Translation and validation of the Persian version of the treatment adherence questionnaire for patients with hypertension

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Original Article

Abstract

BACKGROUND: Hypertension is a global public health crisis. Poorly controlled high blood pressure is one of the major factors contributed to this crisis. As lack of treatment adherence is often considered the main reason for this failure, the Treatment Adherence Questionnaire for Patient with Hypertension (TAQPH) was developed. Since this questionnaire should be reliable and strongly valid to be used in clinics and research, this study was performed to test the reliability and validity of the TAQPH.

METHODS: A cross-sectional study was conducted to validate the Persian version of TAQPH after using a modified forward/backward translation procedure. A total of 330 hypertensive patients were participated in this study. Construct and criterion validity, Cronbach's alpha, and test-retest reliability were used to validate the Persian scale.

RESULTS: Data analysis showed that the scale had excellent stability (intraclass correlation = 0.95) and good acceptability of internal consistency (α = 0.80). The exploratory factor analysis (EFA) was meaningful but was not confirmed with confirmatory factor analysis (CFA). The scale score was correlated with Morisky Medication Adherence Scale (MMAS) score (P = 0.27).

CONCLUSION: In total, most of the psychometric properties of the 25-item P-TAQHP achieved the standard level and were sufficient to recommend for general use.

Keywords: Hypertension, Treatment Adherence, Validation, Questionnaires

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Introduction

Hypertension is the most prevalent health concern among adult patients affecting approximately one billion persons worldwide.[1] It is one of the major risk factors for cardiovascular, cerebrovascular, renal diseases, or other end-organ damage leading to premature death.[2,3] In developing countries, the mean awareness, treatment, and control of hypertension among men were 40.6, 29.2, and 9.8 percent, and among women were 52.7, 40.5, and 16.2 percent, respectively.[4] The prevalence of hypertension in Iran is estimated by 23% in 30-55 aged population and by 50% in the population older than 55-year-old.[5]

According to the World Health Organization, a low adherence level of hypertensive patients is one of the major reasons for uncontrolled blood pressure.[6] Javadi showed that only 5% of Iranian hypertensive patients comply with their prescribed regimen and have control blood pressure.[7] Non-adherence to treatment regimen may lead to the worsening of disease, increasing morbidity and mortality, frequent hospitalization, and significant healthcare costs.[8,9]

To understand and facilitate adherence for hypertensive patients, the first step is to measure patient adherence to recommended treatment regimen. Therefore, a valid and reliable tool is required. Different adherence scales have been designed in various settings to assess patient-reported compliance levels.[10-12] The Morisky Medication Adherence Scale (MMAS), the Self-efficacy for Appropriate Medication Use Scale, the Brief Medication Questionnaire, the Medication Adherence Rating Scale, and The Hill-Bone compliance with High Blood Pressure Therapy Scale were developed by Morisky et al.,[13,14] Risser et al.,[15] Svarstad et al.,[16] Thompson et al.,[17] and Kim et

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al.,[18] respectively. Some of these scales are hypertensive specific[18] while the others are general[13,15,16] or specific for other diseases.[17] However, most of these scales are mainly focused on medication adherence. The Seventh Report of the Joint National Committee (JNC-7) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommended both use of antihypertensive medication and health-promoting lifestyle to cure and manage high blood pressure.[19] Beside medication therapy, a healthy diet, weight control, and regular exercise all have been shown to have potential benefits to improve blood pressure control and even reduce medication needs.[20] Regarding these recommendations, Ma et al.[1] developed the Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH) in a Chinese population. They evaluated psychometric properties of the TAQPH and showed that it was a reliable and valid scale. According to this scale different aspects of hypertensive treatment adherence were addressed including medication compliance, diet, weight control, exercise, stimulation, and stress relive.[1] This scale is a more comprehensive than other scales which only addressed medication compliance, appointment keeping, and low salt diet.[18] However, literature review showed no previous study assessed TAQPH validity in other countries.

In Iran, treatment adherence was mostly measured using researcher-designed questionnaires, however, the validating process of developing these questionnaires was not sufficient.[21,22] Dehghan et al.[23] have evaluated the psychometric properties of Hill-Bone Scale and found that this scale was not validated in Iranian population. Therefore, a valid, reliable, and concise scale are required to measure treatment adherence in Iranian hypertensive patients. A valid and reliable scale would be helpful in both selecting patients that are likely to be poor adherents and finding out why patients do not comply with their prescribed treatment. The aim of this research was to validate the Persian version of "TAQPH" (P-TAQPH).

