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RESEARCH PAPER

Validity and reliability of the Turkish Adherence to Refills and Medications Scale

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Aims: The aim of the study was to create a Turkish version of the Adherence to Refills and Medications Scale (ARMS-7) and to examine its validity and reliability.

Methods: The sample of this methodological type study consisted of 100 Turkish patients with chronic disease. In the evaluation of data, the content validity index, Cronbach α, test-retest, item total score correlation, exploratory and confirmatory factor analyses, and adherence statistics were used.

Results: The scale's content validity index was 0.94, its Kendal W goodness-of-fit test was 0.188 (P = .246), its Cronbach α coefficient was 0.75, and its item total score correlation was between 0.32 and 0.59 (P < .001). The test-retest reliability was also satisfactory with interclass correlation coefficients higher than 0.75.

Conclusion: The Turkish version of the ARMS-7 is a reliable and valid instrument that can be used in the evaluation of attitudes to adherence to medications and refills based on self-reporting by the chronically ill.

KEYWORDS

adherence, medication adherence, reliability, validity

SUMMARY STATEMENT

What is already known about this topic?

- Measurement of medication adherence in chronic disease is important for assessment of treatment efficacy.
- Valid, reliable, and standardized measurement tools are needed to perform this assessment as quickly and conveniently as possible.
- No scale instrument exists in Turkey, which is adapted to the language and culture and which monitors the adherence to drug treatment of the chronically ill and those continuously using medications and the adequacy of their refilling prescriptions.

What this paper adds:

- It was determined that the Turkish ARMS-7 is a valid and reliable scale that can be used in the assessment of self-reported adherence to taking and refilling medications by patients with chronic illnesses, especially those whose literacy level is low.

The implications of this paper:

- The use of the ARMS-7 is recommended in the assessment of the effectiveness of treatment and care of first-stage health services or in the home environment, and in the assessment by nurses and other health professionals of adherence medication and or refilling of prescriptions.
- The use of the ARMS-7 will enable nurses and other health personnel to evaluate the adherence of the chronically ill to drug treatment and their adequacy in refilling prescriptions quickly, easily, and correctly.

1 | INTRODUCTION

Adherence to medication is an important part of patient care and obligatory for reaching treatment goal (Ho, Bryson, & Rumsfeld, 2009). The WHO defines adherence as "the extent to which the person's behaviour (including medication-taking) corresponds with agreed recommendations from a healthcare provider." It includes the initiation of the treatment, implementation of prescribed regime, and discontinuation of the pharmacotherapy (Brown & Bussell, 2011). Only 50% to 75% of patients are adherent to medication prescribed for the management of chronic illness (Kripalani, Risser, Gatti, & Jacobson, 2009). Nonadherence to treatment of chronic illnesses can cause a flare-up

in the illness, an increase in readmittance to hospital, a reduction in the patient's quality of life, and an increase in mortality (Baroletti & Dell'Orfano, 2010; Brown & Bussell, 2011; Ho et al., 2009; Kripalani et al., 2009). It has been shown in the literature that among the reasons for deliberately not adhering to treatment in chronic illness are having more than one chronic illness, using different treatments at the same time, experiencing side effects of drugs, beliefs concerning the illness and the treatment, difficulties in obtaining the prescription, low literacy level, a belief that the drugs are not safe, language differences, and cultural barriers (Baroletti & Dell'Orfano, 2010; Hsu, Mao, & Wey, 2010; Jimmy & Jose, 2011; Kripalani et al., 2009; Solomon & Majumdar, 2010). There are many ways of telling whether an individual is using the prescribed medicines. These methods can quickly, easily, and economical show whether that patient is adequately adhering to treatment and refilling prescriptions by examining for the presence in the patient's body of the drug itself, its metabolites, or other indicators in the blood, urine, or other bodily fluids, or by electronic drug monitoring, drug counting, pharmacy records, physician's examination, or the patient's own reporting, and by asking the patients questions using a valid and reliable self-report scale, which is adapted to the language and culture of the society. Different methods have been used to assess patient adherence to medication, as there is no single gold standard measurement of patient adherence to medication (Costa et al., 2015; Culling & Leppee, 2014; Lam & Fresco, 2015; Lavsa, Holzworth, & Ansani, 2011; Nguyen, Caze, & Cottrell, 2014; Scholtes, Terwee, & Poolman, 2011). In developing countries such as Turkey, information on patient adherence to medication is often derived from self-report instrument because self-report instruments are comprehensive, practical, and inexpensive (Culling & Leppee, 2014; Lam & Fresco, 2015; Lavsa et al., 2011; Nguyen et al., 2014). There are different scales to adherence to medication in the literature. Apart from adherence, they often aim at identification of inconvenience related, attitudes and beliefs about treatment, or the level of knowledge about the disease and its treatment (Costa et al., 2015; Culling & Leppee, 2014; Lam & Fresco, 2015; Stirratt, Dunbar-Jacob, & Crane, 2015). Some of these scales are hypertensive specific while the others are specific for the other disease (such as diabetes, psychosis, or HIV). These scales have a limited generalizability since it target patients' specific medication only. These scales measuring medication-taking behaviour do so through exploring the frequency of patient not refilling their prescription on time (Costa et al., 2015; Culling & Leppee, 2014; Lam & Fresco, 2015; Lavsa et al., 2011; Nguyen et al., 2014; Scholtes et al., 2011; Stirratt et al., 2015). Adherence to Refills and Medications Scale (ARMS-7) is such an instrument as it can assess both taking medication and refilling medication on schedule. ARMS-7 is the shortest, easiest to score and vary adaptable various groups of medication. A major advantage of the ARMS is its suitable for use among minority populations and patients with limited literacy skill, groups that appear to have level of adherence (Kripalani et al., 2009). ARMS-7 can easy to use in patient with chronic disease because limited literacy is very common problem in Turkey (Kripalani et al., 2009; Turkish Statistical Institute, 2016).

