ORIGINAL ARTICLE

Psychometric Properties of Trilingual Versions of HBC-HBP Hill-Bone Compliance to High Blood Pressure (9-Items) in Divergent Ethnic Groups of Older Adults in Iran

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ABSTRACT

Introduction: The HBC-HBP Scale is the most common scale for measuring adherence to medication in the elderly with hypertension, its Persian version has never been tested in Iran. **Methods:** 281 older adults with hypertension were randomly selected from health care centers in Iran during the second half-year of 2019. The demographic questionnaire and Persian, Turkmen, and Kazak versions of HBC-HBP were completed by participants. The scale structure was evaluated using goodness of fit by Exploratory and Confirmatory Factor Analysis using IBM-SPSS v.26 and AMOS v.24. **Results:** The mean of CVI was 0.94, indicating good content validity for HBC-HBP. Exploratory Factor Analysis revealed two subscales for HBC-HBP, collectively explaining 70% of the adherence medication variance in three versions. All item loadings were "moderate" to "excellent", ranging from 0.38 (Moderate) to 0.95(excellent). Confirmatory Factor Analysis indicated the goodness of fit for the HBC-HBP based on the trilingual version. A high goodness of fit was sown for Turkmen, Persian, and Kazak versions of HBC-HBP. (Chi-Square=8.213, 8.354, 8.210, RMSEA=0.016, 0.013, 0.010, GFI=0.90, 0.90, 0.91, CFI=0.91, 0.90, 0.91, and AGFI=0.90, 0.91, 0.90). Cronbach's alpha was 0.90 for the whole scale ($p<0.001$). The optimal cut-off point that best distinguished between adherent and non-adherent patients was 26.5. **Conclusion:** Results showed the validity and reliability of the trilingual versions of the HBMA for measuring adherence medication in the elderly with hypertension.
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INTRODUCTION

The growing population of the older adults is indisputable and has resulted in widespread changes in the prevalence of diseases throughout the world (1, 2). In recent years, not only the rapid growth of the elderly population, but also lifestyle changes such as increased urbanization, nutritional habits, the prevalence of new traditions and industrialization have reduced the growth rate of infectious diseases and as well as the non-communicable diseases such as cardiovascular diseases, stroke and cancer (3). According to recent studies, 80% of the elderly have at least one chronic condition that puts them at greater risk of disability and mortality (1). Each year, these diseases incur huge costs in the healthcare systems of different countries, and hypertension is one of the most important diseases (4). The prevalence of hypertension increases with age, with more than half of people aged 60 to 69 and nearly three-quarters of those aged 70 or older suffering from the disease (5). This disease, which is the most common cause of the cardiovascular diseases, often creates irreversible complications such as stroke, myocardial infarction, kidney failure, disability and mortality in the elderly (4, 6). Current statistics show that hypertension is the primary cause of death among the non-communicable diseases and the second most common cause of illness worldwide. Also according to the statistics, by 2025, 1.56 billion people worldwide will develop hypertension (7). Iran is a Middle Eastern, middle income country with diverse ethnicities and lifestyles across the country. A systematic review of published studies from Iran has estimated the prevalence of hypertension to be 22.1% (8), and about 10 million people aged 15-64 years suffer from hypertension and it is estimated that an annual 86500 mortalities are associated with this disease (9). Today, with the advancement of technology, there are numerous medicinal and non- medicinal therapies for hypertension, but despite the ease of diagnosis and treatment, controlling the disease is still challenging (10, 11). Evidence suggests that many patients with

hypertension in Iran are unaware of their disease and, even in the diagnosed cases, patients do not have adequate control over their disease (12). Medication adherence has a prominent role in the control of hypertension, and includes a range of behaviors that are in line with the recommendations given by health care practitioners (13). Researchers have proven the positive effects of pharmacotherapy along with measures such as weight loss, low sodium diet, smoking cessation and regular physical activity on controlling the hypertension (14, 15). According to evidence, in case of no intervention, 50% of patients with hypertension die from coronary artery disease, 33% from stroke and 15% -10% from renal failure (16). Medication adherence has been considered the primary cause of failure in the control of hypertension (17, 18). Therefore, therapeutic and medication adherence is an important challenge in patients with chronic conditions, and in case of noon-adherence, these patients suffer severe complications, including recurrence and progression of disability, thus needing immediate treatment and hospitalization (19). Examples of non-adherence may include non-following the initial prescription, use of higher or lower doses than prescribed, and using prescriptions of other people (16). Considering the importance of medication adherence in controlling hypertension and its complications, Kim et al. (2000) designed and validated a 9-item questionnaire to measure the medication adherence (20). This instrument has been used in various studies and its utility has been confirmed (21, 22). Despite the rapid growth of aging in Iran, the lack of appropriate tools for measuring medication adherence among the Iranian elderly has made a barrier to formulate policies and plans required for controlling hypertension (23). Accordingly, this study is to investigate the following: 1. Psychometric properties of the Persian, Kazak, and Turkmen versions of the HBC-HBP Medication Compliance scale, 2. Determination of cut-off points of medication adherence index, and 3. The medication adherence rate and the influential factors in the elderly of these three Iranians ethnicities.