Materials and Methods

This was a methodological study conducted in educational hospitals in Kerman (the largest city in southeastern Iran with a population of 722000) where hypertensive patients are being actively treated.

TAQPH

To evaluate treatment adherence, Ma et al.[1] developed the TAQPH in 2011. TAQPH is a 4-point Likert-type scale that consisted of 28 items grouped into six factors labeled as follows: medication (9 items), diet (9 items), exercise (2 items), stimulation (3 items), weight control (2 items), and relieving stress (3 items). The range of potential scores varied between 28 and 112. The higher scores indicated a higher level of adherence. The authors evaluated the psychometric properties of the Chinese version of TAQPH (the original version). According to their report, content validity index was 0.93. Construct validity had been confirmed by the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Cronbach's alpha of the overall questionnaire was 0.86 and the test-retest reliability was 0.82.[1]

The Persian MMAS-8 (P-MMAS-8)

P-MMAS-8 is a generic assessment of medication-taking behavior. This self-reported measure of medication taking was developed from a previously validated four-item scale[14] and supplemented with additional items addressing the circumstances surrounding adherence behavior. The MMAS comprises seven questions with a yes/no response format and one question with 5-point Likert response. The authors reported acceptable reliability and validity of the original version.[13] Dehghan et al.[24] and Moharamzad et al.,[25] have validated the P-MMAS-8. They indicated that the Persian version was valid and reliable to use in Iranian context (good face validity, significant known-groups validity, and significant test-retest reliability).

Translation

As the Persian translation did not exist for TAQPH, we generated Persian language version of this scale using a modified forward/backward translation procedure.[26,27] In this procedure, the original English-language version of the scale was first translated into Persian (the Iranian language) by two experienced Iranian health experts, independently. If there was any difference between two translations, the problem was resolved through discussion with the translators to yield a provisional forward translation. To check the adequacy of the first translation, the initial Persian version was translated back into English by two independent translators who had no previous knowledge of the scale. The original and back-translated versions were discussed in a bilingual expert panel to check semantic, idiomatic, experiential and conceptual equivalence and to resolve the discrepancies.

In the next step, 25 hypertensive patients were selected to test the face validity of the pre-final version of the Persian scale. Each subject should completed the scale and was interviewed about the meaning of each item. Regarding the results of this pilot study, the final version of the Persian scale was confirmed after revising the difficult to understand and confusing questions. The face validity was acceptable.

The study population consisted of hypertensive patients, older than 18 years who were taking at least one antihypertensive medication. Patients were asked about socio-demographic data such as gender, age, marital status, education, and occupational status. The patients also were asked for the dates of the hypertension diagnosis and the initiation of drug treatment. Blood pressure was measured with an aneroid sphygmomanometer (ALPK2, Japan) using the average of two measurements by 5-minute interval. To validate the aneroid sphygmomanometer, the readings from this instrument were compared by those of a mercury sphygmomanometer in the same patients. The readings were not significantly different. Systolic blood pressures (SBP) and diastolic blood pressures (DBP) were obtained from the right arm of the subjects in a seated position. The subjects were required to avoid caffeine (coffee, colas) intake and not to smoke 30 minutes before blood pressure measurement. If the blood pressure was ≥ 140/90 mmHg (in patients with diabetes ≥ 130/80 mmHg), indicated insufficiently controlled, and if it was < 140/90 mmHg (in patients with diabetes < 130/80 mmHg), considered as sufficiently controlled hypertension.[12,13]

All patients were approached during their hospitalization and asked to participate in the study. In addition, a convenience sampling technique was utilized to select 330 hypertensive patients who had been referred to the above-mentioned centers from November 2013 to March 2014. Furthermore, we used interviews instead of the self-administered method for illiterate individuals.

Tehran University of Medical Sciences (TUMS), Iran, approved this project. After approval of TUMS and coordination with Kerman University of Medical Sciences and the clinical centers, we provided information for the subjects. The information addressed: (1) The goal and objectives of the study, (2) the confidentiality of the data, and (3) the participants would be anonymous and were free to withdraw from this study at any time. Then, the informed consent was obtained verbally. Finally, we appreciated participants.

