BAU Journal - Society, Culture and Human Behavior

Volume 3 | Issue 2
ISSN: 2663-9122

Article 5

February 2022

PSYCHOMETRIC EVALUATION OF THE ADHERENCE TO REFILLS AND MEDICATIONS SCALE (ARMS) AMONG ADULTS PATIENTS WITH CHRONIC DISEASE: THE LEBANESE VERSION

Mohamad Ismail
Post-graduate student, Faculty of Pharmacy, Beirut Arab University, Beirut, Lebanon,
mohamad_i_92@hotmail.com

Mayssah El Nayal
Professor, Department of Psychology, Faculty of Human Sciences, Beirut Arab University, Beirut, Lebanon,
mnayal@bau.edu.lb

Pascale Salameh
Professor of Epidemiology and Accreditation Leader, Faculty of Pharmacy, Lebanese University, Beirut, Lebanon, psalameh@ul.edu.lb

Souraya Domiati
Department of Pharmacology and Therapeutics, Faculty of Pharmacy, Beirut Arab University, Lebanon,
t.domyati@bau.edu.lb

PSYCHOMETRIC EVALUATION OF THE ADHERENCE TO REFILLS AND MEDICATIONS SCALE (ARMS) AMONG ADULTS PATIENTS WITH CHRONIC DISEASE: THE LEBANESE VERSION

Abstract

Background: Non-adherence to medications can lead to several consequences that range from waste of drugs to death. Consequently, a tool to assess the adherence to chronic medication is a necessity. Objectives: The purpose of this study was to conduct the translation and cross-cultural adaptation process of ARMS into the Lebanese Arabic version (ARMS-A) and to examine its psychometric properties (validity and reliability assessment). Design: The original English version of ARMS was translated into Arabic based on the established guidelines. Eight expert panels were involved in content validation, while face validation was conducted on twenty participants during pilot testing. A cross-sectional survey was used to evaluate the psychometric properties of ARMS-A on 135 participants. Participants: Adults patients on chronic medications were invited to be part of the study. Main outcome measures: Overall content and universal face validity indexes were determined in addition to the exploratory factors and Cronbach's alpha. Key Results: The overall content validity index was 0.91, and the universal face validity index was also 0.91. For the exploratory factor analysis, two factors were extracted. The first one consisted of 6 items and explained 43.9% of the variance. The second one also comprised of 6 items with a variance of 9.59%. For internal consistency and reliability, the Cronbach's alpha was 0.877. Conclusion: ARMS-A appears to be a valid and reliable medication adherence tool to assess the adherence of chronic medications among native Arabic speaking patient with chronic diseases.

Keywords

Medication, Adherence, Scale, Validation, Translation, Cross-cultural, Arabic

1. INTRODUCTION

Medication non-adherence is defined by the World Health Organization as the degree to which the person's medication-taking behavior does not match with the recommendation of the health-care provider (Vrijens et al, 2012; WHO, 2013). It is divided into three types: non-fulfillment non-adherence which occurs when the patient fails to fill or initiate the provided prescription (Fischer et al, 2010); non-persistence non-adherence that occurs when the patient fails to continue the prescription that is already filled (Solomon and Majumdar, 2010); and non-conforming non-adherence which is characterized by patient's failure to take medications according to the prescribed instructions (Jimmy and Jose, 2011).

Studies show that half of the patients are considered non-adherent to their chronic medications (Haynes, McDonald, and Garg, 2002). Consequently, medication waste, poor clinical outcomes, increase medical resources' use, increase hospital admissions rate, as well as morbidities and mortality risks are increased (Osterberg and Blaschke, 2005).

Since adherence to medications is a dynamic and complex behavior, its barriers are linked to several factors (Pages et al, 2016). Patient factors comprise mental illness such as anxiety/depression and poor health-related knowledge. Environmental factors encompass social support, poverty, and homelessness. Health-care provider factors include lack of trust, unclear communication, and suboptimal time spent to properly counsel the patient (Lam et al, 2015).

There are two methods to measure patient adherence: direct and indirect. Direct methods include clinical patient observation, drug or metabolite in body fluid measurement, and blood biological markers monitoring (Lam et al, 2015). Indirect methods include patient self-report, patient diaries, pill counts, rate of prescription refill, and most importantly patient questionnaire (Lam et al, 2015).