To the best of the author's knowledge, no scale instrument exists in Turkey, which is adapted to the language and culture and which monitors the adherence to drug treatment of the chronically ill and those continuously using medications and the adequacy of their refilling prescriptions. This study, by creating a Turkish version of the ARMS-7 and by testing its reliability and validity, will enable nurses and other health personnel to evaluate the adherence of the chronically ill to drug treatment and their adequacy in refilling prescriptions quickly, easily and correctly, and it is felt that this will make an important contribution to the nursing literature.

2 | METHODS

This study evaluated the psychometric properties of the Turkish version of ARMS-7 that was conducted in 2 phases. The aim of the first phase was to translate the original English version of the ARMS-7 into Turkish version and thereafter examine the semantic equivalent and content validity of the ARMS-7. The second phase aimed at examining the internal consistency, test-retest reliability, and factor structure of this translated assessment tool.

3 | TRANSLATION AND DEVELOPMENT OF THE ARMS-7

The scale was translated into Turkish by a member of the teaching staff who was an expert in internal medicine nursing and 2 experts in English. After this, the 3 translations were reviewed by the researchers and a single translation was obtained. This was then checked by an expert on the Turkish language for spelling and comprehensibility of statements. Retranslation from Turkish to English was performed by 2 people of foreign origin who knew both languages and who performed editorial work for journals; this was then compared with the original and approved as conforming (Devellis, 2016; Epstein, Santo, & Guillemin, 2015; Erdogan, Nahcivan, & Esin, 2015; Polit & Beck, 2009). In this way, the final form of the Turkish version was created and achieved language equivalence. When the scale was being used, it was seen that patients completed it without any difficulty or the need for help.

For the content validity of the scale, it was sent to 12 nursing teachers who were experts on the topic. The scores given by the experts to the scale items varied from 1 to 4. In assessing the comprehensibility of each question, they were asked to score 1 point for *not suitable*, 2 points for *somewhat suitable, but needs revision to make it suitable*, 3 points for *fairly suitable, but needs small revisions*, and 4 points for *completely suitable*. A scoring scale was used for language equivalence. When the experts were assessing the questions on the scale, the mean score for 7 questions was calculated as 3.70 ± 0.57 (2-4 points) of 4 points. In assessing the expert views, the content validity index (CVI) developed by Waltz and Bausell was used (Devellis, 2016; Erdogan et al., 2015; Polit & Beck, 2009; Zamanzadeh et al., 2015). The experts' mean scores were calculated as between 3.42 and 3.92. No item was removed from the scale on the grounds of content validity, as no item scored below 3 according to the experts' mean scores. The number of experts marking choices 3 and 4 was divided by the total number of experts, and in this way, the CVI of the item was obtained. Rather than compare this value with a statistical measure (Devellis, 2016; Erdogan et al., 2015; Polit & Beck, 2009; Zamanzadeh et al., 2015), 0.80 was accepted as a standard 7. Because the CVI for

the scale was found to be 0.94, the experts agreed not to make any fundamental changes or corrections to the questions. The Kendal W goodness-of-fit test was used for content validity (Devellis, 2016; Erdogan et al., 2015; Polit & Beck, 2009; Zamanzadeh et al., 2015), and the result of the test showed that agreement was reached between the experts (Kendall W = 0.188; P = .246). In this way, it is agreed that the statements on the scale were suitable for Turkish culture and that they represented what it was intended to measure.