All analyses were performed using SPSS software (version 19.0, SPSS Inc., Chicago, IL, USA) and LISREL (version 8.70, Scientific Software International, Chicago, IL, USA). Descriptive statistics [frequency and percentage, mean, and standard deviation (SD)] and analytical statistics (Mann-Whitney U, Spearman rho correlation, and factor analysis) were used to analyze the data. The 0.05% significance level was used in this study. Psychometric properties of the P-TAQPH were evaluated in terms of validity and reliability.

Construct validity

To verify construct validity, the factorial design of the TAQPH was analyzed using both EFA and CFA. EFA was performed to investigate the factor structure of the scales by principal component analysis (PCA) with varimax rotation.[28] At first, we tested the factorability of the intercorrelation matrix of the 28 items according to the Kaiser–Meyer–Olkin (KMO) coefficient (should be > 0.50).[29] In the second step, we conducted a PCA to derive an initial solution. Third, we determined the number of factors to be extracted according to three different criteria: (1) Eigen values > 1, (2) Cattell's scree plot, and (3) items with loadings of 0.4 or greater on each factor.[30] In the final step, we compared the unrotated versus the rotated factor solutions. The rotating factors have been applied to obtain a simple factor structure that is more easily interpreted and compared. We chose the varimax rotation as the most popular method of orthogonal rotation. Each factor will tend to have either large or small loadings of any particular variable. Construct validity was further assessed by CFA. CFA was used to test the goodness-of-fit of the structural equation model in which the observed variables (items) correlated with their underlying latent constructs (subscales). Model adequacy was evaluated by the chi-square test. The main model fit indices were the goodness-of-fit index (GFI), adjusted GFI (AGFI), comparative fit index (CFI), root mean squared error of approximation (RMSEA), non-normed fit index (NNFI), and standard root mean square residual (SRMR). The acceptable model fit is indicated by χ^2/degree of freedom (df) < 3.0, RMSEA < 0.08, and SRMR < 0.8. The values of GFI, AGFI, CFI and NNFI indices are 0.9 or greater.[28,31,32]

Criterion validity: Concurrent validity

To assess the concurrent validity, we calculated association between scale score and the sufficiently controlled versus uncontrolled blood pressure using

Mann-Whitney U-test. Furthermore, we calculated the correlation of the scale with the SBP, DBP and P-MMAS-8 score using Spearman rho coefficient.

Reliability: Internal consistency and repeatability

Internal consistency refers to the extent to which items of the scale measure the same construct (i.e., homogeneity of the scale) and was assessed in our study by Cronbach's alpha (should be > 0.70) for 330 hypertensive patients. We used the test-retest method to evaluate the repeatability of the TAQPH. To do so, 25 hypertensive patients completed this scales twice (at 2-week intervals). To interpret the obtained coefficients values above 0.7 were considered as excellent reliability.[33]

Results

Socio-demographic characteristics

In total, 330 hypertensive patients were assessed. The mean age of participants was 55.7 ± 8.9 years. 64.7% (n = 213) of them were men. 75.8% (n = 248) were married who their partners were alive, 18.3% (n = 60) were widows/ers and the rest were single. 42.0% (n = 136) were illiterate. 52.6% (n = 172) of patients were employed. 27.9% of participants were diabetic. Duration of having hypertension was 42.5 ± 28.4 months and initiation of hypertension drug therapy was 41.0 ± 28.4 months. 52.6% (n = 172) of patients have been prescribed more than one antihypertensive drug. The mean scores of SBP and DBP were 139.8 ± 13.6 mmHg and 98.0 ± 13.5 mmHg, respectively. 85.6% (n = 280) of participants had insufficiently controlled blood pressure. The hypertensive medication adherence was 69.4 ± 9.6 according to the P-TAQPH. The distribution of the responses to each item in the P-TAQPH is presented in table 1. More than half of the respondents reported perfect adherence only for three of the 28 items (items 9, 19 and 20).

