Menopause Rating Scale: Psychometric properties of Iranian version

CURRENT STATUS: UNDER REVIEW

BMC Women's Health  ▪  BMC Series

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DOI: 10.21203/rs.3.rs-22800/v1

SUBJECT AREAS
- Preventive Medicine  - Internal Medicine

KEYWORDS
Menopause Rating Scale, health related quality of life, psychometric properties, validity, reliability
Abstract
Background
To measure the severity of menopausal complaints and determine the pattern of menopause symptoms, a valid and reliable instrument is needed in health care settings for women. Menopause Rating Scale (MRS) is one of the best known instruments that were invented in response to the lack of standardized scales. This study examines its psychometric properties in Iran.

Methods
Participants were randomly selected from women referring to healthcare centers in Miandoab, West Azerbaijan, Iran. A total of 330 questionnaires were completed (response rate 96.9). Two sample sizes were considered for analysis in validation process. Exploratory Factor Analysis (EFA) was conducted on the first sample \( n_1 = 165 \) and confirmatory factor analysis (CFA) was done by using a second study sample \( n_2 = 165 \). The internal consistency reliability and test-retest reliability was calculated to complete psychometric properties process.

Results
EFA with Principal Component Analysis (PCA) extracted three factors explaining 75.47% cumulative variance. CFA confirmed the three-factor structure of the MRS with 11-items. All fit indices proved to be good. The relative chi-square \((\chi^2/df)\) was equal to 3.686 \((p < .001)\). The RMSEA of the model was .04 \((90\% CI = .105-.150)\). All comparative indices of the model, including Comparative Fit Index (CFI), Normed Fit Index (NFI); and Relative Fit Index (RFI) were more than .80 (.90, .87, and .80, respectively). Cronbach’s alpha for the overall scale was .931 whereas the alpha for the subscales ranged from 0.705-0.950. Intra class correlation was .91 \((95\% CI = .89-.93), p < 0.001\).

Conclusion
This study indicates that the Persian-MRS is a valid and reliable scale. This instrument as a screening tool could be used to identify the pattern of symptoms among menopausal, peri-menopausal, and post-menopausal women in need to care and educate them on how to deal with the symptoms.

Introduction
Menopause is defined as the time in a women’s life when there has been no menstrual periods for 12 consecutive months without any pathologic reason [1]. Although menopause is a normal and natural physiological process of the women life, it has several negative effects on their lives [2, 3] while they
are spending about one-third of their lifetime after menopause [4]. Strong evidences have shown the negative impact of menopausal symptoms on health related quality of life (HRQOL) [5–7]. Almost women experience several symptoms such as hot flushes, sweats, sleep disorders, depression and vaginal dryness. The onset of these symptoms may be more severe enough to influence their normal daily activities and cause to seeking to health care and treatment [8]. Thus, health care professionals should be aware of these menopause symptoms.

To measure the severity of menopausal complaints and determine the pattern of menopause symptoms, a valid and reliable instrument is needed in health care settings for women. Menopause Rating Scale (MRS) is one of the best known instruments that was invented in response to the lack of standardized scales [9]. MRS has been developed for cross-cultural comparisons of menopausal symptoms related to HRQOL and is available in more than 10 languages. It has been adopted in the German, Switzerland, Spain, France, Mexico/Argentina, Turkey, Brazil, Indonesia [10], China [11], and Sri Lanka [12]. The MRS scale consists of 11 items within three dimensions including somato-vegetative, psychological, and urogenital. Response to each of eleven symptoms can get 0 (no symptom) to 4 (sever symptom) based on the severity of the symptoms perceived by the women. We selected this questionnaire because it is short and easy to use, so, this study examines its psychometric properties in Iran. We thought this probably allows applying the scale in both epidemiological and outcome studies and could provide opportunity for future studies to work and compare MRS related to HRQOL among Iranian women and women living in other countries.

