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ARTICLE

Translation and validation study of Morisky Medication Adherence Scale (MMAS): the Urdu version for facilitating person-centered healthcare in Pakistan

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Abstract

Objective: The study aims to translate and examine the psychometric properties of the Urdu version of Morisky Medication Adherence Scale (MMAS) among hypertensive patients in Quetta, Pakistan.

Method: A standard ''forward–backward'' procedure of translation was used to translate the English version of MMAS into Urdu. The translated version was then validated on a convenience sample of 150 hypertensive patients attending a public hospital in Quetta, Pakistan, between August and November 2010. The reliability of the translated questionnaire was tested for internal consistency. Validity was confirmed using convergent and known group validity.

Results: Adopting the recommended scoring method, the mean ± SD of MMAS scores was 6.23 ± 0.9. The instrument demonstrated good internal consistency (Cronbach's a = 0.701). The test–retest reliability value was 0.8 ($p < 0.001$). A positive correlation between the 8 and 4 item MMAS was found ($r = 0.765$; $p \leq 0.01$). There was a significant relationship between MMAS categories and the hypertension control groups ($\chi 2 = 19.996$; $p < 0.001$). The MMAS sensitivity and specificity, with positive and negative predictive values, were 46.15%, 60.0%, 45.0% and 61.11%, respectively.

Conclusions: Results from this translation and validation study conclude that the Urdu version of the MMAS is a reliable and valid measure of medication adherence and therefore a valid tool for the advancement of person-centered healthcare.

Keywords

Adherence, adherence scale, Morisky Medication, person-centered healthcare, translation, Urdu, validation

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Introduction

Hypertension (HTN) is listed as the key risk factor in the development of various clinical complications in Pakistan [1]. The National Health Survey of Pakistan (NHSP) highlighted hypertension as affecting 18% of adults more than 15 years and 33% of adults more than 45 years [1]. Another study reported that 18% of people in Pakistan suffer from hypertension with every third person above 40 years of age becoming increasingly vulnerable to a wide range of diseases [2]. It is also reported that only 50% of the people suffering from hypertension were diagnosed and that only half of those diagnosed are ever treated [2].

In clinical practice, although there are evidence-based pharmacological treatments available, a large number of hypertensive patients will still remain with uncontrolled hypertension due to number of factors [3]. One of the major reasons associated with the occurrence of uncontrolled hypertension is the patient's non-adherence to medications prescribed [4-6]. Within this context, Nichols and Poirier (2000) reported that only 60% of patients with hypertension take their medication as prescribed by their physicians [7]. Moreover, this proportion of medication-taking behavior ranged from 50-75% in studies from different healthcare settings [8,9]. In addition to the development of additional cardiovascular disorders, non-adherence results in significant increases in healthcare utilization. In a study by LaFleur and Oderda (2004), non-adherence to medication resulted in an unnecessary yearly cost of $396 to $792 million [10]. Furthermore, between one-third and two-thirds of all medication-related hospital admissions were also attributed to non-adherence [11,12].

The World Health Organization (WHO) defines adherence as ‘‘the extent to which a person’s medication-taking behaviour, following a diet and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider’’ [13]. Adherence is a multi-factorial phenomenon and varies from population to population [14-17]. Although various methods are available for the assessment of medication adherence [18], there is still no gold standard for the measurement of medication adherence [19]. Biological assays, pill counts, electronic monitoring, self-reported questionnaires, pharmacy records and prescription claims are usually applied for measurement of adherence [20]. Amongst them, self-reported questionnaires are more frequently used because they are low in both cost and time expenditure and provide a reasonably accurate estimate of adherence [21]. Within this context, the Morisky Medication Adherence Scale (MMAS) is one of the most widely used tools in health and social research. Originally developed by Morisky *et al* (1986) as a 4-itemed scale [22], the scale was modified to 8 items in 2008 [23]. The new scale was developed as the previous scale was considered accusatory in nature, isolating and often evoked defensiveness from patients [24].

Because of the profound acceptance of the MMAS in measurement of medication adherence in health and social sciences, this study aimed to translate and validate the Urdu version of the MMAS-8 in Pakistani population with HTN as a contribution to person-centered healthcare.