Construct validity

For the validity of the construct, the P-TAQPH was examined by undertaking PCA with a varimax rotation. At first, Bartlett's test of sphericity was used to determine if the sample size were appropriate for a factor analysis and to determine whether the data came from a sample of the normal distributed population. This test showed statistical significance (χ^2 = 4944.6, df = 378, P < 0.001). In addition to Bartlett's test, the KMO measure of sampling adequacy was examined. In this study, the KMO coefficient was 0.76, confirming factorability of the correlation matrix of the P-TAQPH. PCA with varimax rotation was conducted, and an eight-factor solution with an Eigen value > 1 was retrieved. The total variance explained by these eight factors was 68.8%. Note that the scree plot begins to level off after six components, with a decrease of the Eigen values from 1.5 to 1.3, which was consistent with the number of subscales. Therefore, we preferred the six-factor solution with an Eigen value (% variance explained) of 7.07 (25.2%), 2.54 (9.1%), 2.16 (7.7%), 1.87 (6.7%), 1.73 (6.2%), and 1.50 (5.4%) which together accounted for 60.3% of total variance. 26 items (out of 28 items) loaded above 0.4. Two items did not load in any factors (item 4 and 20). Four items loaded in two factors (item 5, 10, 14, and 24). Depending on value of item load, positive or negative correlation between item and factors, and the underlying meaning, we decided to dedicate item 5 to the fifth factor, item 10 and 24 to the first, item 14 to the third factor. Thus, seven items of the "medication subscale" loaded on the second and fifth factor. The nine items of diet subscale' loaded in the first and third factor. Two items of "stress relieve subscale" loaded in the sixth factor and the two items related to "exercise subscale" loaded in the fourth factor. One of the three items related to "stimulation subscale" loaded in the fourth factor and another in the sixth factor.

The two items of "weight control subscale" loaded in the first factor. Therefore, the first and third factors were related to "diet and weight control subscales," the second and fifth factors to "medication subscale," the fourth factor to "stimulation and exercise subscales," and the sixth factor to "stress relieve subscale." Approximately, all factor-related items were meaningful except the item 6 which loaded in the first factor and item 28 which loaded in the second factor. EFA showed that the six factors of TAQHP could be merged to four factors of "diet and weight control," "medication," "stimulation and exercise," and "stress relieve" in the observed variables in the Iranian context (Table 2). Since items 7 and 19 were negatively correlated with the second and sixth factors, respectively, these items and the two items (4 and 20) not loaded in any factors were candidates for omission (Table 2). Note that, to calculate the factor analysis, missing responses were replaced with means.

Following the identification of a six-factor solution

Table 1. Distribution of the responses to the P-TAQPH

Question: Would you…	Missing (No)	Mean	Response [n (%*)]			
			Never	Some of the time	Most of the time	All of the time
Comply with the total times of prescribed medications?	4	2.90	6 (1.8)	105 (32.2)	130 (39.9)	85 (26.1)
Comply with the total number of pills consumed daily?	1	3.05	3 (0.9)	81 (24.6)	142 (43.2)	103 (31.1)
Comply with the required time to take prescribed medications every day?	1	3.15	5 (1.5)	39 (11.9)	186 (56.5)	99 (30.1)
Never stop taking prescribed medications?	1	3.24	19 (5.8)	28 (8.5)	136 (41.3)	146 (44.4)
Never increase or decrease tablets by yourself?	2	3.32	3 (0.9)	25 (7.6)	163 (49.7)	137 (41.8)
Adhere to take prescribed medications, whether in hypertension symptoms or not?	2	2.47	73 (22.3)	101 (30.8)	82 (25.0)	72 (22.0)
Never forget to take prescribed medications?	2	3.28	1 (0.3)	11 (3.4)	211 (64.3)	105 (32.0)
Never stop taking prescribed medications when you feel better?	1	3.32	-	15 (4.6)	194 (59.0)	120 (36.5)
Never stop taking prescribed medications when you feel badly?	2	3.43	12 (3.7)	21 (6.4)	108 (32.9)	187 (57.0)
Comply with low salt diet?	3	2.53	63 (19.3)	111 (33.9)	71 (21.7)	82 (25.1)
Comply with low fat diet?	1	2.88	21 (6.4)	103 (31.3)	100 (30.4)	105 (31.9)
Comply with low cholesterol diet?	1	2.88	46 (14.0)	61 (18.5)	110 (33.4)	112 (34.0)
Reduce intake of sugar and sweets?	1	2.74	53 (16.1)	78 (23.7)	98 (29.8)	100 (30.4)
Eat more roughage?	1	2.51	57 (17.3)	104 (31.6)	111 (33.7)	57 (17.3)
Increase intake of fresh vegetables?	2	2.64	10 (3.0)	159 (48.5)	98 (29.9)	61 (18.6)
Increase intake of fresh fruits?	3	2.72	10 (3.1)	139 (42.5)	109 (33.3)	69 (21.1)
Eat more bean products?	3	2.67	11 (3.4)	150 (45.9)	102 (31.2)	64 (19.6)
Increase intake of low fat dairy products?	2	2.65	24 (7.3)	138 (42.1)	95 (29.0)	71 (21.6)
Reduce intake of coffee?	2	3.46	27 (8.2)	21 (6.4)	55 (16.8)	225 (68.6)
Give up drinking?	1	3.90	1 (0.3)	3 (0.9)	23 (7.0)	302 (91.8)
Give up smoking?	0	2.77	53 (16.1)	105 (31.8)	38 (11.5)	134 (40.6)
Exercise for 5 times and above per week?	0	1.92	94 (28.5)	183 (55.5)	40 (12.1)	13 (3.9)
Exercise more than 30 minutes per time?	0	2.04	95 (28.8)	145 (43.9)	70 (21.2)	20 (6.1)
Limit the total diet?	0	2.41	55 (16.7)	131 (39.7)	97 (29.4)	47 (14.2)
Control weight?	1	2.14	78 (23.7)	141 (42.9)	95 (28.9)	15 (4.6)
Leave some time to relax every day?	1	1.84	141 (42.9)	113 (34.3)	61 (18.5)	14 (4.3)
Adopt methods to relieve stress?	0	1.98	132 (40.0)	105 (31.8)	60 (18.2)	33 (10.0)
Get a hold of yourself when facing with any incidents?	0	2.78	33 (10.0)	101 (30.6)	102 (30.9)	94 (28.5)