Methods
Participants and study design
In this validity and reliability study, we used a secondary analysis of data from a larger study of determining the menopausal pattern with a sample of Iranian women (Miandoab, West Azerbaijan, Iran). Participants were menopausal women who randomly selected and recruited form health centers by using SIB (an abbreviation for Persian integrated health system) of household health files in 2018 from 1 September to 30 November. SIB is an Electronic Health Records (HER) has been created for all Iranian within health information system [13]. SIB database was screened by a trained research
assistant to recognize women aged 20 and over. The initially screened women randomly selected and contacted by telephone for eligibility. Menopausal women with 45–65 years of age were included; and women with: a) having mental and cognitive disorders, b) musculoskeletal disabilities, and c) surgical conditions were excluded of the study.

Menopausal status was defined based on the classification of stages of Reproductive Aging Workshop (STRAW) [14] which is cessation of menstruation within the previous 12 months after last menstruation.

The study questionnaire
Menopause Rating Scale (MRS) is an 11-item instrument consisting of three dimensions: somatic symptoms (4 items), psychological symptoms (4 items), and urogenital symptoms (3 items) [9]. 1) Somatic domain includes: hot flushes, heart discomfort, joint and muscular discomfort, and sleep problems; 2) psychological domain includes: depressive mood, irritability, anxiety, and physical and mental exhaustion; and 3) urogenital domain includes: sexual problems, bladder problems, and dryness of vagina. Possible answers were based on the severity of symptoms in five-likert scale (0 = none, 1 = mild, 2 = moderate, 3 = severe, 4 = very sever). The total severity (ranged from the minimum of 0 to the maximum of 44) was determined by adding the scores of the three subscales.

Demographics information including age, education, occupation, marital status, menstruation age, menopausal age and obstetrics history were gathered.

Translation
The MRS has been adapted to measure menopausal symptoms for use in the Iranian women population; however the MRS has not been validated in Iranian women. The questionnaire probably is affected by the context when they are used in different culture. So, the research group used the backward translation [15]. Two bilingual in Persian (the Iranian language) and English health professionals independently translated the English version of the MRS into Persian. Then, a member of research team (MM) produced the consolidated forward version. If there were differences between two translated versions, the problem was resolved through discussion with translators to obtain a provisional forward translation. In case, there was substantial disagreement, a third independent
translator was invited for more decision. Next, Two independent translators with English mother tongue and without previous knowledge of the questionnaire translated the questionnaire back to English to assess the comparability with the original English version and ensure that there were no discrepancies.

Face and content validity
In this study, qualitative face validity was implemented. A sample of menopausal women (n = 8) were asked to assess the scale and give feedback for improvement. This process led to some changes in the wording of the scale. The provisional Persian version of MRS was evaluated by an expert panel. The relevance and appropriateness of items to Iranian women culture and context were reviewed by three professors in midwifery, three in health education, one gynecologist, and one psychologist. The items’ Content Validity Index (CVI) was evaluated by the expert panel through a four-point scale: 4 = “very relevant,” 3 = “relevant with some adjustment to phrasing,” 2 = “only relevant if the phrasing is strongly adjusted and 1 = “irrelevant.” They also provide information to help improve wording of each item. If an expert panel member rated any item less than 4, so they were asked to have recommendations for modifying of the item. According to recommendation of World Health Organization (WHO), the CVI scales’ score greater than 0.79 was used for confirmation of content validity [16]. For the face validity and clarity, the pre-final version of questionnaire was evaluated with 10 menopausal women with the same characteristics of the main study. Similar to the original MRS, it was resulted in no deletion of items and the Persian version of MRS contained 11 items.

Sample size
In order to estimate an optimal sample size, 15 respondents in to one variable ratio was used [17]. The sample size was calculated by multiplying the number of variables in the MRS questionnaire (11 items) with 15 respondents and it was estimated 165. Two sample sizes were considered for analysis in validation process. The data of the first sample (n₁ = 165) were used for exploratory factor analysis (EFA). The data of the second sample (n₂ = 165) were used for cross-validation of the confirmatory model derived from sample1 data. So, 330 eligible participants were invited to the study and a total of 325 menopausal women completed the questionnaires (response rate 96.9). Table 1 provides
descriptive characteristics of the participants for the two samples.