Over the last few decades, there have been several non-adherence measures in the literature; however, only few have been validated on patients taking chronic medications (Nguyen, La Caze, and Cottrell, 2014). The most used, reliable, and valid questionnaires are the Morisky Medication Adherence Scale 8-items (MMAS-8) (Morisky, Ang, Krousel-Wood, and Ward, 2008) and the Adherence to Refills and Medications Scale 12-items (ARMS) (Kripalani, Risser, Gatti, and Jacobson, 2009). The ARMS scale is translated into many different languages such as Korean (Kim, Park, Schlenk, Kim, and Dim, 2016), Turkish (Gokdogan and Kes, 2017), and Polish (Lomper et al, 2018). In Qatar, as a tool to assess the burden of medication non-adherence in diabetic patients, Zidan et al. translated the ARMS into the Arabic language (Zidan et al, 2018). In Iraq, Al Ganmi et al., also translated the ARMS into Arabic to assess the medication adherence and its predictive factors among cardiovascular disease patients (Al-Ganmi et al, 2018). Consequently, the ARMS Arabic version was only validated to assess diabetic and cardiovascular disease patients' adherence. Moreover, to be used in different cultures, any instrument must not only go through proper linguistic translation but also through a cultural adaptation process to conserve the instrument's content validity (Wagner et al, 1998; Beaton, Bombardier, Guillemin, and Ferraz, 2000; Arafat et al, 2016).

Accordingly, the current study aimed to translate the ARMS into Arabic language and to assess its cross-cultural adaptation and its psychometric properties in the Lebanese population complaining from multiple, concomitant, chronic diseases.

2. METHODS

2.1 Study Design

A cross-sectional survey study was carried out from November 2019 till January 2020. Data was equally collected from three community pharmacies found in different socioeconomic areas in Beirut, the capital of Lebanon. The questionnaire was distributed through a single interviewer who administered it to eligible patients.

2.2 Inclusion and Exclusion Criteria

Patients were included in the study, if they were Lebanese, above 18 years of age, and reported to have at least one of the following chronic diseases (CMS, 2015): hypertension, ischemic heart disease, heart failure, arrhythmia, diabetes mellitus, dyslipidemia, thyroid, stroke, epilepsy,

osteoporosis, osteoarthritis/rheumatoid arthritis, asthma, chronic obstructive pulmonary disease, benign prostatic hyperplasia, and chronic kidney disease, for more than one year and taking at least one chronic medication. On the other hand, patients with previous mental/dementia disorder were excluded from the study since the aim was to assess the medication-taking behavior of patients under volitional control.

2.3 Sample Size Calculation

The sample size was based on the moderate factor structure ratio between subject and variables which is 10:1 for exploratory factor analysis (EFA) (Costello and Osborne, 2005). Since the ARMS is made up of 12-items, a minimum of 120 participants were needed in this study.

2.4 Questionnaire Construction and Design

The instrument was divided into two main sections. The first one included demographic and socio-economic characteristics of the participants. The second section comprised the Adherence to Refills and Medication Scale 12-items (ARMS) (Kripalani, Risser, Gatti, and Jacobson, 2009) which consists of 12 items, each with a 4-point scale. The scale ranges from "None of the times", rated as "1", to "All of the times", rated as "4", making the total score ranges from 12 to 48. It is noteworthy to mention that the 12th item is reverse-coded. The scale used the score of 12 as a cut point value: patients with a score of 12 are rated as having high adherence while patients with a score more than 12 are rated as low adherence (Kim, Park, Schlenk, Kim, and Dim, 2016; Lomper et al, 2018). Moreover, the original ARMS is made up of two subscales: adherence to taking medications (8 items) and adherence to refilling prescriptions (4 items) (Kripalani, Risser, Gatti, and Jacobson, 2009).

2.5 Instrument Translation and Adaptation Process

The translation process of the original ARMS from English into Arabic Language was based on the recommended guidelines for translation and cross-cultural adaptation (Wild et al, 2005; Hall et al, 2018). The forward translation was done by two bilingual and bicultural translators: a medical field expert and a sworn certified legal translator. Then, a reconciliation process was carried out to merge the two translated versions of the instrument into one forward translated version. Afterward, a back-translation was performed to translate the new Arabic version back to English. Similar to forward translation, this process required two bilingual and bicultural translators: a sworn translator and a medical field expert who were different from the previous ones. Both back translation review and harmonization steps were conducted through the comparison of the two back-translated versions of the instrument to evaluate the semantic equivalency. The draft version of ARMS-A went through a pre-testing process which included cognitive interviewing and pilot testing. The cognitive interviewing was performed on 5 participants from the target audience to make sure that they understood the questions. To ensure readability and acceptability of the questionnaire a pilot testing followed on 20 participants chosen by convenience.