*Valid percent, P-TAQPH: Persian Treatment Adherence Questionnaire for Patients with Hypertension

Table 2. Rotated factor matrix: The P-TAQPH

Question: Would you…	Rotated matrix					
	Decrease unsafe diet and weight control	Medication	Increase safe diet	Stimulation and exercise	Avoiding self-medication	Stress retrieve
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
1. Comply with the total times of prescribed medications?		0.74				
2. Comply with the total number of pills consumed daily?		0.88				
3. Comply with the required time to take prescribed medications every day?		0.73				
7. Never forget to take prescribed medications?		-0.64				
28. Get a hold of yourself when facing with any incidents?		0.41				
5. Never increase or decrease tablets by yourself?		-0.52			0.43	
8. Never stop taking prescribed medications when you feel better?					0.68	
9. Never stop taking prescribed medications when you feel badly?					0.79	
6. Adhere to take prescribed medications, whether in hypertension symptoms or not?	0.45					
10. Comply with low salt diet?	0.62		0.42			
11. Comply with low fat diet?	0.79					
12. Comply with low cholesterol diet?	0.88					
13. Reduce intake of sugar and sweets?	0.86					
24. Limit the total diet?	0.52	0.40				
25. Control weight?	0.52					
14. Eat more roughage?	0.63		0.43			
15. Increase intake of fresh vegetables?			0.79			
16. Increase intake of fresh fruits?			0.85			
17. Eat more bean products?			0.76			
18. Increase intake of low fat dairy products?			0.48			
21. Give up smoking?				0.43		
22. Exercise for 5 times and above per week?				0.88		
23. Exercise more than 30 minutes per time?				0.87		
19. Reduce intake of coffee?						-0.61
26. Leave some time to relax every day?						0.79
27. Adopt methods to relieve stress?						0.63
Items not loaded						
20. Give up drinking?	-	-	-	-	-	-
4. Never stop taking prescribed medications?	-	-	-	-	-	-
Eigen value	7.07	2.54	2.16	1.87	1.73	1.50
Percentage of explained variance	25.2	9.10	7.70	6.70	6.20	5.40

Factor load > 0.40 are mentioned. P-TAQPH: Persian Treatment Adherence Questionnaire for Patients with Hypertension

using EFA, CFA was performed to further test the factor model that emerged from EFA. The first- and second-order CFA models were used. In Model 1 (first-order model), we assumed that the P-TAQHP was composed of six separate correlated dimensions, and in Model 2 (second-order model), we assumed that a higher-order factor accounted for the relationships between the individual factors. GFI were examined to determine the degree of fit between the data and the results of the hypothesized models. In M1, the loadings of items were statistically significant at the 0.05 level ($t > 1.96$) except for items19 and 20. In M2, all of the factors loadings were significant ($t > 1.96$) except for the sixth factor. The χ^2-associated P value was below the 0.050 significance level in both models (M1: $\chi^2 = 1690.58$, df = 335, and $P < 0.001$) (M2: $\chi^2 = 1729.07$, df = 344, and $P < 0.001$).