MATERIALS AND METHODS

This is a methodological study of validation type. In this study, the researcher obtained the list of patients with hypertension by referring to the comprehensive health centers in Gonbadkavus and Gorgan in northern Iran and Shiraz in southern Iran. Klein (2015) argues that the appropriate sample size in factor analysis studies should be 20 subjects per item (24). The study included a total of 281 elderly people (1:28). The names of qualified seniors were entered into the Excel and a number was assigned to each one. Then the subjects were randomly selected using a random number table. Inclusion criteria included age 60 and over, recent diagnosis with hypertension that obtain from comprehensive health centers in Gonbadkavus and Gorgan in northern and Shiraz in southern Iran, ability to communicate, willingness to participate in the study. Also, unwillingness to participate in the study was considered as the exclusion criterion. The ethnic groups were persuaded to participate in the study and while translating and conducting the research elite panel from any ethnic groups was held. Their suggestions were taken and implemented throughout the process of study. Demographic questionnaires were completed for each patient which included age, gender, ethnicity, marital status, education, lifestyle, co-morbidities and smoking. Also, the trilingual version of the medication adherence questionnaire, discussed in the following, was completed.

The HBC-HBP instrument

To measure medication adherence in patients with hypertension, Kim et al. (2000) designed a 14-item instrument at Johns Hopkins University. The designed instrument has 3 subscales of reduced sodium intake, medication intake and appointment keeping and has optimal validity and reliability. Questions are responded on a 4-point Likert scale from never (1) to always (4). Higher scores indicate greater medication adherence (20). Gradually, considering the importance of medicinal therapy in controlling hypertension, researchers became more interested in the subscale of medicinal treatment, which included nine key items related to the proper use of blood pressure medication and used it in the study (22). The 14-items version was validated just in the Persian-speaking community (young and middle aged citizens) in Iran (25). So, the recent version of it (9-items) was selected to validate in Iranian older adults, because it's a short version and filling fast the items by the elderly. Recently, the 9-item version has become more useful for special groups, such as the older adults in the ED and nursing settings, due to its time-saving. Accordingly, this study focuses on the 9-item version of the tool. However, in the process of preparing and validating questionnaires, shortening them is more valuable for urgent use in some settings i.e., nursing and emergency departments.

Procedure

After coordination and obtaining permission from the designer of the questionnaire, the WHO protocol was used to translate and validate the research instrument (26). According to this protocol, the English version of the questionnaire was initially translated by two translators into each intended language. Then the questionnaire was reviewed in a meeting along with the translators and a common initial version of the questionnaire was obtained. The face validity of the questionnaire was evaluated qualitatively by interviewing 15 seniors from each ethnicity (45 subjects). Seniors were asked to examine the difficulty level, relevance, and ambiguity of the items and to make suggestions. After the face validity was confirmed, content validity was assessed using Content Validity Ratio (CVR) and Content Validity Index (CVI). For this purpose, the questionnaire was distributed among 10 experts (5 physicians and 5 nurses) and they

