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Original Article

The eight-item Morisky Medication Adherence Scale: validation of its Persian version in diabetic adults

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Abstract

Background: Adherence to treatment is an important factor in the management of diabetic patients. The aim of this study was to examine the psychometric properties of the 8-item Morisky Medication Adherence Scale (MMAS-8) among type 2 diabetes.

Methods: This study carried out in Family Medicine Clinics (FMCs) in Tabriz, North West of Iran from May to September 2018. A total of 320 patients suffering from Type 2 diabetes were included. Content and face validity of the Persian version of MMAS-8 were quantitatively evaluated. The Cronbach's alpha and intra-class correlation (ICC) were calculated to assess the reliability. Exploratory factor analysis (EFA) was used to assess the construct validity of the questionnaire.

Results: Content and face validity of the Persian version of MMAS-8 were confirmed. Good internal consistency (Cronbach's a = 0.83) and test–retest reliability (ICC= 0.87, P<0.001) were found. According to the results of the EFA, Persian version of MMAS-8 among diabetic patients had two dimensions: stopping to take medication due to the forgetfulness and for reasons other than forgetfulness.

Conclusion: The Persian version of the MMAS-8 is a high valid and reliable questionnaire to screen medication adherence of Persian-speaking patients with diabetes.

Keywords: Diabetes mellitus, Type 2, Iran, Medication adherence, Validation, Questionnaire

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Diabetes and its complications have a significant economic loss to the diabetic patient, their families, health system and national economy through direct and indirect costs (1). It was estimated that in 2018, more than 500 million prevalent cases of type 2 diabetes were living worldwide, and the prevalence will increase in all countries especially in lower-income countries (2). In Iran, approximately 4.5 million diabetic patients were living in 2011, and it is estimated that by 2030, this rate will rise to 9.2 million (3). Regarding the chronic nature of diabetes, adherence to the prescribed treatment regimens without direct supervision of physician is one of the important factors in the management of diabetes (3, 5). Some rigorous reviews have shown that the adherence to treatment among patients with chronic diseases even in developed countries is only 50 percent; given the scarcity and inequities in access to health-care services in developing countries, this estimation is assumed to be even higher (6). Several studies have demonstrated that people with diabetes often discontinue their dietary recommendations as well as prescribed oral hypoglycemic medication or even do not take them at all, because they consider them ineffective or experience unpleasant side effects (7, 8). There are a number of ways to measure medication adherence.

Although direct methods (i.e. measuring the concentrations of the drug or its metabolites in blood or urine) are more precise than indirect ones (i.e. pill counts, electronic medication monitors, questionnaires, diaries and interviews), they are used infrequently due to the cost and difficulty to use (9). Self-report questionnaires compared to other methods have some advantages including completing easily, being non-expensive and getting fast feedback on the point of care (10). Among self-report questionnaires, the MMAS-8 is used as the most widely scale to assess the medication adherence, because of its good sensitivity, specificity as well as its high validity and reliability (11, 12).

The validity of the Persian version of MMAS- 8 has been examined among hypertensive patients (13), but its validity has not been evaluated among diabetic patients. Considering the importance of adherence to treatments among diabetics, the aim of this study was to assess the validity of the translated MMAS-8 among Iranian diabetic patients.

Methods

Setting and Participant: This cross-sectional study was conducted from May to October 2018 in Tabriz, Iran. The sampling setting was in the Asad Abadi Clinic, and the sampling method was convenience. The inclusion criteria for the sampling were patients with type II diabetes, age above 30 and taking oral glucose-lowering drugs or insulin. The exclusion criteria were the presence of any cognitive and psychological disorders that interfered with responsiveness and disagreement on participating in the ongoing study. Data were collected through in-person interviews by research team members.

Instrument: The original version of MMAS-8 (12) was translated from English into Persian by a single bilingual translator, who was fluent in English. Then, the translated questionnaire was back-translated into English by another bilingual translator. The back-translated questionnaire was subsequently compared to the original English version, and at the end, the final questionnaire was prepared with the agreement of both translators to produce a version that was semantically as close as possible to original questionnaire. The process of the translation was done by a linguistic organization that provides services to the research centers and universities of medical sciences.