Methods

Study participants and settings

A cross-sectional, observational study design was adopted to conduct this study. The study was conducted at Sandamen Provisional Hospital (SPH) Quetta, Pakistan. SPH is a tertiary teaching hospital and bears the major health burden of the city. Patients aging 18 years and above with a confirmed diagnosis of hypertension, using antihypertensive medications for the last six months and literate (speaking, reading and writing) with the national language of Pakistan (Urdu), were enrolled in the study. Those that had co-morbidities and serious impairments, immigrants from other countries (i.e. Afghanistan, Iran, etc.) and pregnant women were excluded.

For translation and validation studies, 60 patients were initially enrolled for the study as this number was anticipated as likely to provide results of accurate validity and reliability [25]. The number was doubled to increase the reliability of the study outcomes. With an expected drop-out rate of 25%, a convenience sample of 150 hypertensive patients visiting the outpatient department were approached from August 2010 until November 2010.

The translated version of the 8-itemed MMAS and the 4-itemed Morisky scale was administered by face-to-face interviews. Socio-demographic and disease-related data were abstracted from the patient’s medical records. All interviews were conducted by pre-trained pharmacists stationed at the cardiac unit of the selected hospital. At the end of the study, 110 patients were found eligible and included in the analysis with a response rate of 73.3%. From the current cohort of patients, one-third (n = 37) were randomly selected for a one month reliability test–retest analysis. Thirty patients completed the test–retest after one month.

Ethical approval and informed consent

As there is no human ethics committee for non-clinical studies in the said institute, permission from the medical superintendent was obtained (EA/FS/10521). Patients who agreed to participate were explained the nature and objectives of the study. Written consent was obtained for both test and re-test data collection. The patients were assured about the confidentiality of their responses and their right to withdraw from the study with no penalty or effects on their treatment.

Translation of the questionnaire

A structured information sheet, consisting of 3 sections was used for data collection. The first section focused on socio-demographic data, the second section consisted of the 8-item MMAS-8 and the third section comprised the 4-

item Morisky scale. Translation of the questionnaires was performed according to the guidelines proposed for translation studies [26,27].

1. Forward translation of the original questionnaires from English to Urdu was undertaken by 2 independent qualified linguistic translators (native speakers of Urdu and adept in English). However, the translators were blinded from each other to produce a translation of the original questionnaire into the target language. The translated versions were compared with the original versions by researchers belonging from Pakistan.

2. Reverse translation from Urdu to English was carried out by another independent translator. Continuous discussion sessions were held between the translator and researchers. Inconsistencies were resolved in a consensus meeting and a final version was approved.

3. The translated questionnaire was then piloted with 25 hypertensive patients. Their comments on the questionnaires were also taken into consideration which were later discussed and streamlined by the research team. The respondents took 15 minutes (on average) to complete the questionnaire. Responses of the pilot phase were not included in the final study results. At the same time, face and content validity of the questionnaire was determined by 8 postgraduate students involved in the research of pharmacy practice.

4. The finalized Urdu versions were made available for the reliability and validity study.

Statistical analysis

Descriptive statistics were used to describe the demographic and disease characteristics of the patients and their medication adherences scores. Percentages and frequencies were used for the categorical variables, while means and standard deviations were calculated for the continuous variables. The characteristics of the whole sample and of the adherent groups were presented. Internal consistency was assessed by using Cronbach's alpha. Spearman's rank correlation was used to assess test–retest reliability. Convergent validity was assessed using Spearman rank correlation between MMAS scores and the scores on the 4-itemed scale. Correlations were interpreted using the following criteria: 0–0.25 = *little or no correlation*, 0.25–0.5 = *fair correlation*, 0.5–0.75 = *moderate to good correlation* and greater than 0.75 = *very good to excellent correlation.* Known group validity was assessed through the association of HTN control (adequate and inadequate) MMAS categories using Chi square test. All analyses were performed using SPSS version 16.5 (SPSS Inc., Chicago, IL). The significance level was set at $p < 0.05$.

Results

Demographic and disease related data

A total of 150 patients were enrolled, but 110 patients provided complete responses which was 73.3% of the total enrollment (response rate). Furthermore, for the test-rest analysis, 37 patients were randomly selected and data were available for 30 patients with a response rate of 81.1%. Table 1 presents the results of the demographics of the patients and medication adherence analysis. The mean age of participants was 39.50 ± 6.93 with males (71.8%) representing the higher proportion. Forty nine percent (n=54) had a university level of education. The majority (n=62, 56.3%) were serving in the private sector. Seventy eight (70.9%) had urban residencies. From the cohort of 110 patients, 46 (41.8%) had HTN history of more than 5 years.