4 | PSYCOMETRIC PROPERTIES TESTING

4.1 | Setting and participants

The study was conducted between May and June 2015. We selected a convenience sample of patients from a university hospital in the northwest of Turkey. The study data were collected using face-to-facequestionnaire with randomly selected 100 patients who had been admitted to the different clinics of the university hospital in different cities and provinces across Turkey. The inclusion criteria for the participants included the following: (1) age > 18 years, examined with one or more chronic disease, and following a chronic treatment for their diseases, duration of chronic disease 6 months or more, use one or more drugs, have no hearing, vision or mental problem, and have no evidence of current or past psychiatric illness. In accordance with the recommendation of 5 to 10 participants per questionnaire item for the assurance of the accuracy (Devellis, 2016; Erdogan et al., 2015; Polit & Beck, 2009; Zamanzadeh et al., 2015), in estimating the model parameters, minimum sample size 70 was needed for the 7-item ARMS-7. A total of 100 participants were selected to participate in this study eventually. For the purpose of test-retest, the data collection operation was repeated 2 weeks later by telephone with the same 100 people.

4.2 | Instruments

4.2.1 | Patient information form

This form contained open- and closed-ended questions on demographic details such as the patient's age, gender, marital status, educational level, people lived with and employment status, the presence of chronic illness, and the use of medications.

4.2.2 | Adherence to Refills and Medications Scale

The original scale, developed by Kripalani et al. (2009), consists of 12 items. The ARMS was developed to evaluate self-reported adherence to taking and refilling medications among patients with chronic disease. Items for the questionnaire were compiled with 2 subscales in mind—adherence with the filling or refilling of prescriptions and adherence with taking medication. The 8-item medication-taking subscale assesses a patient's ability to correctly self-administer the prescribed regimen. The 4-item prescription refill subscale assesses a patient's ability to refill medications on schedule. Kripalani recommended use of the reduced form of 7 items (Appendix I). It is reported that the scale can be used to establish of a medication adherence of chronically ill patients with a low level of literacy. The scale is of 4-way Likert type, and 1 of 4 choices *never* (1), *sometimes* (2), *often* (3), or *always* (4) has to be marked. The total score varies between 7 and 28. On the 4-item taking medication subscale, scores range from 4 to 16. On the 3-item refilling medication subscale, scores range from 3 to 12. Lower scores indicate better adherence. The general internal consistency value of the 12-item scale (Cronbach α = 0.81) was established as 0.79 for those with inadequate literacy and as 0.82 for those with literacy at adequate levels (Kripalani et al., 2009).

4.3 | Data analysis

Analysis and evaluation of the data collected was performed by computer using the programs SPSS 18.0 and LISREL 8.7 for confirmatory factor analysis (CFA). For the reliability of the ARMS-7, item-total score correlation and Cronbach α coefficient were used for item reliability in internal consistency analysis, and test-retest correlation was used for invariability of the scale against time (Alpar, 2014; Beavers et al., 2013; Erdogan et al., 2015; Grave & Cipher, 2017; Kalaycı, 2010; Schmitt, 2011; Sharma, 2014). Pearson correlation test was used in the item-total score correlation. The criterion for the coefficient of item-total score correlation was taken as above 0.30 (Erdogan et al., 2015; Grave & Cipher, 2017; Sharma, 2014). The test-retest reliability was evaluated using interclass correlation coefficient (ICC), and r > 0.75 suggested adequate stability (Grave & Cipher, 2017). For content validity, exploratory factor analysis (EFA) and CFA were used for the scale. In CFA, a value of ≤2 for chi-square goodness (χ^2/df) shows that the model fitted well; a root-mean-square error of approximation (RMSEA) of ≤0.08 and a P value of <.05 show that the fit is good; a standardized root-mean-square residual (SRMR) of <0.10 shows that there is a fit; and a comparative fit index (CFI), adjusted goodness-of-fit index (AGFI), non-normed fit index (NNFI), and goodness-of-fit index (GFI) of ≥0.90 show that there is a fit (Alpar, 2014; Beavers et al., 2013; Erdogan et al., 2015; Grave & Cipher, 2017; Schmitt, 2011; Sharma, 2014; Kalaycı, 2010).