2.6. Validation Process

The validity of ARMS-A was assessed through translational and construct validity to ensure a proper translation and cross-adaptation process of the original content (Beaton, Bombardier, Guillemin, and Ferraz, 2000; Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019). Translational validity is subdivided into face and content validity.

2.6.1. Content Validity

A format was sent to eight Lebanese experts to check if the content is relevant and appropriate to the study goal. The panel is made up of four academic pharmacy professors, two clinical pharmacists, and two community pharmacists. Each expert, independently, rated the degree of relevancy of each item found in ARMS-A using a 4-point scale that ranges from "1"

(not relevant), “2” (somewhat relevant), “3” (quite relevant) to “4” (highly relevant) (Parsian and Dunning, 2009). The obtained results were computed to estimate the Content Validity Index (CVI) to each item (Lynn, 1996).

2.6.2. Face Validity

The translated Arabic version was distributed to 20 participants who meet the inclusion criteria. This format aimed to check the appearance of ARMS-A in terms of readability, clarity of the language used, comprehension, and consistency of the style and layout. Similarly, each included participant had to rate the degree of clarity and comprehension of each item found in ARMS-A using a 4-point scale that ranges from “1” (not clear at all, not understandable at all), “2” (somewhat clear, somewhat understandable), “3” (quite clear, quite understandable) to “4” (totally clear, totally understandable). Then, the collected results were also computed to estimate the Face Validity Index (FVI) for each item (Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019).

2.6.3. Construct Validity

The EFA of ARMS-A was assessed on a sample of 135 participants. A correlation matrix of all scale items was explored to inspect the item-total score correlation (Kripalani, Risser, Gatti, and Jacobson, 2009).

2.7. Reliability Process

Internal consistency reliability was determined on the 135 participants by measuring the total-item correlation coefficients and Cronbach’s alpha (Kripalani, Risser, Gatti, and Jacobson, 2009; Parsian and Dunning, 2009; Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019).

2.8. Data Analysis

All the collected data were entered, coded, and analyzed using Statistical Package for Social Services (SPSS) version 23. Continuous/numerical data were presented as Median followed by Inter-Quartile Range (IQR) or Mean ± Standard Deviation while the categorical data were presented as counts followed by percentage.

For the CVI analysis, the rating obtained from the experts was re-coded as “1” for relevant (for 3 and 4 scores) and as “0” for not relevant (for 1 and 2 scores) to each item (Lynn, 1986). Afterward, the overall CVI was calculated by summing up the values attained from the 12-items. The steps were performed as described by Lynn, 1986.

For the FVI analysis, the results were re-categorized as “1” for clear and understandable (for 3 and 4 scores) and as “0” for not clear and not understandable (for 1 and 2 scores). The universal FVI was determined by averaging the values obtained from clarity and comprehension (Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019).

EFA was conducted using the extraction method known as Principal Component Analysis (PCA) with a Promax rotation. The oblique rotation was chosen because the factors were correlated to each other (Tabachnick and Fidell, 2007). Both Kaiser-Meyer-Olkin (KMO) test - to check for sample adequacy- and Bartlett’s test of sphericity - to check if the items are correlated and suitable to proceed for factor analysis - were done (Kim, Park, Schlenk, Kim, and Dim, 2016; Arafat et al, 2016; Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019), Kaiser’s eigenvalue > 1.0 rule (K1), Cattell’s Scree test, and Horn’s parallel analysis method were used to select the number of the loaded factors (O'Connor, 2000; Ledesma and Mora, 2007).

The mean inter-item correlation was carried out to establish the correlation between the items beneath each factor. A mean inter-item correlation higher than 0.6 reveals that the item is strongly correlated under its domain (Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019). Moreover, each total-item correlation coefficient should be a minimum of 0.3 (Morisky, Ang, Krousel-Wood, and

Ward, 2008; Kripalani, Risser, Gatti, and Jacobson, 2009; Kim, Park, Schlenk, Kim, and Dim, 2016; Lomper et al, 2018). For Cronbach's alpha, values between 0.7 and 0.9 were considered to show a high internal consistency (Morisky, Ang, Krousel-Wood, and Ward, 2008; Kripalani, Risser, Gatti, and Jacobson, 2009; Kim, Park, Schlenk, Kim, and Dim, 2016; Lomper et al, 2018).