Fifty (45.4%) of the patients were categorized as low, 35 (31.8%) as medium and 25 (22.7%) as highly adherent to their therapies. There were statistically significant differences among education, occupation, MMAS score and 4-itemed score among the 3 adherence groups ($p < 0.05$). No statistical difference was noted in other study variables.

Reliability analysis

Cronbach's alpha test of internal consistency was for the measurement of reliability for our study instrument. Cronbach's alpha value for the scale was 0.701 with correlation coefficient ranging from 0.3 to 0.48 (Table 2). The MMAS was declared as a reliable instrument in HTN population as the Cronbach's alpha value was within acceptable ranges [21,28]. Spearman's rank coefficient was 0.8 ($p < 0.001$) indicating first-rate reliability and consistency of MMAS.

Validity analysis

Convergent validity

Spearman's rank coefficient between MMAS and four-itemed scale was 0.765 ($p < 0.001$) that demonstrates excellent association between the two scores.

Known group validity

The Chi square ($\chi 2$) test showed a significant relationship between MMAS categories and HTN control group ($\chi 2 = 19.996$; $p < 0.001$). Eighty four percent of patients with low adherence were reported in inadequate HTN control, whereas 96% of those in the high adherence group were in adequate HTN control group (Table 3).

Table 1 Patients' characteristic and adherence scores

Characteristics	Total Sample (N=110)	Low Adherence 50 (45.4%)	Medium Adherence 35 (31.8%)	High Adherence 25 (22.7%)
Age				
Mean ± SD	39.50±6.93	39.90±1.83	41.40±3.42	37.70±1.75
Sex N (%)				
Male	79 (71.8)	39 (78.0)	20 (57.2)	20 (80.0)
Female	31 (28.2)	11 (22.0)	15 (42.8)	5 (20.0)
Education N (%)*				
No formal education	28 (25.4)	14 (28.0)	10 (28.5)	4 (16.0)
Primary	1 (0.9)	0 (0.0)	1 (2.8)	0 (0.0)
Secondary	27 (24.5)	10 (20.0)	10 (28.5)	7 (28.0)
University	54 (49.0)	26 (52.0)	14 (40.0)	14 (56.0)
Occupation N (%)*				
Not employed	30 (27.3)	16 (32.0)	12 (34.2)	2 (8.0)
Government official	18 (16.4)	6 (12.0)	2 (5.7)	10 (40.0)
Private	62 (56.3)	28 (56.0)	21 (60.0)	13 (52.0)
Duration of HTN N (%)				
Less than 1 year	7 (6.4)	4 (8.0)	2 (5.7)	1 (4.0)
1 – 3 years	23 (20.9)	8 (16.0)	10 (28.5)	5 (20.0)
3 – 5 years	34 (30.9)	24 (48.0)	6 (17.1)	4 (16.0)
> 5 years	46 (41.8)	14 (28.0)	17 (48.5)	15 (60.0)
Locality N (%)				
Urban	78 (70.9)	29 (58.0)	27 (77.1)	22 (88.0)
Rural	32 (29.1)	21 (42.0)	8 22.8)	3 (22.0)
HTN Control N (%)				
Adequate	44 (40)	7 (14.0)	14 (40.0)	23 (92.0)
Inadequate	66 (60)	43 (86.0)	21 (60.0)	2 (8.0)
Eight Itemed MMAS score*				
Mean ± SD	6.23±0.9	4.25±1.2	6.5±0.2	7.9±1.1
Four Itemed original MS score*				
Mean ± SD	2.12±0.7	1.25±0.8	2.1±0.7	3.2±0.55

**Significant differences among groups*

Table 2 Reliability analysis of the MMAS (Total correlation and Cronbach's alpha)

Items in Questionnaire	Mean ± SD	Corrected item (Total correlation)	Cronbach's alpha (when item deleted)
Do you sometimes forget to take your [health concern] pills?	0.50 ± 0.41	0.395	0.600
People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your [health concern] medicine?	0.80 ± 0.45	0.410	0.656
Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	0.81 ± 0.40	0.325	0.621
When you travel or leave home, do you sometimes forget to bring along your [health concern] medication?	0.65 ± 0.45	0.355	0.650
Did you take your [health concern] medicine yesterday?	0.98 ± 0.25	0.300	0.620
When you feel like your [health concern] is under control, do you sometimes stop taking your medicine?	0.84 ± 0.44	0.480	0.687
Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?	0.65 ± 0.35	0.350	0.655
How often do you have difficulty remembering to take all your medications?	0.75 ± 0.30	0.480	0.625