were asked to answer each item in a 3-point Likert scale (necessary=1, useful but not necessary=0, and not necessary=0); and also, in terms of relevance, simplicity, and clarity in the 4-point Likert scale (completely non-relevant=0 to completely relevant=4). The percentage of total number of "1" responses (necessity of the item) to the total number of items showed the CVR and the percentage of the percentage of total number of "3" and "4" responses to the total number of items showed the content validity index (CVI). According to the Lawshe Table, if the 10 raters are used, the acceptance threshold of CVR is 0.62 for all versions. In the present study, the mean score of validity ratio for all items in four versions was over 0.91. Likewise, the mean validity of the questionnaire items determines the overall content validity index of the instrument(27). In this study, the content validity of the items was 90, 91, 90, and 90 per cent for the Turkmen, Persian, Kazak, and Total version respectively; and for the whole questionnaire, it was 94%. After the face and content validity was confirmed, these 3 versions of the questionnaire were sent to each translator and were translated back into English. The English versions were merged under the supervision of four faculty members of our university and the united version, which most closely matched the original version, was extracted. It was submitted to the original designer for final approval. Then, 281 elderly people from all 3 ethnicities completed the medication adherence and demographic questionnaires and the data were entered into SPSS v.26 statistical software (SPSS Inc., Chicago, IL, USA). In order to determine the structural validity in the first step, the Exploratory Factor Analysis (EFA) was used through Varimax and Quartimax rotation methods and the scree test were used to identify the factors of the questionnaire in Iranian ethnicities (28). The use of the EFA method requires examining the presumptions regarding the adequacy of the samples through Kaiser-Meyer-Olkin (KMO) test and analysis of the correlation coefficients of the questionnaire items through the Bartlett test (29). In the second step, structural validity was assessed by second group population (n=281) by using Confirmatory Factor Analysis (CFI) in AMOS v.24 Computer software (SPSS Inc., Chicago, IL, USA) and Principal Component Analysis (PCA), and by examining model fit indices. In the third step, the internal consistency of the questionnaire was tested using Cronbach's alpha coefficient and Pearson correlation. Also, the internal consistency of the instrument was evaluated by the examination of the intra-cluster correlation coefficient (ICC). At the final stage, the cut-off points of the questionnaire were determined using Receiver Operating Characteristics (ROC) analysis. The present study was conducted in accordance with the Helsinki Treaty and approved by the local Ethics Committee of our University and the informed consent form was completed for all participants.

Ethical Clearance

This study was approved by Research Ethics Committee, The Research Deputy of Health School at Shiraz University of Medical Sciences, Grant N0.: IR.SUMS. REC.1398.1200.

RESULTS

Characteristics of Participants

Table I shows the demographic and descriptive data of the participants in the study. Sixty-two point three percent (n = 175) of the participants were females and 37.7% (n=106) were males. In the present study, three Iranian ethnicities, Persian 35% (n=101), Turkmen 29% (n=84) and Kazaks (n=96) 34% participated in two stages with 1 month intervals. Eighty-two point two percent (n=231) of the elderly other morbidities in addition to hypertension (Diabetes, Osteoporosis, Arthritis, Heart Diseases, Depression, and Chronic Obstructive Pulmonary Disease). Thirteen point five percent (n=38) of participants were tobacco smokers and 99.3% (n 279) did not live alone. The majority of participants, 65.5% (n=185), were married and 64.8% (n=182) only had read and write capabilities. To statistical comparing of variables in their subdomains, the one-way ANOVA and chi-square were applied. The results of table I show no significant differences were obtained in the variables of age, smoking, marriage, Sleeping Time per 24-houre, and HBC-HBP subscales between groups (Sig. ≥ 0.005). But there was a significant difference in the total score of the questionnaire (Sig. ≤ 0.005).

Reliability of medication adherence questionnaire

Internal consistency of the instrument was assessed using Cronbach's alpha coefficient and correlation coefficient between items. The items were evaluated with total score of the instrument using Pearson correlation test. Thus, the Cronbach's alpha coefficient was calculated by means of split-half method and was higher than 0.90. The results of the Intraclass Correlation Coefficient (ICC) also showed the internal consistency of the instrument. The obtained values for total version were ICC=0.90 (p <0.001, 95% CI=0.89-0.92). The ICC for the versions of Turkmen, Persian, Kazak was 0.91, 0.90, and 0.90 (p <0.001). Also, results of Fleiss's Kappa coefficient (Fleiss, 1981) for total version were higher than 0.80 and its means score of all version was more than 0.81. In accordance with Fleiss's Kappa coefficient index, the values above 0.70 indicate high instrument reliability (p <0.001, 95% = 0.75-0.88).