3. RESULTS

One hundred and seventy-four participants were screened; however, only 157 of them were found to be eligible for this study. Moreover, only 135 of the eligible participants were included in the analysis because 14 of them refused to participate while the rest did not complete the instrument requested.

Out of the 135 patients that were included in the study, 57% were female, 34.8% were ≥ 65 years old, and 63% were married. University degree holders and employed patients accounted for 49.6% and 51.1%, respectively. Besides, 82.2% were non-healthcare providers and 68.9% had medication health insurance. Concerning diseases and medication-related characteristics, nearly half of the patients had three or more chronic diseases (45.2%) and they were on five or more chronic medications (43.7%). The median (IQR) for the cost of medications was 100,000 (150,000) Lebanese pounds (refer to table 1).

Results show that around 82% with a 95% CI [0.739, 0.876] of the patients were not adherent to their chronic medications.

Table 1: General and Medication-Related Characteristics of the Participants (n = 135)

Characteristics	**n (%)** *or* **Median (IQR)**
Gender	
Male	58 (43.0)
Female	77 (57.0)
Age (years)	
18 - 24	6 (4.4)
25 - 34	19 (14.1)
35 - 44	14 (10.4)
45 - 54	13 (9.6)
55 - 64	36 (26.7)
≥ 65	47 (34.8)
Marital Status	
Single	32 (23.7)
Married	85 (63.0)
Divorced	4 (3.0)
Widowed	14 (10.4)
Educational Status	
University	67 (49.6)
High School	32 (23.7)
Middle School	10 (7.4)
Elementary School	15 (11.1)
Illiterate	11 (8.1)
Employment Status	
Employed	69 (51.1)
Unemployed	45 (33.3)
Retired	21 (15.6)
Occupation Status	
Health-Care Provider	24 (17.8)
Non Health-Care Provider	111 (82.2)
Medication Insurance	
Yes	93 (68.9)
No	42 (31.1)

Characteristics	n (%) *or* Median (IQR)
Type of Insurance	
Insurance Company	6 (4.4)
State Employees	27 (20.0)
National Social Security Fund	49 (36.3)
Charity Centers	11 (8.1)
No Insurance	42 (31.1)
Number of Chronic Diseases	
1	45 (33.3)
2	29 (21.5)
≥ 3	61 (45.2)
Number of Chronic Medications	
1	29 (21.5)
2	9 (14.1)
3	7 (5.2)
4	21 (15.6)
≥ 5	59 (43.7)
Cost of Chronic Medications/month (in Lebanese Lira)	
	100,000 (150,000)

Throughout the content validity process, none of the ARMS-A items were removed based on the expert panel's scoring. The iCVI ranges from 0.88 to 1.0 and the overall CVI was calculated to be 0.91 (refer to table 2). For both clarity and comprehension, the iFVI ranges from 0.80 to 1.0 and their overall iFVI was 0.91. Hence, the universal iFVI was 0.91 which indicates a satisfactory level of face validity (refer to table 2).

Table 2: Content and Face Validity of ARMS-A (n = 9 and 20 respectively)

ARMS-A Items	**iCVI***	**iFVI****		
		Clarity	***Comprehension***	***Universal***
ARMS-A 1	1.0	1.0	1.0	1.0
ARMS-A 2	0.88	0.90	0.90	0.90
ARMS-A 3	0.88	0.90	0.90	0.90
ARMS-A 4	0.88	1.0	1.0	1.0
ARMS-A 5	0.88	0.90	0.90	0.90
ARMS-A 6	0.88	1.0	1.0	1.0
ARMS-A 7	0.88	0.90	0.90	0.90
ARMS-A 8	0.88	0.80	0.80	0.80
ARMS-A 9	1.0	0.90	0.85	0.88
ARMS-A 10	1.0	0.80	0.85	0.83
ARMS-A 11	0.88	0.95	0.95	0.95
ARMS-A 12	0.88	0.90	0.85	0.88
Overall	0.91	0.91	0.91	0.91

*iFVI: Item Face Validity Index
**iCVI: Item Content Validity Index

For construct validity, a Spearman's rho correlation coefficient statistical test revealed that there was a moderately positive statistically significant correlation between ARMS-A score and all 12-items of ARMS-A in which rs (135) ranges from +0.539 to + 0.742 with a p-value = 0.01.