After translation, face and content validity of the questionnaire were evaluated both quantitatively and qualitatively. The expert panel of 8 members including internal medicine specialist, endocrinologist and community medicine specialist assessed the instruments. To ensure that the essential content was selected and the instrument measured the content well, the content validity ratio (CVR) and content validity index (CVI) were calculated, respectively (14).

For calculating CVR, the expert panels were requested to rate each item into one of three categories: “necessary”, “useful but not necessary” or “not necessary”. The minimum acceptable CVR value for accepting an item in the final instrument based on Lawshe’s table was ≥0.75 (15). After excluding unnecessary items (CVR<0.75), the CVI for each item (I-CVI) and for scale (S-CVI) was computed. Expert panels were requested to rate each item in terms of relevancy, simplicity and clarity on a 4-point ordinal scale (e.g. "1= not relevant, 2= somewhat relevant, 3= quite relevant and 4= highly relevant").

The I-CVI was calculated as ‘the number of experts who gave a rating of 3 or 4, divided by the total number of experts. The S-CVI was calculated as an average of the I-CVIs for all items on the scale’. The value of I-CVI > 0.79 and S-CVI >0.90 was considered as an appropriate value (16-18). Each item was judged as follows (19): 1) I-CVI > 0.79: item accepted, 2) I-CVI: 0.70- 0.79: item revised, and 3) I-CVI < 0.70: item excluded.

To assess the face validity of the questionnaire, the expert panels were requested to write their comments about each item, as well as their importance on a 5-point Likert scale including very important (score 5), important (score 4), relatively important (score 3), slightly important (score 2) and unimportant (score 1) for calculating the impact score as follows (11):

$$\textit{Item Impact Score} = \sum \frac{frequency \times Importance}{n}$$

n= the total number of expert panels

If the impact score of an item was ≥1.5, it was maintained in the instrument; otherwise, it was excluded (20). Moreover, the comments of the panels were considered at the final version of the instrument.

To assess the external consistency or test-retest reliability of the instrument, the questionnaires were completed by 30 diabetic patients referred to the Family Medicine Clinic (FMC), Asad Abadi Clinic. After two-week interval, the same questionnaires were filled out by the same 30 respondents. Collected data were entered into SPSS and the intra-class correlation (ICC) was calculated. To assess the internal

consistency, the translated questionnaires were completed by other 320 diabetic attendees to the FMC, Asad Abadi Clinic. The construct validity of the questionnaire was assessed by exploratory factor analysis (EFA). Kaiser-Meyer-Olkin (KMO) and Bartlett's tests were used to determine sufficiency of sample size and its suitability for factor analysis (21). The recommended sample size was at least 300 for an EFA or the ratio of respondents to variables should be at least 10:1 (22), therefore, the EFA was conducted on collected data from 320 diabetic patients.

Statistical analysis: For evaluating the content and face validity, the CVR, CVI and impact score were calculated in Excel 2013, respectively. The Cronbach's alpha coefficient and inter-class correlation (ICC) were calculated to assess internal and external consistency of the questionnaire. The construct validity of the Morisky questionnaire was tested by the principal axis factoring (PAF) with varimax rotation. Kaiser Meier Olkin (KMO) and Bartlett tests were applied to examine the adequacy of the model, and scree plot test was used to identify the number of factors. A minimum acceptable score for KMO test was considered 0.5 (23). The data were analyzed using SPSS 21.

Ethics considerations: This study received approval from the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.187). Necessary coordination was done with the head of Asad Abadi Clinic for data collection. Participants were informed about the purposes of the study. Participation in this study was voluntary.

Results

The socio-demographic characteristics of participants are displayed in table 1. In total, 320 diabetics with the mean age of 58±13.7 years completed the Persian version of the MMAS. The majority of participants were female (64 % vs. 36%). The results of validity and reliability: The CVR, CVI values and impact score of all MMAS-8 items were ≥ 0.75, > 0.79 and > 1.5, respectively. As a result, all of its items were accepted in the scale. In addition, the average scale value of the questionnaire was high (S-CVI/Ave = 0.956) (Table 2). The internal consistency of this questionnaire was high (Cronbach's alpha= 0.83) (Table 3). The test-retest reliability of the Persian version of MMAS-8 was good with an ICC of 0.87, (ICC (95% CI) = 0.83 (0.76 to 0.95)) (24).