Validity of the medication adherence questionnaire

In the present study, the normality of the data was verified by Kolmogorov-Smirnov and Shapiro-Wilk tests in all 3 versions. Significant values obtained for the tests were 0.328 and 0.313, respectively, indicating normal distribution of the research data. The results of KMO test for Persian, Turkmen and Kazak versions were 0.851, 0.848 and 0.850, respectively, indicating the adequacy of the number of samples for exploratory factor analysis. Also, the chi-square values used to assess the correlation

Table I: Demographic and Descriptive Characteristics of Participants (n = 281)

Variable	Total (n =281)		Persians (n =101)		Turkmens (n =84)		Kazaks (n =96)		P
	Mean/Count	SD/%	Mean/Count	SD/%	Mean/Count	SD/%	Mean/Count	SD/%	
Age	68.45	8.092	68.15	7.271	68.54	8.416	68.70	8.678	0.632*
Gender									
Male	106	37.7	34	33.7	34	40.5	38	39.6	0.001**
Female	175	62.3	67	66.3	50	59.5	58	60.4	
Chronic Condition									
No	50	17.8	14	13.9	14	16.7	22	22.9	0.001**
Yes	231	82.2	87	86.1	70	83.3	74	77.1	
Duration of Condition per Year									
Nothing	62	22.0	16	15.8	18	21.4	28	29.2	0.000***
< 1 year	20	7.1	4	4.0	7	8.3	9	9.4	
2-5 years	61	21.7	31	30.7	17	20.2	13	13.5	
6-10 years	50	17.8	19	18.8	15	17.9	16	16.7	
>11 years	88	31.4	31	30.7	27	32.1	30	31.3	
Smoking									
No	243	86.5	89	88.1	71	84.5	83	85.5	0.124**
Yes	38	13.5	12	11.9	13	15.5	13	13.5	
Living alone									
No	162	57.7	60	59.4	45	53.6	57	59.4	0.002**
Yes	119	42.3	41	40.6	39	46.4	39	40.6	
Duration of Living alone per Year									
> 1	23	8.2	7	6.9	8	9.5	8	8.3	0.002***
1-2	24	8.5	10	9.9	9	10.7	5	5.2	
3-5	48	17.1	17	16.8	14	16.7	17	17.7	
> 6	24	8.5	7	6.9	8	9.5	9	9.4	
am Not alone.	162	57.7	60	59.4	45	53.6	57	59.4	
Marital Status									
Widowed	92	32.7	38	37.6	25	29.8	29	30.2	0.278*
Separated	2	0.7	1	1	1	1.2	0	0	
Married	185	65.8	62	61.4	58	69.0	65	67.7	
Never Married	2	0.7	0	0	0	0	2	2.1	
Education									
No Formal School/Illiterate	30	10.7	7	6.9	14	16.7	9	9.4	0.002***
Only Reading	182	64.8	69	68.3	53	63.1	60	62.5	
Primary School	21	7.5	4	4.0	7	8.3	10	10.4	
Middle School	31	11.0	13	12.9	7	8.3	11	11.5	
High School	4	1.4	4	3.0	0	0	1	1.0	
Graduated	13	4.6	5	5.0	3	3.6	5	5.2	
Nutritional Status [a]	14.78	0.963	16.79	0.828	13.56	0.936	11.97	1.08	0.001*
Overall Health [b]									
Poor	220	78.3	81	80.2	60	71.4	79	82.3	0.000***
Not Bad Nor Good	36	12.8	13	12.9	12	14.3	11	11.5	
Healthy	17	6	4	4.0	10	11.9	3	3.1	
Very Healthy	8	2.8	3	3.0	2	2.4	3	3.1	
Sleeping Time per 24-houre	6.68	1.463	6.53	1.487	6.70	1.429	6.81	1.486	0.167*
HBC-HBP	32.96	4.13	33.38	3.075	32.57	5.376	32.88	3.861	0.004*
Behavioral	18.62	2.41	19.0	1.817	18.39	3.109	18.41	2.255	0.562*
Cognitive	14.35	1.83	14.38	1.427	14.18	2.345	14.35	1.832	0.001*

To comparing grpups in more than 2 subdomains, One-way ANOVA test was used, ** To comparing dicotomous grpups, Chi-square test was used, * Kruskal–Wallis H test was used; P value 0.05.* [a] *In five questions with a 4-point Likert scale, the samples were asked on having three meals and consumption of fruits and vegetables, minimum-maximum score =5-20.* [b] *In four ranks with a 4-point Likert scale, the samples were asked on having Poor: My health significantly limits what I can do, Not bad nor good: I have good days and bad days, Healthy: I have a few problems that are well-managed, & Very healthy: I feel good.*

coefficients of the items of the Bartlett test were 1932.708, 1901.002 and 1941.812, respectively, and the degrees of freedom was 36, indicating that the correlation matrix of the data is not zero in the samples and therefore the questionnaire factors were valid (P=0.001). In addition, the correlation matrix in the Pearson test showed the desired correlation between the items and also between the items and the entire instrument, that is, the correlation rate in all numerical relationships was between 60% -90%. Scree curve, eigenvalues coefficient and Exploratory Factor Analysis (EFA) were used to determine the factors of the questionnaire. In this test, factors with eigenvalues above 1 will be considered as the constituent factors of the questionnaire(28). In the present study, two points had eigenvalues higher than one, indicating the existence of two factors for the HBC-HBP questionnaire. After examining the presumptions of the KMO and Bartlett tests, the exploratory factor analysis was used to investigate the factors that constituted the questionnaire and its subset of items using varimax and quartimax rotated component analysis. As shown in Table II, the questionnaire had two factors that could