The KMO test showed sample adequacy with a value of 0.839 which surpassed the minimal requirement of 0.7. Furthermore, Bartlett's test showed significant results with a p-value ≤ 0.001 which indicates that the items were correlated. Hence, we were able to proceed with factor analysis. Since all items had a factor loading of > 0.4, none of the items were removed.

Two factors with eigenvalues > 1.0 were extracted. Factor 1 had an eigenvalue of 5.172 and explained 43.09% of the variance whereas Factor 2 had an eigenvalue of 1.151 and explained 9.59% of the variance. Moreover, the Scree plot graphic revealed that there was a two-factor solution that was compatible with the number of factors obtained through the K1 method.

Afterward, the parallel analysis was computed. The eigenvalue of the first factor in the actual data was 5.172, whereas it was 1.372 in the simulative data set. In addition, the eigenvalue of the second factor in the actual data was 1.151, while it was 1.124 in the simulative data. However, when shifting from the second to the third factor, the case was divergent in which the eigenvalue of the simulative data of the second factor (1.013) was higher than that of the actual data (0.987). Thus, the number of the scale factors was restricted to two.

Finally, upon implementing both curves of the actual data along with the simulative one, it was clear that the two-factor construct rationale which was based on the exploration of the eigenvalue is highly supported (see figure 1).

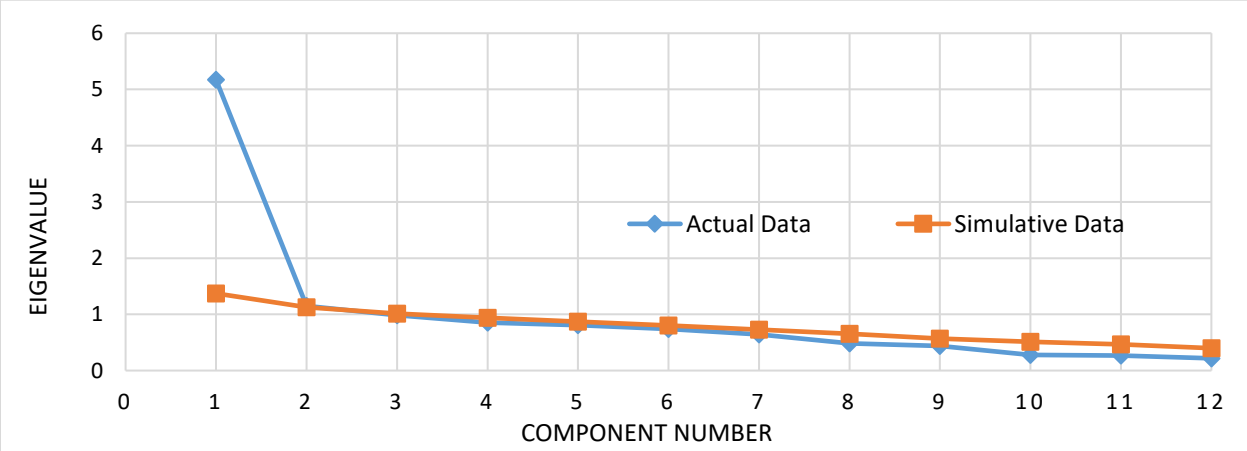

Fig.1: The Scree Plot of the Actual Data and Simulative Data

As a result of the above-mentioned findings, the number of the scale factors was settled to be two to execute the factor analysis. From the latter analysis, Factor 1 had an eigenvalue of 5.172, explained 43.09% of the variance, contained six items (item 2, 6, 7, 8, 9, and 11), and labeled as "intentional non-adherence to taking medications". Furthermore, Factor 2 had an eigenvalue of 1.151 and explained 9.59% of the variance. It also contained six items (1, 3, 4, 5, 10, and 12) and entitled as "unintentional non-adherence to taking medications and refilling medications" (refer to table 3).

The reliability analysis results of the whole ARMS-A questionnaire show that the standardized Cronbach's α was 0.877 and the removal of any item of the score was associated with a decrease in the model's Cronbach's alpha (refer to table 4). Moreover, the mean inter-item correlation was 0.63 and all the item-total correlation coefficients were > 0.3 (coefficients range between 0.419 and 0.719).

Furthermore, both subscales of ARMS-A have internal consistency. For the first subscale (Factor 1), Cronbach's alpha was 0.839 and the item-total correlations range between 0.442 and 0.756. For the second subscale (Factor 2), Cronbach's alpha was 0.776 and the item-total correlations range between 0.440 and 0.603.