None of the fit indices reached acceptable levels in both models (M1: $\chi^2/df = 5.05$, RMSEA = 0.11, SRMR = 0.1, GFI = 0.73, AGFI = 0.67, CFI = 0.81, IFI = 0.81, and NNFI = 0.79) (M2: $\chi^2/df = 5.03$, RMSEA = 0.11, SRMR = 0.1, GFI = 0.73, AGFI = 0.68, CFI = 0.82, IFI = 0.81, and NNFI = 0.79). Consequently, based on these models, we could not confirm the structure resulting from the EFA. Since items 19 and 20 were not significant in the confirmatory model and item 4 was not loaded on any factors in EFA, these items were removed from the model. The modification of the structures in M2 showed that the fit indices did not improve considerably (modified second-order CFA model: $\chi^2 = 1493.64$, df = 269 and $P < 0.001$; $\chi^2/df = 5.55$, RMSEA = 0.12, SRMR = 0.11, GFI = 0.73, AGFI = 0.68, CFI = 0.82, IFI = 0.82, and NNFI = 0.80). Based on the fit indices, the modified model did not provide a reasonable fit to the data.

Concurrent criterion validity

To measure the concurrent validity, the correlation was assessed between SBP and DBP and the P-TAQHP and the P-TAQHP-25 item. None of them was correlated with SBP or DBP ($P > 0.050$).

Moreover, there were no differences between sufficiently control group versus insufficiently in P-TAQHP score (Mann-Whitney U = 4.14, P = 0.690). The correlation between the P-TAQHP and P-MMAS was assessed (Table 3). The correlation between these two scales was positively significant ($P < 0.001$).

Table 3. Association between The P-TAQPH and the P-MMAS and systolic and diastolic blood pressure

Variables	The P-TAQPH score	
	Spearman rho coefficient	P
Systolic blood pressure	$\rho = 0.08$	0.140
Diastolic blood pressure	$\rho = 0.01$	0.870
The P-MMAS score	$\rho = 0.27$	< 0.001

P-TAQPH: Persian Treatment Adherence Questionnaire for Patients with Hypertension; P-MMAS: Persian Morisky Medication Adherence Scale

Reliability

The value of Cronbach's alpha for the P-TAQPH was 0.80. The P-TAQPH item-total correlations ranged from -0.39 (Item 5) to 0.70 (Item 12). The item-total correlations were 0.20 or greater for 19 items of the P-TAQPH. The Cronbach's alpha coefficient of the P-TAQPH increased slightly (0.82) when item 5 was not used in the calculation. The test-retest reliability of the P-TAQPH indicated excellent reliability at a two-week interval with an intraclass correlation coefficient (ICC) of 0.95 [confidence interval (CI): 0.88-0.98] (Table 4).

Discussion

According to the results, "the P-TAQPH" had sufficient psychometric quality in different aspects of reliability, criterion, and construct validity. The repeatability of the P-TAQPH was excellent. The internal consistency of the P-TAQPH was acceptable. The mean score of the P-TAQPH was significantly correlated with the mean score of the P-MMAS-8. In total, the EFA was meaningful. However, the factors structure was not confirmed by CFA.