The result of construct validity: The KMO value of MMAS-8 was determined as 0.79, indicating that the sample size for conducting factor analysis was suitable. Similarly, Bartlett's Test of Sphericity was also significant (Approx.$\chi 2$=590.92, P <0.0001), suggesting that the data were inter-related and suitable for factor analysis.

The result of factor analysis demonstrated two factors with eigenvalues of greater than 1, which explained 52.69% of the total variance, and first factor explained 38.72% of the total variance (see Table 4).

Items 2 and 1 had the highest correlation with the first factor of the PAF (r= 0.796, r= 0.795, respectively), and items 3, 4, 6, 8, 5 and 7 had the highest correlation with the second factor (see table 3).

Table 1- Profile of participants in exploratory factor analysis (n=320)

Characteristics	Number	frequency
Gender		
Male	116	36.2%
Female	204	63.8%
Age		
≤ 50 years	103	32.2%
> 50 years	217	67.8%
Marital status		
Single	7	2.2%
Married	313	97.8%
Education		
Illiterate	114	35.6%
Under the diploma	134	41.9%
Diploma and higher	72	22.5%
Job		
Unemployed	19	9.7%
Housekeeper	176	30%
Manual worker	26	32%
Self-employment	65	20%
Employee	34	8.3%
Number of children		
< 4	170	76.6%
≥ 4	150	23.4%
living area		
Urban	230	72%
Rural	90	28%
Insurance statues		
Have	235	73.4%
Does not have	85	26.6%

Table 2: The relevancy, clarity, simplicity, CVI, CVR and impact scores for the Persian version of the MMAS-8

Items	Relevancy	clarity	simplicity	I-CVI*	CVR€	Impact score	Accept / Reject
Q1	1	1	1	1	1	5	Accept
Q2	1	0.87	0.87	0.91	0.75	4.34	Accept
Q3	1	1	1	1	1	4.82	Accept
Q4	1	1	1	1	1	4.83	Accept
Q5	1	1	1	1	0.75	4.35	Accept
Q6	1	1	1	1	1	4.83	Accept
Q7	0.87	0.87	0.75	0.83	0.75	3.84	Accept
Q8	1	0.87	0.87	0.91	0.75	4.21	Accept
S-CVI/Ave¥ = 0.956							

*I-CVI= item - level of content validity index €CVR= Content Validity Ratio

¥ S-CVI/Ave = Scale- level of content validity index/ Average = mean of I-CVIs

Table 3. Corrected item-to-total correlation and factors loading of the Persian version of the MMAS-8 among type 2 diabetes (n=320)

Items	Patient response	Entry(n=320), Number (%)	Corrected Item-Total Correlation	α if Item Deleted	Factor loading*	
					Factor1	Factor2
Q1	Yes	211(65.9)	0.644	0.811	0.795	0.165
Q2	Yes	214(66.9)	0.718	0.800	0.796	0.189
Q3	Yes	222(69.9)	0.711	0.801	0.351	0.507
Q4	Yes	235(73.4)	0.708	0.801	0.400	0.569
Q5	No	61(19.1)	0.367	0.845		0.394
Q6	Yes	177(55.3)	0.558	0.822	0.279	0.499
Q7	Yes	303(94.7)	0.326	0.856		.310
Q8	never/rarely	58(18)	0.609	0.815	0.360	0.420
	Once in a while	132(41.2)				
	Sometimes	83(26)				
	Usually	30(9.4)				
	All the time	17(5.3)				

Overall Cronbach's alpha for 8 items= 0.83 Extraction method: Principal Axis Factoring (PAF) Rotation Method: Varimax with Kaiser Normalization

*Items with coefficient value < 0.4 are shown in bold. MMAs-8: eight-item Morisky Medication Adherence scale; α: Cronbach's alpha coefficient

Table 4. The total variance explained by principal axis factoring extraction method for the Persian version of the MMAS-8 among type 2 diabetics (n=320) Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.098	38.722	38.722	2.574	32.178	32.178	1.761	22.009	22.009
2	1.118	13.977	52.699	0.513	6.418	38.595	1.327	16.587	38.595
3	0.924	11.555	64.254						
4	0.835	10.442	74.696						
5	0.69	8.619	83.315						
6	0.564	7.054	90.369						
7	0.451	5.633	96.003						
8	0.32	3.997	100						

