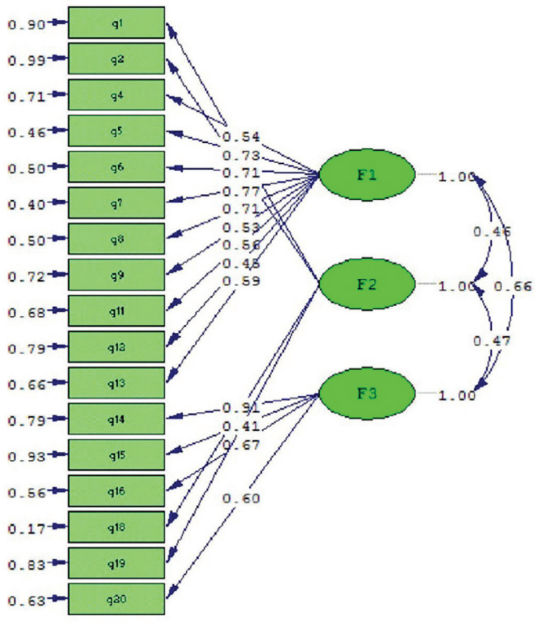

Figure 1. Final Structure of the Self-Efficacy Questionnaire for Patients with Hypertension

In summary, this questionnaire had a significant negative correlation with Morisky's questionnaire, which indicated that it could explain adherence to treatment in the patients (20). Self-efficacy is an important concept that describes adherence to treatment behaviors in this group of patients and can be the basis for interventions that are based on behavioral changes (16).

The overall reliability of the questionnaire based on Cronbach's alpha coefficient was 0.822. The reliability of self-efficacy in patients with hypertension was 0.91 in the original version (20). Kho et al. also reported the internal consistency of the questionnaire to be 0.931 in patients with hypertension (29). Giving that reliability estimate based on Cronbach's alpha coefficient is affected by the number of items, the reliability of the questionnaire was also calculated based on McDonald's omega coefficient. The results indicated that the items were reliable. Furthermore, ICC was above 0.932 for the whole questionnaire.

This study had some limitations, including the low number of items in each dimension and, consequently, low Cronbach's alpha coefficient. Indeed, location restrictions could affect the generalizability of the results. Hence, further studies in different settings and on larger sample sizes are required to ensure the results of psychometric tests. On the other hand, using McDonald's omega reliability coefficient was one of the strengths of this study.

5.1. Conclusion

The results of exploratory and confirmatory factor analysis of the Persian version of self-efficacy questionnaire for hypertensive patients (with 17 items) identified three factors; i.e., diet regimen, disease management, and adherence to treatment. The three-factor structure of this questionnaire had an appropriate validity and reliability. Therefore, this tool can be used to assess the level of patients' self-efficacy and to plan and implement educational and clinical interventions.

Generally, one of the challenges physicians face in treating patients with hypertension is lack of adherence to medications and treatment recommendations, which can be caused by patients' inability to change their behaviors. This instrument can help physicians identify patients' ability to perform self-care, change undesirable behaviors, and predict their adherence to treatment status. This tool can also help caregivers and health service providers assess the self-efficacy of patients with hypertension in order to plan and implement educational and clinical interventions.

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Authors' Contribution

Study concept and design: Reza Ghanei Gheshlagh and Abbas Ebadi; Data acquisition: Fereshteh Najafi, Mahdie Ghalenoee, and Vajiheh Baghi; Data analysis and interpretation: Abbas Ebadi and Sahar Dalvand; Manuscript drafting: Naser Parizad; Study supervision: Abbas Ebadi; Critical revision of article: Salvador Cruz-Flores

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There is no conflict of interests.

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