Table II: Rotated Component Matrix for the Trilingual Version of HBC-HBP, 9-Items

Items No.	Turkmen Version				Persian Version				Kazak Version				Total Version	
	Component [a]		Component [b]		Component [a]		Component [b]		Component [a]		Component [b]		Component [b]	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
2	0.932		0.885		0.944		0.951		0.938		0.875		0.901	
4	0.927		0.863		0.908		0.914		0.932		0.841		0.814	
9	0.917		0.838		0.885		0.866		0.927		0.802		0.806	
5	0.858		0.764		0.763		0.829		0.878		0.744		0.732	
8	0.677		0.523	0.310	0.738		0.755	0.250	0.767		0.673	0.301	0.685	0.402
6		0.668		0.663		0.695		0.763		0.728		0.652		0.812
1		0.666		0.638		0.619		0.738		0.716		0.643		0.781
7		0.569		0.564		0.612		0.564		0.689		0.604		0.664
3		0.482		0.480		0.502		0.383		0.652		0.540		0.543

a. Rotation Method: Quartimax with Kaiser Normalization. b. Rotation Method: Varimax with Kaiser Normalization

explain more than 79% of the variance in medication adherence in the elderly in all 3 versions. The first factor, i.e., behavioral factor, consists of five items (2,4,5,8,9) and the second factor, i.e., the cognitive factor, contains 4 items (1,3,6,7).

The extracted factors were analyzed by confirmatory factor analysis and based on the most common goodness-of-fit indices of structural equation model, that is, chi-square (χ^2), normed chi-square (χ^2/df), root mean square error of approximation (RMSEA), Goodness-of-fit index (GFI), Bentler-Bonnet Normalized fit index (NFI), Tucker-Lewis index (TLI) and comparative fit index (CFI). The obtained values for χ^2 test are greater than 0.05 and above 8.13 which indicate the fit of the model. But the sensitivity of χ^2 to the sample size and the deviation from the multivariate normality results in the use of (χ^2/df). Acceptable values for this index are considered less than 2 to be more conservative, which is less than 1.023 in the present study. In this study, the numerical value of RMSEA was less than 0.05. Acceptable values for this index are considered to be less than 0.081, and the closer the value is to zero, the greater the fit of the model. The values obtained for the NFI, CFI, NNFI, GFI and AGFI indices were higher than 0.90 for all three versions, which was suitable (Table III). Acceptable values for the four final indices are considered 0.90 and further approach of these indices to 1 improves model fit. The final model of the questionnaire is shown in Fig. 1 as an example for the Turkmen version (29).