4.4 | Ethical considerations

The necessary permission and cooperation were obtained from Kripalani, the developer of the scale, in writing on the Internet to adapt the original scale to Turkish. After obtaining the necessary permission to perform the research from the ethics committee and the university hospital where the study was conducted, information was given orally and in writing on the purpose and method of the study to the participants, and it was explained to them that their participation was voluntary.

5 | RESULTS

5.1 | Sample

The mean age of the patients with chronic diseases was 63.32 ± 9.45 (min = 42, max = 78) years, 61% were female, 83% were educated to primary school level, 90% were not working, and 63% had a medium income. In addition, the mean number of chronic diseases was 3.03 ± 0.91 (min = 1, max = 5). The mean number of drugs used was 4.67 ± 2.21. It was found that 78% of the patients forgot to take their medicine, 46% did not take their medicine, and 23% forgot to refill their prescriptions (Table 1).

TABLE 1 Sociodemographic and clinical characteristics of the sample (n = 100)

Variable	Frequency	Percentage
Sex		
Male	39	39.0
Female	61	61.0
Education level (y)		
Primary or less (<6)	83	83.0
Secondary (7-13)	6	6.0
Tertiary (>13)	11	11.0
Working status		
Working	10	10.0
Not working	90	90.0
Income rate		
Low	37	37.0
Medium/high	63	63.0
Chronic disease		
Hypertension	36	36.0
Hypertension/diabetes	18	18.0
Hypertension/ischaemic heart disease	8	8.0
Hypertension/diabetes/heart failure	12	12.0
Hypertension/diabetes/ nephropathy	22	22.0
Diabetes/peripheral vascular disease	4	4.0

5.2 | Internal consistency and reliability

The item-total score correlations ranged from 0.32 to 0.59 ($P < .001$). The Cronbach α for the full 7-item scale was 0.75, which demonstrated good internal consistency. For taking medication subscale, Cronbach α was 0.73, and the item-total correlations ranged from 0.32 to 0.56. For refilling medication, Cronbach α was 0.65, and the item-total correlations ranged from 0.35 to 0.58. The stability of the instrument was supported by ICCs over time (Grave & Cipher, 2017): total score ICC: 0.80, taking medication subscale ICC: 0.76, and refilling medication subscale ICC: 0.77 (Table 2).

5.3 | Validity analysis

According to the results of EFA, Kaiser-Meyer-Olkin (KMO) test was found to be 0.75. The Bartlett test was significant with 179.958 (SD = 21; $P < .001$). The necessary conditions were met, and so no items were removed in this study, and the 7 items in the original scale were kept. Two factors were obtained by principal component factor analysis whose eigenvalue exceeded 1 and whose total variance was 59.36%. Factor 1 had an eigenvalue of 2.965 and explained 42.36% of the variance. It contained 4 items that assessed adherence to taking medications correctly. Factor 2 had an eigenvalue of 1.190 and accounted for 17.00% of the variance. It contained 3 items that assessed adherence to refilling medication on schedule. The factor correlation varied between 0.57 and 0.84, and so all items were found to be above the 0.40 taken as a reference value for EFA (Beavers et al., 2013; Grave & Cipher, 2017; Schmitt, 2011; Sharma, 2014). Factor load, eigenvalue, explanatory variance, percentage, and Cronbach α coefficient are given for the ARMS-7 on the factor analysis (varimax rotation) table (Table 2).

5.4 | Factor structure

In the initial analysis, an adherence was shown with a χ^2/df value of 2.61, RMSEA = 0.11, SRMR = 0.07, CFI = 0.91, AGFI = 0.83, NNFI = 0.86, and GFI = 0.92. In the final analysis, similar values were obtained, except that there was an improvement in RMSEA (Table 3).

6 | DISCUSSIONS

In this study, significant findings were obtained—that the ARMS-7 had adequacy, validity, and reliability and that it could be used with the chronically ill in the case of Turkey. The internal consistency and invariability characteristics of the scale were examined regarding reliability. To determine that the scale measured the same characteristic and that it was internally consistent, the Cronbach α reliability coefficient and the item-total score correlation coefficient were used. The Cronbach α coefficient of the ARMS-7 was found to be 0.75 in our study. The

TABLE 2 Internal consistency (item-to-total correlation and Cronbach α coefficients), test-retest reliability, and exploratory factor analysis of the ARMS-7