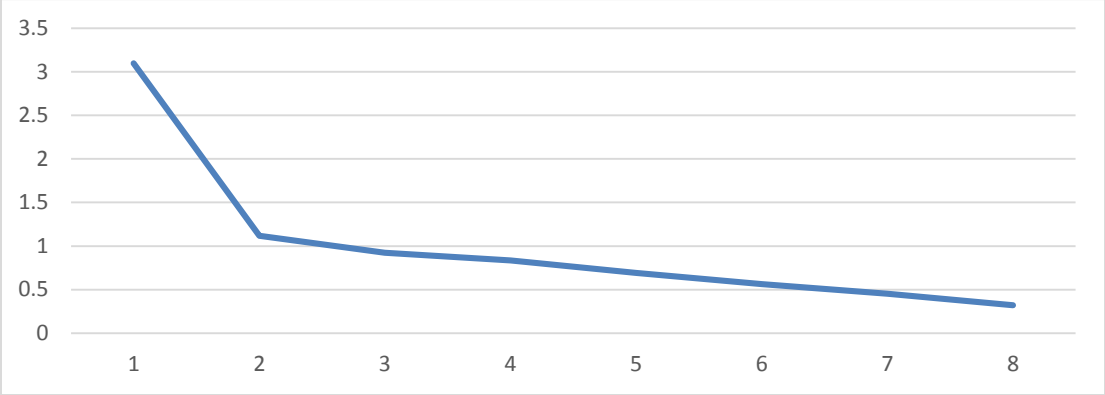

Fig. 1. Scree plot diagram for the Persian- version of the MMAS-8 in type 2 diabetic patients (n=320)

Discussion

This study aimed to provide the Persian version of MMAS- 8 to assess self-reported medication adherence in diabetic patients. After translating the English version of the MMAS into Persian, its validity and reliability among diabetic patients were evaluated. Since the CVR, CVI and impact scores of all items of the translated questionnaire were above the defined criteria, its content and face validity were confirmed. Furthermore, the internal consistency and test-retest reliability of the Persian version of the MMAS like the original English version were good (12). However, in studies from other countries, its reliability has been reported differently. For example, the internal consistency of German version among cardiovascular patients was lower than that of English version (0.31 vs. 0.83) (25). Besides, internal consistency of French version in hypertensive adults (Cronbach's alpha =0.54) (26), and that of Thai version (Cronbach's alpha = 0.61) (27), Korean version (Cronbach's alpha = 0.66) (28) and Greek version (Cronbach's alpha = 0.753) (29) in diabetic patients were ranged from low to medium. The internal consistency of Chinese version was moderate, but its test-retest reliability was good (30). Given that the internal consistency can be affected by the sample size, the discrepancy in the Cronbach's alpha values may somewhat justified by this factor (31). In the current study, there was a weakest correlation between the entire scale and items7 and 5, respectively; therefore, the reliability could be the strongest when these items were removed from the scale. The same result was observed in the original English version of MMAS-8 (12). Item 5 was related to the use of medicine in the recent past i.e. yesterday, and also unlike the other questions of this scale, it was about the adherence in a definitive and restricted time period; hence, its weak correlation with other items in the scale could be justified.

According to the result of the factor analysis in the present study, the Persian version of the MMAS had two dimensions, named: 1- stopping to take medication for forgetfulness reason, and 2- stopping to take medication for reasons other than forgetfulness. The current result was not the same as that for the original version of the MMAS, which was a unidimensional scale (12). However, our result was consistent with the Wang et al. and Moharamzad et al.'s results (30, 24). In conclusion, the Persian version of the eight-item MMAS has high validity and reliability among diabetic patients and can be used as an appropriate tool to screen medication adherence among diabetes.

In content validity studies, sampling bias may occur because the selection of experts is purposive. Therefore, by selecting other experts, the results of the study could be changed. In the ongoing study, the sampling method for conducting factor analysis was non-random, and convenient sampling was used. Additionally, only diabetes outpatients were selected. These may limit the generalizability of our results. Moreover, due to the participants' literacy problems, the questionnaires were filled out by an interviewer.

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