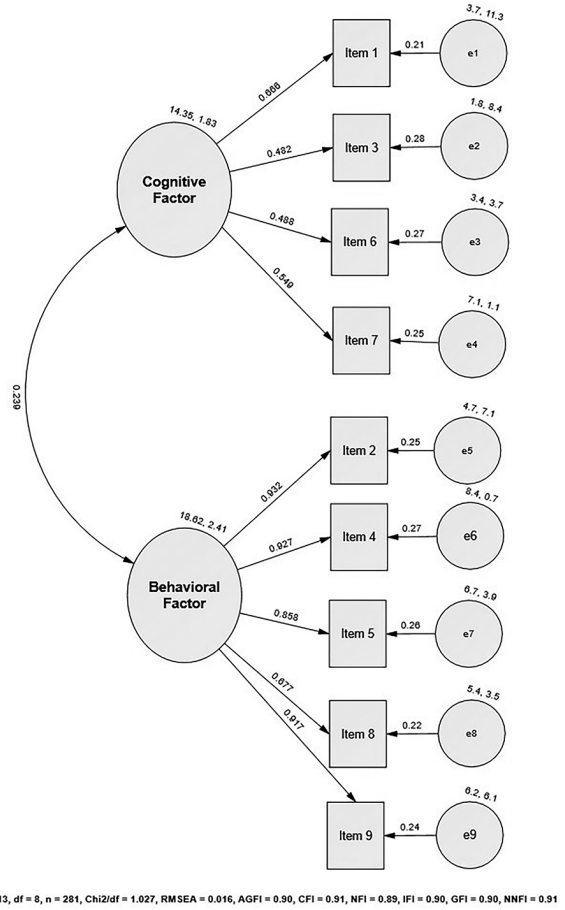

Figure 1: Final model of the questionnaire

Cut-off points for the medication adherence questionnaire After exploratory and confirmatory factor analysis, the cut-off points of Receiver Operating Characteristics (ROC) analysis were used. According to Table IV, using the ROC Curve distribution for the Turkmen version, the cut-off points were 12.5 for the cognitive subscale, 14.5 for the behavioral subscale and 26 for the whole instrument, which was within reasonable confidence.

Table III: Goodness of fit indices of the extracted model for the 9-item HBC-HBP

Versions	Chi2	df	Chi2/df	Sig.	AGFI	RMSEA	CFI	IFI	TLI	GFI
Turkmen	8.213	8	1.02	0.000	0.90	0.016	0.91	0.90	0.91	0.90
Persian	8.354	8	1.04	0.001	0.91	0.013	0.90	0.90	0.90	0.90
Kazak	8.210	8	1.02	0.000	0.90	0.010	0.91	0.90	0.90	0.91
Total	8.259	8	1.02	0.002	0.90	0.013	0.91	0.90	0.90	0.90

Goodness of Fit Indices: Adjusted Goodness of Fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), Incremental Fit Index (IFI), Confirmatory Fit Index (CFI), Bentler & Bonnet's Normed Fit Index (NFI), Tucker–Lewis Index (TLI), and Goodness of Fit Index (GFI)

Table IV: AUC, sensitivity, specificity, and Youden's index for possible cut-off points of the HBC-HBP subdomains and its subscales

Version	Variables	AUC	95% CI		Mean (SD)	P [a]	Cut-off Point (≥)	Sensitivity	1- Specificity	Youden's J	D Value	DIFF
			Lower Bound	Upper Bound								
	Cognitive	0.904	0.922	0.975	14.18(2.345)	0.004	12.5	1	0.150	0.850	0.023	0.150
Turkmen	Behavioral	0.957	0.982	0.986	18.39(3.109)	0.005	14.5	1	0.057	0.943	0.003	0.057
	Total Score	0.948	0.922	0.975	32.57(5.376)	0.001	26.5	1	0.057	0.943	0.003	0.057
	Cognitive	0.900	0.870	0.910	14.38(1.427)	0.001	12	0.98	0.130	0.850	0.037	0.110
Persian	Behavioral	0.930	0.890	0.945	19.01(1.817)	0.001	14	0.98	0.052	0.928	0.023	0.032
	Total Score	0.940	0.900	0.975	33.38(3.075)	0.001	25.5	0.99	0.052	0.938	0.013	0.042
	Cognitive	0.904	0.890	0.946	14.35(1.832)	0.000	12.5	1	0.140	0.860	0.020	0.140
Kazak	Behavioral	0.956	0.901	0.985	18.41(2.255)	0.000	14	1	0.055	0.945	0.003	0.055
	Total Score	0.947	0.921	0.970	32.88(3.861)	0.000	26	1	0.055	0.945	0.003	0.055
	Cognitive	0.902	0.894	0.943	14.21 (0.879)	0.000	12.3	1	0.141	0.853	0.026	0.133
Total	Behavioral	0.947	0.924	0.972	19.01 (1.081)	0.002	14	0.99	0.054	0.938	0.009	0.048
	Total Score	0.945	0.914	0.973	31.21 (2.054)	0.002	26	0.99	0.054	0.942	0.006	0.051

a. Two-sided Chi-squared test, P .05. Abbreviations: AUC= area under curve; CI = confidence interval; DIFF = abs (sensitivity– specificity); D Value or K-Index = Sqrt [(1-Sensitivity) + (1-Specificity)] (31).

The statistical indices of the J-Yuden and D-Value coefficient known to determine the appropriate cut-off point and the area under the rock curve were 0.943 and 0.003, respectively. The G-Yuden coefficient equal to or higher than 0.6, and the D-Value less than 0.2 indicate the favorable cut-off scores. Similar results were obtained in two other versions of the instrument.