Despite an extensive search, we could not access relevant articles, and we could not find any article that validated this scale in other contexts. The different aspects of reliability (repeatability and internal consistency) of the P-TAQPH were excellent. This was comparable with the original version. Ma et al.[1] reported that the TAQPH reliability was more than 0.80 in both aspects of internal consistency and stability. In this study, the P-TAQPH was positively correlated with P-MMAS-8 but it failed to be correlated with SBP and DBP. The original scale was correlated with MMAS-4.[1] This was in agreement with our study. However, they did not calculate the correlation between TAQPH with blood pressure measures. In this study, hospitalized patients participated. It is assumed that if the patient has low adherence to treatment recommendations hospitalization will be

Table 4. Corrected item-to-total correlation, Cronbach′s alpha and ICC of The P-TAQPH

Question: Would you…	Corrected item-to-total correlation (n = 330)	Cronbach′s alpha if item deleted	ICC (CI) (n = 25)
1. Comply with the total times of prescribed medications?	0.37	0.79	0.88 (0.74-0.94)
2. Comply with the total number of pills consumed daily?	0.38	0.79	0.89 (0.78-0.95)
3. Comply with the required time to take prescribed medications every day?	0.32	0.79	0.91 (0.81-0.96)
4. Never stop taking prescribed medications?	-0.09	0.81	0.97 (0.94-0.99)
5. Never increase or decrease tablets by yourself?	-0.39	0.82	0.86 (0.71-0.93)
6. Adhere to take prescribed medications, whether in hypertension symptoms or not?	0.25	0.80	0.84 (0.68-0.93)
7. Never forget to take prescribed medications?	-0.30	0.81	1 (1-1)
8. Never stop taking prescribed medications when you feel better?	-0.18	0.81	1 (1-1)
9. Never stop taking prescribed medications when you feel badly?	-0.04	0.81	0.96 (0.92-0.98)
10. Comply with low salt diet?	0.63	0.78	0.81 (0.62-0.91)
11. Comply with low fat diet?	0.68	0.78	0.94 (0.88-0.97)
12. Comply with low cholesterol diet?	0.70	0.77	0.95 (0.88-0.98)
13. Reduce intake of sugar and sweets?	0.66	0.78	0.95 (0.90-0.98)
14. Eat more roughage?	0.66	0.78	0.94 (0.87-0.97)
15. Increase intake of fresh vegetables?	0.50	0.79	1 (1-1)
16. Increase intake of fresh fruits?	0.54	0.78	0.98 (0.96-0.99)
17. Eat more bean products?	0.63	0.78	0.77 (0.54-0.89)
18. Increase intake of low fat dairy products?	0.47	0.79	0.88 (0.75-0.94)
19. Reduce intake of coffee?	0.04	0.81	0.88 (0.75-0.94)
20. Give up drinking?	-0.01	0.80	0.80 (0.61-0.91)
21. Give up smoking?	0.00	0.81	0.73 (0.48-0.87)
22. Exercise for 5 times and above per week?	0.39	0.79	0.71 (0.45-0.86)
23. Exercise more than 30 minutes per time?	0.43	0.79	0.73 (0.49-0.87)
24. Limit the total diet?	0.55	0.78	0.50 (0.15-0.74)
25. Control weight?	0.36	0.79	0.95 (0.88-0.98)
26. Leave some time to relax every day?	0.05	0.81	0.88 (0.75-0.95)
27. Adopt methods to relieve stress?	0.38	0.79	0.84 (0.67-0.92)
28. Get a hold of yourself when facing with any incidents?	0.34	0.79	0.77 (0.56-0.89)

The P-TAQPH Cronbach′s alpha = 0.80 and ICC = 0.95 (CI: 0.88-0.98); ICC: Intraclass correlation; CI: Confidence interval; P-TAQPH: Persian Treatment Adherence Questionnaire for Patients with Hypertension

increased. This may affect their blood pressure and the correlation coefficient in our study.

In our EFA, six-factor solution was retrieved that was the same as the original version. Item 4; "Never stop taking prescribed medications?" and item 20; "Give up drinking?" did not load in any factors. The majority of Iranians are Muslims. According to "Quran" - Muslims holy book - drinking alcohols is forbidden (2:219). As it is obvious in our findings, more than 90% of subjects did not drink alcohols. Therefore, this may affect loading of this item. In this study, the six factors were related to "decrease unsafe diet and weight control" (7 items), "medication" (5 items), "increase safe diet" (5 items), "stimulation and exercise" (3 items), "avoiding self-medication" (3 items), and "stress retrieve" (3 items), while in the original version, the six factors were related to "medication" (9 items), "diet" (9 items), "exercise" (2 items), "stimulation" (3 items), "weight control" (2 items), and "relieving stress" (3 items).[1] The most important factor in our study was decreasing unsafe diet that was in contrast with the original version of TAQPH. In the original version, "medication subscale" was the first and important factor. In our study, items related to "diet" and "weight control" subscales located in the first and third factors. All items that related to decreasing harmful food and controlling weight such as low salt, fat, cholesterol, and sugar, and limiting the total diet located in the first factor.