Table 3: Factor Analysis: Principal Component Analysis using Promax Rotation (n = 135)

Factor 1			Factor 2		
ARMS-A Items	**Rotated Factor Loading**	**Communality**	**ARMS-A Items**	**Rotated Factor Loading**	**Communality**
11	0.900	0.604	1	0.907	0.653
9	0.783	0.579	12	0.728	0.430
6	0.771	0.695	4	0.712	0.590
8	0.753	0.682	5	0.573	0.524
7	0.589	0.336	10	0.423	0.414
2	0.531	0.467	3	0.413	0.448

Table 4: Reliability Analysis for ARMS-A 12 Items Questionnaire (n = 135)

ARMS-A Items	Mean ± SD	Item Total Correlation	Cronbach's Alpha if Item Deleted
ARMS-A 1	1.60 ± 0.63	0.519	0.870
ARMS-A 2	1.34 ± 0.68	0.594	0.866
ARMS-A 3	1.45 ± 0.75	0.496	0.872
ARMS-A 4	1.52 ± 0.72	0.608	0.865
ARMS-A 5	1.26 ± 0.58	0.617	0.865
ARMS-A 6	1.44 ± 0.76	0.719	0.857
ARMS-A 7	1.37 ± 0.63	0.447	0.874
ARMS-A 8	1.47 ± 0.79	0.717	0.857
ARMS-A 9	1.41 ± 0.63	0.615	0.865
ARMS-A 10	1.47 ± 0.63	0.550	0.868
ARMS-A 11	1.33 ± 0.61	0.535	0.869
ARMS-A 12	1.48 ± 0.70	0.419	0.876

4. DISCUSSION

ARMS-A denoted valid and reliable results when put to application. The iCVI value showed a result of 0.91, suggesting that the content of ARMS-A is well adapted into the local context. A CVI score of above 0.8 revealed that the items in the translated questionnaire were relevant to the domain (Polit and Beck, 2006; Arafat et al, 2016). Furthermore, the universal FVI score was also equal to 0.91, which indicated that the original ARMS was translated well into the Arabic language using clear and understandable sentences.

The acceptable level of FVI scores was taken as ≥ 0.8, extracted from CVI value (Zun, Ibrahim, Mokhtar, Halim, and Mansour, 2019).

The EFA for construct validity in this study identified two factors for ARMS-A. The first subscale that represented Factor 1 assessed the intentional non-adherence to taking medications with an eigenvalue of 5.172 and accounted for 43.09% of the variance. Moreover, the second subscale representing Factor 2 had an eigenvalue of 1.151, explained 9.59%, and assessed the unintentional non-adherence to taking medications and refilling medications. By comparison, the original ARMS showed almost similar results in which the factor analysis of the original ARMS also extracted two factors. Factor 1 of the original ARMS was made up of eight items: 1, 2, 5, 6, 7, 8, 9, and 10, had an eigenvalue of 4.209, explained 35.1% of the total variance, and assessed medication taking. Factor 2 was made up of four items: 3, 4, 11, and 12, had an eigenvalue of 1.199, accounted for 10.0% of the variance, and assessed medication refilling (Kripalani, Risser, Gatti, and Jacobson, 2009). Furthermore, ARMS-Polish showed two factors during its validation process but with different item distribution. The latter showed that Factor 1 was made of ten items, had an eigenvalue of 6.672, accounted for 55.6% of the variance, and assessed the medication taking. The second factor was based on two items only (items 7 and 9), explained 22.4% of the variance, and described the patients' tendency to change medication dosages arbitrarily (Lomper et al, 2018). On the other hand, the EFA of ARMS-Korean extracted three factors. Both Factor 1 and 2, in ARMS-Korean, were made up of 5 items, accounting for 21.73% and 20.95% of the variance and representing the intentional non-adherence with taking medications & refilling of medicines and unintentional non-adherence to taking medications, respectively. Therefore, the third and last Factor was left with two items (items 4 and 12) that were expressed as 12.06% of the variance and assessed as the persistence with refilling medicine (Kim, Park, Schlenk, Kim, and Dim, 2016). Therefore, the results obtained in the analysis of the current study reflect the meticulous methods used for translation and cross-adaption by translational validity such as face and content validity.