Evaluation of medication adherence in the elderly with hypertension and related factors

As shown in Table V, the mean scores of medication adherence were significantly different among the three ethnicities in the study and they can predict 33% of variations in the total score of medication adherence. Except for the cognitive subscale, there was a significant difference between the three ethnicities in the behavioral subscale and the total score (P≤0.05). Ethnicity can explain up to 26.9 behavioral factors of treatment adherence. The highest mean medication adherence score was observed in Persian (33.38 ± 3.07) followed by Turkmen (32.5 ± 5.37) and Kazaks (32.88 ± 2.68).

According to the findings of the present study, among the demographic variables studied, only three variables related to co-morbidities, ethnicity, and general health status were able to predict variations of medication adherence in the elderly with hypertension. Co-morbidities can increase the odds of medication adherence by 2.68 times. The accuracy of all three models was 95%, and the co-morbidity variable accounted for 30.0-30.1% of variations in medication adherence (Wald=0.88, 95% CI=0.341-4.137). Relative to other ethnicities (Turkmen and Kazak), Persian ethnicity increased the odds ratio of medication adherence by 1.47 times (Wald=0.4, 95% CI=0.041-2.688). Compared to the other three conditions (Not Bad nor Good, Poor, Healthy), the suitable health status variable increased odds ratio of mediation adherence 2.24 times (Wald=0.934, 95% CI=0.114-2.305).

DISCUSSION

Antihypertensive medication adherence reduces the hypertension effectively and, as a result, reduces the risk of other cardiovascular diseases. On the other hand, non-adherence can increase the risk of hospitalization in the elderly and has a negative impact on hypertension management (30). To increase medication adherence in the elderly, we first need an instrument to measure it. This instrument should have the necessary characteristics such as optimal validity and reliability for measuring the relevant component (20).

Table V. The One-Way ANOVA for Subscales Factors Based on Ethnicity (N = 281, p ≤ 0.05)

Subscales	Source of Variation	Mean (SD)	Sum of Squares	df	Mean Square	F	Eta Squared	Sig.
	Between Groups		3.891	2	1.946			
Cognitive Factor	Within Groups	14.35(1.83)	935.931	278	3.367	0.578	0.004	0.562
	Total		939.822	280				
	Between Groups		23.299	2	11.650			
Behavioral Factor	Within Groups	18.62(2.41)	1615.192	278	5.810	2. 005	0.269	0.001
	Total		1638.491	280				
	Between Groups		30.870	2	15.435			
Total	Within Groups	32.96(4.13)	4760.774	278	17.125	0.901	0.336	0.004
	Total		4791.644	280				

In this study, conducted on three Iranian ethnicities - to validate the questionnaire – the indices of content validity, face validity, structural validity, and internal reliability were examined. The validity and reliability of the items of the questionnaire were higher than 0.90 in all cases and showed that in addition to simplicity, clarity and comprehensibility, the items had the necessary requirements to measure the medication adherence in the elderly. The structural validity results showed that the cognitive and behavioral subscales were able to explain 79% of the variance in medication adherence. The items are also highly correlated with each other and with the total score of the instrument. The use of confirmatory factor is one of the distinguishing factors of the present study. In most previous studies, only Cronbach's alpha coefficient and internal correlation or Kappa coefficient of agreement were used to measure the validity of the questionnaire (20, 21, 31). In the present study, Fleiss's coefficient of consistence for the questionnaire was 0.80. The figure was 0.79 in the study by Ramli et al. (2012), based on the Bahasa Melayu version of the questionnaire, indicating a high consistency of items regarding measuring the medication adherence (32). But examining the fit indices in the present study increases the reliability of the assumed structure for the trilingual version of the questionnaire. Cronbach's alpha of the Arabic version of the questionnaire in the Alsolami et al. (2015) study, performed on 308 elderly with hypertension in Saudi Arabia, was 0.76. In the krousel et al. (2005) study in the United States it was 0.68 for the English version. In karademire et al. (2009), the Cronbach's alpha of was 0.83 for Turkish version. In Song et al. (2011) Ramli et al. (2012), the kappa coefficient and Cronbach's alpha for the Korean and Malaysian versions were 0.79 and 0.78, respectively (22, 31, 33). Medication adherence in the elderly with hypertension is particularly important as it changes with the pharmacokinetic age of the medicine and the likelihood of complications increases by inappropriate consumption (30). Nonetheless, medication non-adherence in the elderly has been considered common (31). In the present study, 95% (n=268) of the elderly had suitable levels of medication compliance (above the cut-off point of 26.5), which was higher in the Persian ethnicity. Medication adherence was reported as 83% (n = 194) in the Mweene et al. (2010) (34). In Alsolami et al. (2015), 27% (n=86) of patients adhered to their medication patterns and 72% (n=222) did not (33). In the study of Hsu et al. (2010), 52% of Chinese elderly living in the US had a high level of medication adherence (35). In the study by Ramli et al. (2012), 53.4% of patients had optimal therapeutic compliance (n=349) (32). The difference in medication adherence level in different studies is mostly affected by the non-consideration of a standard cut-off point for the questionnaire. The cut-off points of the HBMA questionnaire included patients' self-report of medication in the study of Mweene et al. (2010), permanent adherence over a Likert spectrum in the study of Alsolami et al. (2015), classification of adherence in a bimodal state (yes or no) in Hsu et al. (2010), and maximum scores or only minimum difference in the study of Ramli et al. (2012) (31, 32, 35). Classification of medication adherence in patients with hypertension based on such variable criteria undermines the epidemiology of medication adherence in different communities and eliminates comparability. For this reason, one of the objectives of the present study was to determine the standard cut-off point for the instrument. In the present study, the optimal cut-off point for the total score of the HBC-HBP questionnaire was 25, 26.5 and 26 for Persian, Turkmen and Kazak ethnicities, 12, 12.5, and 12.5, for cognitive subscales and 14, 14.5 and 14 for behavioral subscales, respectively. According to the findings of the present study, gender was not a determinant for medication adherence in the elderly with hypertension. This finding contradicts the results of Krousel et al. (2005), who found that women had 1.35 more adherent than men, and also Ramli et al. (2012), who stated that women had a 1.46 times higher medication adherence. However, it was consistent with the study of Alsolami et al. (2015), in which was no significant relationship between gender and medication adherence among patients (31-33). Cultural similarities can be considered a factor in the similarity of findings because the first and second studies which were conducted in Louisiana, United States and Malaysia, respectively, having a wider cultural gap with the present study, and the third study was performed in Saudi Arabia with more cultural consistencies with the present study (31).