All items related to increasing useful food such as eating roughage, fresh vegetables, fresh fruits, bean products, and low-fat dairy products located in the third factor. It means that in Iran, patients believe that decreasing unsafe food will control

weight. They also believe that decreasing unsafe food and weight control may have more effect on their blood pressure than increasing useful food. In Iran, some of patients do not consider to hypertension as a disease so they may not pay enough attention to prescribed medication. Therefore, it is predicted that medication adherence is less important in their opinion. In our finding, items related to exercises and giving up smoking loaded in the fourth factor. It seems that in Iranian population these items are related to safe health behaviors that are more emphasized by physicians. The last factor in our finding was related to stress reduction. Item related to "reducing intake of coffee" was negatively correlated to that factor which was in contrast with the original version. Most of the Iranian populations believe that coffee has a relaxation effect and it is used to reduce tensions. They are not well informed about its negative effect on blood pressure.[34] Therefore, as it is evident in our finding they believed reducing intake of coffee is against of stress reduction. This may explain some differences between the Persian versions and the original Chinese version. In addition, the most popular drink in Iran is tea and our populations do not use coffee regularly.[35] Since the effect of tea on hypertension is controversial,[34] we ignored to replace coffee consumption with tea consumption. Therefore, we preferred to omit this item from the Persian version. The items 6 and 28 had meaningless loading. The item 6: "Adhere to take prescribed medications, whether in hypertension symptoms or not?" loaded in diet subscale and the item 28: "Get a hold of yourself when facing with any incidents?" loaded in medication subscales. These were in contrast with the original version. Therefore, according to the original version, we preferred to keep this item in "medication" and "stress retrieve" subscales. In this study, the CFA did not confirm the model obtained from the EFA. This was in contrast with the original version.[1]

Information gathered with such a scale, can be used to manage patient education and behavioral reinforcement, and reveal reasons of non-adherence. Therefore, it can help the healthcare provider to make better treatment decisions.[36] This scale may be useful to highlight potential reasons for medication non-adherence, such as side effects, denial of illness because of lack of symptom, combine medication, and complexity of drug therapy. However, the scale failed to explain the other potential risk-factors and reasons of treatment non-adherence such as the cost of treatment, dependency to medication, lack of patient involvement in the care plan, patient's cultural differences, beliefs and previous experience with health care system.[19] All these factors may have direct or indirect influence on treatment adherence. Another aspect of antihypertensive treatment adherence that was not addressed directly by the current scale is that of self-efficacy, which has been implicated in a wide range of health behaviors.[37] In patients with chronic diseases, positive self-efficacy appraisals can predict adherence to a variety of health-related behaviors including dietary recommendations, exercise regimens, and self-management behaviors.[38]

Some study identified that low self-efficacy may be a potential barrier to treatment adherence.[37] Beside all pros and cons of the current scale, this scale should be used in conjunction with other information that may influence on treatment adherence such as socio-demographic factors, length of illness and treatment, economic status, the severity of hypertension, and other associated medical concerns.[36]

Like other studies, our study had some limitations. Hospitalized patients participated in the study. We paid attention to the patients' comfort status, and their blood pressures were measured by a standard approach, but their responses may have been affected by their hospitalization. In addition, it is assumed that the hospitalized patient have less treatment adherence. Therefore as we only used hospitalized patients, this may limit generalization of our results. In addition, we used the English translation of Chinese version that Ma et al.[1] had mentioned in their study. They did not explain about forward/backward translation procedure. Hence, if the English translation of the scale has not established in a standard approach, this may affect our results.

Conclusion

The results of this study showed that "P-TAQPH" had excellent stability, good internal consistency, meaningful construct validity, and significant criterion validity. It seems that the P-TAQPH can help healthcare providers assess adherence to the hypertension treatment regimen appropriately. The results suggested that further study is needed to assess the treatment adherence in a different population with various degree of adherence. This may help the researcher to establish an appropriated cut off point according to P-TAQPH. Further

studies also are needed to test a more comprehensive and multi-dimensional tool to measure hypertension-adherence behaviors in the Iranian context.

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Conflict of Interests

Authors have no conflict of interests.

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