The current study showed a Cronbach's α value of 0.839 for Domain 1 that assessed the intentional non-adherence to medication-taking and a Cronbach's α of 0.776 for Domain 2 that assessed the unintentional non-adherence to medication taking and medication refilling. Moreover, the reliability analysis results of the whole ARMS-A questionnaire showed a standardized Cronbach's alpha of 0.877. Since all previous alpha values were above 0.7, ARMS-A could be considered as having high internal consistency. This was consistent with the reliability analysis results from previous studies on translation of ARMS into non-English languages including Korean, Polish, and Turkey (Kim, Park, Schlenk, Kim, and Dim, 2016; Gokdogan and Kes, 2017; Lomper et al, 2018). However, among these values, ARMS-Polish took the highest Cronbach's alpha with a value of 0.954 (Lomper et al, 2018). By comparison, the current study, with an $\alpha = 0.877$, had a higher internal consistency than the original ARMS and ARMS-Korean with a Cronbach's alpha of 0.814 and 0.801, respectively (Kripalani, Risser, Gatti, and Jacobson, 2009; Kim, Park, Schlenk, Kim, and Dim, 2016). The finding in this study further confirmed both original and previously translated ARMS validation process in which the developers kept the number of items small and used a short number of categorical response that is based on a 4-point scale so that any patient regardless of his/her educational level could comprehend and respond easily.

5. CONCLUSION

The validity of ARMS-A demonstrated the reliability of this tool as an adherence measure to chronic medications. Nevertheless, further studies are needed to examine the performance of the instrument in different settings and to check its ability to evaluate the changes that might occur from interventions to improve the adherence to chronic medications.

6. ACKNOWLEDGEMENTS

The authors of the article would like to thank Dr. Kripalani and colleagues for the approval to use the original ARMS questionnaire.

REFERENCES

- Al-Ganmi A.H., Al-Fayyadh, S., Abd Ali, M., Alotaibi, A., Gholizadeh, L., Perry, L. (2018). Medication Adherence and Predictive Factors in Patients with Cardiovascular Disease: A Comparison Study between Australia and Iraq. *Australian College of Nursing, 26*(3), 235-253.
- Arafat, S., Chowdhury, H., Qusar, M., Hafez, M.. (2016). Cross-cultural Adapation and Psychometric Validation of Research Instruments: A Methodological Review. *Journal of Behavioral Health, 5*(3), 129-136.
- Beaton, D.E., Bombardier, C., Guillemin, F., Ferraz, M.B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine, 25*(24), 3186–3191.
- CMS (Centers for Medicare and Medicaid Services). (2015). Top 19 Chronic Diseases Worldwide. Retrieved January 18, 2021. Retrieved from www.cms.gov
- Costello, A.B., & Osborne, J.W. (2005). Best Practices in Exploratory Factor Analysis: Four Recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation, 10*(7), 1-9.
- Fischer, M., Stedman, M., Lii, J., Vogeli, C., Shrank, W., Brookhart, Weissam, J. (2010). Primary Medication Non-Adherence: Analysis of 195,930 Electronic Prescription. *Journal of General Internal Medicine, 25*(4), 284-290.
- Gokdogam, F., Kes, D. (2017). Validity and Reliability of the Turkish Adherence to Refills and Medications Scale. *International Journal of Nursing Practice, 23*(5), 12566.
- Hall, D., Domingo, S., Hamadche, L., Manchaiah, V., Thammaiah, S., Evans, C., Wong, L. (2018). A Good Practice Guide for Translating and Adapting Hearing-related Questionnaires for different Languages and Cultural. *International Journal of Audiology, 57*(3), 161-175.
- Haynes, R., McDonald, H., Garg, A. (2002). Helping Patients Follow Prescribed Treatment: Clinical Applications. *The Journal of the American Medical Association, 288*(22), 2880-2883.
- Jimmy, B., & Jose, J. (2011). Patient medication adherence: measures in daily practice. *Oman Medical Journal, 26*(3), 155–159.
- Kim, C.J., Park, E., Schlenk, E.A., Kim, M., Dim, D.J. (2016). Psychometric Evaluation of a Korean Version of the Adherence to Refills and Medications Scale (ARMS) in Adult with Type 2 diabetes. *Diabetes Educator, 42*(2), 188-198.
- Kripalani, S., Risser, J., Gatti, M.E., & Jacobson, T.A. (2009). Development and Evaluation of the Adherence to Refills and Medications Scale (ARMS) among low-literacy Patients with Chronic Diseases. *Value in Health, 12*(1), 118-123.
- Lam, W, & Fresco, P. (2015). Medication Adherence Measures: An Overview. *BioMed Research International*. 217047.
- Ledesma, R.D., & Mora, P.V. (2007). Determining the number of factors to retain in EFA: an easy-to-use computer program for carrying out parallel analysis. *Practical Assessment, Research, and Evaluation, 12*(2), 1-11.
- Lomper, K., Chabowski, M., Chudiak, A., Bialoszewski, Dudek, K., Jankoowska, B. (2018). Psychometric Evaluation of the Polish Version of the Adherence to Refills and Medications Scale (ARMS) in Adult with Hypertension. *Patient Preference and Adherence, 12*, 2661-2670.
- Lynn, M.R. (1986). Determination and Quantification of Content Validity. *Nursing Research, 35*(6), 382-385.
- Nguyen, T.M., La Caze, A., Corttel, N. (2014). What are validated self-report Adherence Scales really measuring?: a Systemic Review. *British Journal of Clinical Pharmacology, 77*(3), 427-445. - Morisky,