Cronbach's alpha for the complete scale was 0.701 with significant intra-class correlation (P< 0.001)

Table 3 Drug adherence categories and hypertension control[1]

HTN group*	Low Adherence (score < 6)	Medium Adherence (6 > score < 8)	High Adherence (score = 8)	P value
HTN adequate control	8 (16.0)	12 (34.2)	24 (96.0)	≤0.001
HTN inadequate control	42 (84.0)	23 (65.7)	1 (4.0)	≤0.001
Total	50 (100)	35 (100)	25 (100)	

[1]Number (%) of patients: $\chi^2 = 19.966$, p≤0.01
**HTN categorized as controlled and uncontrolled under JNC-7 recommendations*

Sensitivity and specificity

Specificity and specificity of MMAS in HTN was evaluated in order to identify patients with inadequate HTN control. Two groups of adherence scores were used taking low adherence as one group whereas medium and high adherence together as second group [21]. MMAS sensitivity and specificity was measured as 46.15% and 60.00% respectively. Positive and negative predictive values for the MMAS were 45.0% and 61.11% respectively (Table 3).

Discussion

The aim of this study was to assess the reliability and validity of the Urdu version of MMAS in a hypertensive population. This is the first study that has demonstrated the systematic translation and validation of MMAS in the Urdu language. MMAS has been translated and validated into other languages including for the study of diabetic patients in Thailand and Malaysia [21,29], HIV positive patients in Sweden [30] and patients with inflammatory bowel diseases in the USA [24]. As the original 8-item MMAS was tested in hypertensive patients [23], recruiting hypertensive patients in the current study would allow comparison with the original study.

The present study findings were associated with Morisky *et al.* (2008) [23] as the Urdu version of the MMAS-8 was found to be reliable with good predictive validity and sensitivity. However, there are some differences among internal consistency and values of test-retest reliability. The Urdu version of MMAS had less internal consistency (Cronbach's alpha = 0.701) as compared to 0.83 reported in Morisky *et al.* (2008) [23]. One possible reason for this is the small sample size in this study. This assumption is again supported by the findings of Al-Qazaz *et al.* (2010) [21], where the consistency value was reported less than the results of the present study. However, findings from the current study reflect improved reliability test-retest ability and convergent validity as compared to the study conducted in diabetic patients in Thailand [29].

A high correlation (r = 0.765) was measured in term of convergent validity. Therefore, it can be concluded that the translated version of the MMAS-8 is associated positively with the translation of the previous 4-item Morisky scale, hence resulting in the improvement of the convergent validity of the scale. The present findings are similar to the results of other studies where high correlation between the 8-item and 4-itemed scales was reported. However, unlike the results of the present study, these values were lower in other studies except in the study by Al-Qazaz *et al.* (2010) where the authors reported a higher correlation coefficient [21].

Known group analysis designated that the Urdu version of the MMAS-8 is a valid instrument for measuring medication adherence. HTN control was significantly related with MMAS scores ($\chi^2 = 19.966$, $p < 0.01$), providing strong criterion-related validity. Theoretically, patients adherent to their therapies have more awareness about HTN, self-management processes and the consequences of uncontrolled HTN. Higher adherence to treatment regimens can lead to adequate HTN control and minimize the chances of development of further cardiac co-morbidities.

In terms of sensitivity and specificity, Morisky *et al.* (2008) [23] reported higher values as compared to the findings in the current study. Differences in the level of awareness among study participants, cultural dissimilarities and patients claiming more adherence than actual, can be accountable for this deficiency. The study findings are similar to those reported by Al-Qazaz *et al.* (2010) in their study in diabetic patients [21].

Conclusion

The MMAS-8 is an important scale which permits healthcare and social researchers to take the initial step in determining non-adherence to medication. The MMAS-8 is a simple and efficient way of determining adherence that can also prove to be cost-effective. From the results of this study, it is concluded that the Urdu version of the MMAS-8 proved to be an authentic instrument for the measurement of medication adherence in the regions where Urdu is a primary language of communication such as Pakistan and some areas of India. The Urdu version of the MMAS-8 is a reliable and valid measure as it illustrates acceptable test–retest reliability and convergent validity. The current study is therefore advanced as an important contribution to the development of person-centered medicine.

Disclosure

The authors report no funding in relation to this research and have no conflicts of interest to disclose.

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