Ethnicity was another factor that significantly influenced medication adherence among elderly and it predicted 33% of variations in medication adherence. In a study by Ramli et al (2012), Chinese ethnic increased the odds of medication adherence by 2 times compared to Malaysian ethnicity(32). In a study by Krousel et al. (2005), race was identified as a factor influencing medication adherence, being 1.27 higher in the Caucasian than the black, reflecting the influence of different ethnicities with different cultures (33). One of the mediating factors in the relationship between ethnicity and medication adherence has been the difficulty of understanding and reading which acts as a barrier to understanding the medication instructions or affects therapeutic beliefs (35). Taheri Kharameh et al. (2016) showed that enhancing patients' perception of the disease and controlling it is an essential educational strategy to increase treatment adherence in hypertensive patients(36) . Based on findings, literacy is not a predictor of medication adherence. However, in the Alsolami et al. (2015), the risk of non-adherence increased with lack of compulsory education and in Hsu (2010), it increased with high school literacy compared to those with no education, which are not consistent with the present study (31, 35). Results showed that the incidence of other diseases increased the odds of medication adherence by 2.6 times. This finding is consistent with the results of the

study by Alsolami et al. (2015) who showed that having no co-morbidities increases the odds ratio of medication adherence to 1.8 (31). In the present study, there was no significant change in medication adherence with age in the elderly. Krousel et al. (2005) showed that with age, the probability of medication adherence increased. Also the odds ratio of medication adherence increased by 1.71 in individuals over 65 compared to the younger patients (33). On the other hand, in the study of Alsolami et al., there was no significant relationship between medication adherence and participants' age. In their study, however, the age index was 45 and higher or lower ages (31). According to the findings of the present study, there was no significant relationship between smoking, lifestyle, marital status and medication adherence, which is in line with the findings of Alsolami et al. (2015) and Hsu et al. (2010) (31, 35). Other effective factors of medication adherence in the present study in patients with hypertension included forgetfulness, adverse complications, medication counseling, and access to drugstore (34).

CONCLUSION

In summary, Hill-Bone Compliance to High Blood Pressure (9-Items) can be easily administered at community and clinical settings to screen hypertensive patients with low medication adherence. The results showed that the Kazak, Turkmen and Persian versions of HBC-HBP questionnaires have validity and reliability for assessing medication adherence in the elderly with hypertension. Considering the diversity of Iranian ethnicities and cultures, future studies could aim at other ethnic groups such as Kurds, Arabs, Baluchis with their linguistic, cultural and lifestyles diversities.

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