D.E., Ang, A., Krousel-Wood, M., Ward, H.J.. (2008). Predictive Validity of a Self-reported measure in an Outpatient Setting. *Journal of Clinical Hypertension* (Greenwich). 10(5):348-354.

- O'Connor, B.P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instrumentation, and Computers, 32,* 396-402.
- Osterberg, L., & Blaschke, T. (2005). Adherence to Medication. *The New England Journal of Medicine*, *353*(5), 487-497.
- Pages, N., Mangues, M., Masip, M., Gabriele, G., Fernandez, L., Blancafort, S., Tuneu, L. (2016). Patients' Perspective of Medication Adherence in Chronic Conditions: A Qualitative Study. *Advances In Therapy, 33*(10), 1740-1754.
- Parsian, N., & Dunning, T. (2009). Developing and Validating a Questionnaire to Measure Spirituality: A Psychometric Process. *Global Journal of Health Science, 11*(1), 1-11.
- Polit, D.F., & Beck, C.T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health, 29* (5), 489–97.
- Solomon, M.D., and Majumdar, S.R. (2010). Primary Non-adherence of Medications: lifting the veil on prescription-filling behaviors. *Journal of General Internal Medicine*, *25*(4). 280-281.
- Tabachnick, B.G., & Fidell, L.S. (2007). Using Multivariate Statistics. 5th Edition. Pearson Allyn and Bacon: Upper Saddle River, NJ, USA.
- Vrijens, B., De Geest, S., Hughes, D. A., Przemyslaw, K., Demonceau, J., Ruppar, T., Dobbels, F., Fargher, E., Morrison, V., Lewek, P., Matyjaszczyk, M., Mshelia, C., Clyne, W., Aronson, J. K., Urquhart, J., & ABC Project Team (2012). A new taxonomy for describing and defining adherence to medications. *British Journal of Clinical Pharmacology, 73*(5), 691–705**.**
- Wagner, A.K., Gandek, B., Aaronson, N.K., Acquadro, C., Alonso, J., Apolone, G., Bullinger, M., Bjorner, J., Fukuhara, S., Kaasa, S., Leplège, A., Sullivan, M., Wood-Dauphinee, S., Ware, J.E., Jr (1998). Cross-cultural comparisons of the content of SF-36 translations across 10 countries: results from the IQOLA Project. International Quality of Life Assessment. *Journal of Clinical Epidemiology, 51*(11), 925–932.
- WHO (World Health Organization). (2003). Adherence to Long-term Therapies: Evidence for Action. Geneva: World Health Organization.
- Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., Erikson, P., & ISPOR Task Force for Translation and Cultural Adaptation (2005). Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in health: the journal of the International Society for Pharmacoeconomics and Outcomes Research, 8*(2), 94–104.
- Zidan, A., Awaisu, A., El-Hajj, M., Al-Abdulla, Figueroa, D., Kheir, N. (2018). Medication-Related Burden among Patients with Chronic Disease Conditions: Perspectives of Patients Attending No Non-Communicable Disease Clinics in a Primary Healthcare Setting in Qatar. *Pharmacy, 6*(3), 85.
- Zun, A., Ibrahim, M., Mokhtar, A., Halim, A., Mansour, W. (2019). Translation, Cross-Cultural Adaptation, and Validation of the Hospital Consumer Assessment of the Healthcare Providers and Systems (HCAHPS) into the Malay Language. *International Journal of Environmental Research and Public Health, 16*(11), 2054.