Domin	EFA Factor Loading (n = 100)	Item-Total Correlation (n = 100)	Cronbach α (n = 100)	Interclass Coefficient
Factor 1: 2.965				
42.36%				
Factor 1: Taking medication			0.73	0.76
Item 2	0.77	0.56		
Item 3	0.72	0.59		
Item 4	0.73	0.56		
Item 6	0.57	0.32		
Factor 2: 1.190				
17.00%				
Factor 2: Refilling medication			0.65	0.77
Item 1	0.75	0.58		
Item 5	0.58	0.53		
Item 7	0.84	0.35		
Over score			0.75	0.80

Abbreviations: ARMS-7, Adherence to Refill and Medications Scale–Turkish; EFA, exploratory factor analysis.

TABLE 3 Adherence indices for confirmatory factor analysis

Analysis	χ^2	$\chi^2/_{df}$	RMSEA	SRMR	CFI	AGFI	NNFI	GFI
Initial	29.39	2.61	0.113	0.074	0.91	0.83	0.86	0.92
Final	28.01	2.15	0.108	0.078	0.92	0.84	0.86	0.93

Abbreviations: χ^2/df, chi-square goodness; AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; NNFI, non-normed fit index; RMSEA, root-mean-square error of approximation; SRMR, standardized root-mean-square residual.

calculated reliability coefficient of 0.70 and above was seen to be sufficient for the reliability of the test scores (Alpar, 2014; Grave & Cipher, 2017; Kalaycı, 2010; Sharma, 2014). In the findings of the work to develop the original scale and to reduce the items, a Cronbach α coefficient of 0.82 was found for those with a high level of literacy and 0.79 for those with a low level of literacy (Kripalani et al., 2009). According to the Cronbach α coefficient, it was found that the scale was as reliable as the original and the items on the scale were consistent with each other.

The item-total score correlation coefficient was examined regarding which items were suitable and which needed to be changed. A low item-total score correlation is a factor that lowers reliability because it measures a different characteristic, and so the item-total score correlation coefficient must be larger than 0.30, and items that do not conform to this rule must be removed from the scale (Alpar, 2014; Grave & Cipher, 2017; Kalaycı, 2010; Sharma, 2014). In our study, item-total score correlation coefficients varied between 0.32 and 0.59 ($P < .001$), and so none were removed from the scale. In the work on the original scale, the item-total score correlation coefficient varied between (Kripalani et al., 2009) 0.34 and 0.59, so that the items were similar to our study, and it was felt that internal consistency was high.

The ICC test was used to examine the test-retest correlation to be able to give consistency results on the fitting of the scale and to determine that is showed temporal invariance. The value obtained for reliability must be greater than 0.75 (Alpar, 2014; Grave & Cipher, 2017; Kalaycı, 2010; Sharma, 2014). The result from 100 participants demonstrated satisfactory test-retest reliability for the overall scale and all subscale, indicating the stability of the instrument in measuring the constructs. In the work of Kripalani et al. (2009), it was reported that the test-retest correlation coefficient (Spearman coefficient) in the study was 0.69 ($P < .001$). According to this, it may be thought that the interval of 3 months in the research design of the original scale work raises the reliability level of applying test-retest in our study at an ideal interval like 2 weeks. According to this finding, it can be stated that none of the ARMS-7 items shows temporal variance with the total. In Kripalani et al.'s (2009) study, the Rapid Estimate of Adult Literacy in Medicine (REALM) scale was used and those with an educational level of ≤12th grade were assessed as inadequate in their literacy levels, while those with a level of >12th grade were assessed as adequate.

Internal consistency and factor analysis were applied separately to inadequately and adequately literate patients with the hypothesis that the scale would remain partially stable according to the literacy level. Internal consistency was found to be as high in the inadequately literate group (Cronbach α = 0.73) as in the adequately literate group (Cronbach α = 0.83) (Kripalani et al., 2009). It was also found that item-total score correlation showed good internal consistency according to literacy level 6. In our study, 83% of patients had an educational level of ≤6th grade (primary school), so that it can be said that in ARMS-7 validity-reliability sampling, most of them fell into the inadequate literacy group.

According to the results of EFA, the KMO value was found to be 0.75. The Bartlett test was significant with 179.958 (SD = 21; $P < .001$) (Alpar, 2014; Bevers et al., 2013; Kalaycı, 2010; Schmitt, 2011). To test the validity of the ARMS-7 structure and to determine the factors showed that the sample taken was sufficient to determine the factor. As well as a sample size of 100 to 200 being seen as sufficient to perform factor analysis, it is recommended that in calculating sample size, the number of individuals should be greater than the number of variables, and that for each variable, there should be at least 10 (Devellis, 2016; Erdogan et al., 2015; Polit & Beck, 2009; Zamanzadeh et al., 2015). As the scale has 7 items, a 70-person sample is sufficient, so that the condition was fulfilled with a sample of 100 people.

In factor calculation, the eigenvalue was used. An eigenvalue is the total variance explained by a factor. To determine the number of factors, the factors with an eigenvalue greater than 1 according to the normalization of KMO were taken (Alpar, 2014; Bevers et al., 2013; Kalaycı, 2010; Schmitt et al., 2011). According to EFA, the scale showed a structure of 7 items and 2 factors. The 2 factors on the scale formed 59.36% of the total variance. However, high the variance rates are, because the factor structure of the scale is just as high, variance of between 40% and 60% that is accepted as adequate in the social sciences (Alpar, 2014). In the original work, 2 factors explained 45.1% of the total variance (Kripalani et al., 2009).

Factor load, which is one of the model parameters, shows whether items are relevant to the concept structure. The factor load value is a coefficient that explains the relationship of the items with the factors. A lower limit value for factor load of >0.30 is desired (Alpar, 2014; Grave & Cipher, 2017; Kalaycı, 2010; Sharma, 2014). Item loads (0.57-0.84) being higher than the reference value (0.40) and the value in the original scale (Kripalani et al., 2009) (0.42-0.75) according to factor analysis show that the ARMS-7 Turkish scale fits with the factor structure of the original scale. Although the factor structure and number of ARMS-7 completely fitted the original structure of the scale (Kripalani et al., 2009), the distribution of items under the factors was found not to conform to the original scale structure. The reason for this is thought to be the difference in the number of items for factor analysis of the original 12-item scale, the higher factor loads in our study, and the difference created by the research being performed on different cultures.

In scale adaptation work, goodness-of-fit statistics must be at the desired level in CFA (Alpar, 2014; Beavers et al., 2013; Erdogan et al., 2015; Grave & Cipher, 2017; Kalaycı, 2010; Schmitt, 2011; Sharma, 2014). Examining the fit indices of ARMS-7 in our study, the χ^2/df value (2.61 and 2.15) was found to be ≤3, the SRMR (0.07 and 0.07) value was ≤0.08, and CFI (0.91 and 0.92) and GFI values (0.92 vs 0.93) were ≤0.90. To determine to what extent the factors accorded with the real data, it was confirmed that there was a generally "acceptable" fit in the result of the first DFA, that the acceptable fit value of SRMR obtained in the last model was better than the fit in the first model, that there was an acceptable fit, and that there was a 2-factor structure.

6.1 | Limitation

The convenience sampling used in our study might limit the generalizability of results. Unlike in the original work, no scale was used in our study to determine literacy. On the other hand, it can be said that because 83% of the sample in the study to adapt the ARMS-7 to Turkish was formed from those who had inadequate literacy (≤6 years of education/primary school), it is a scale that can be reliably and validly used with adults whose literacy is inadequate. Future studies might be conducted to examine the applicability of ARMS-7 in other disease groups.

7 | CONCLUSION

It was determined that the Turkish ARMS-7 is a valid and reliable scale that can be used in the assessment of self-reported adherence taking and refilling medication by patients with chronic illnesses, especially those whose literacy level is low.

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AUTHOR CONTRIBUTIONS

FG contributed to acquisition of data, drafted data of this study, and drafted the manuscript. DK contributed to the conception and design, interpreted the statistical analysis, critically reviewed the manuscript, and supervised the whole study process. All authors read and approved the final manuscript.

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APPENDIX I

TURKISH FORM OF ADHERENCE TO REFILL AND MEDICATIONS SCALE—ARMS-7-TR

I will now ask you how often you actually miss taking your medicines. There are no right or wrong answers. For each question, please answer "none of the time," "some of the time," "most of the time," or "all of the time."

None	Some	Most	All	All
1. How often do you forget to take your medicine?	1	2	3	4
2. How often do you decide not to take your medicine?	1	2	3	4
3. How often do you forget to get prescriptions filled?	1	2	3	4
4. How often do you run out of medicine?	1	2	3	4
5. How often do you miss taking your medicine when you feel better?	1	2	3	4
6. How often do you miss taking your medicine when you feel sick?	1	2	3	4
7. How often do you plan ahead and refill your medicines before they run out?	1	2	3	4