Statistical analysis

The analyses were performed using the statistical program SPSS for Windows version 23.0 and Amos 24.0. Socio demographic characteristics of the participants in validation process are shown in Table 1 as frequencies (percentages or mean and standard deviation). The Kaiser-Meyer-Olkin (KMO) was used for investigation of suitability of the respondent data for factor analysis. The principal component analysis with varimax rotaion was used for extraction in factor analysis where there were loading criteria of 0.4 or more. The used fit indices included Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMSR). Cut-off points for inferring adequate fit indices were set at (CFI > 0.95; TLI > 0.95; Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMSR) with acceptable values of zero to one.

Results

Construct validity

The assessed KMO was 0.855; (P < 0.0001), and Bartlett’s test of sphericity was significant (χ² = 1146.18, p < 0.0001), that verified the appropriateness of the sample within the acceptable range for a well-specified model. Principal component analysis (PCA) revealed the presence of three factors with Eigen value exceeding 1, explaining cumulative variance of 75.47% with varimax rotation in the rotated component matrix and screen plot are show in Figure. 1.

All items loaded highly (> 0.50) on their respective factors except item sexual problems, which were loaded on psychological factors. Items 1–4 (heart discomfort, joint and muscular discomfort, sleep problems, and hot flushes/sweating) which correspond to somatic symptoms saturated in to a single factor (factor 1) without cross loading items. It was named somatic factors same in the original scale. Items 5–9 (anxiety, irritability, depressive mood, physical and mental exhaustion, and sexual problems) saturated in to a single factor (factor 2) without cross loading items that was named psychological factors as in the original scale. Also, items 10–11 (bladder problems and dryness of vagina) saturated in to a single factor (factor 3) without cross loading items which was named urogenital factors same in the original scale (Table 2).
CFA was conducted on the 11-items MRS scale to assess the fitness of the model obtained from the EFA. Figure 2 shows the best model fit. Fit indexes were calculated through using covariance matrixes. All fit indices proved to be good. The relative chi-square ($\chi^2$/df) was equal to 3.686 ($p < .001$). The RMSEA of the model was .04 (90% CI = .105–.150). All comparative indices of the model, including CFI, NFI, and RFI were more than .80 (.90, .87, and .80, respectively).

Reliability
To measure reliability the internal consistency, the Cronbach's alpha was calculated. The Cronbach's alpha coefficient for MRS was .931 that was showed a high internal consistency and ranged from 0.705–0.950 for three subscales; somatic, psychological and urogenital symptoms; .84, .89, and .90, respectively.

Test-retest analysis was conducted to test the stability of the MRS scale. The results indicated satisfactory results. Intra-class correlation (ICC) was .91 (95% CI = .89-.93). ICC for somatic symptoms subscales was (ICC = .84, 95% CI = .79-.87), for psychological symptoms was (ICC = .89, 95% CI = .86-.91), and for urogenital symptoms was (ICC = .90, 95% CI = .86-.92).

Discussion
This study aimed to evaluate psychometric properties of the Iranian version of the MRS. We revealed that the Persian version of the MRS presents sound psychometric properties of validity and reliability that are concordant with previous MRS validation studies [10–12]. Similar as the original study, a 3-factor structure was generated for the MRS which explained of 75.47% of the total variance from EFA which was greater than the first MRS where three factor model accounted for 58.8 of the total variance [9], though the items included in our study had only an exceptions. In our study, factor 1 was somatic symptoms included 4 items, factor 2 psychological symptoms included 5 items, and factor 3 urogenital symptoms included 2 items. One urogenital symptom (sexual problems) saturated with psychological symptoms. It seems that women in our study might be misclassified in symptoms and arranged sexual problems as psychological symptoms because of cultural considerations [18]. Parallel to our validation study, a prior study have been reported similar misclassification of menopause symptoms among Sinhalese women [12] where they were unable to distinguish physical
and mental exhaustion as psychological symptoms. In other validation studies, musculoskeletal problems were loaded in both Somatic and urogenital subscales \cite{19, 20}, or sleep disorders were loaded in psychological symptoms while bladder problems were loaded in somatic symptoms in a study from China \cite{11}.

The CFA was used to examine whether the hypothesized model identified from EFA fit the data. Results of CFA supported the three-factor model of Persian-MRS. EFA and CFA revealed an excellent construction for the Persian-MRS. Because of the availability of data, we were able to use EFA and CFA on two different data sets from the same sample.

In terms of reliability consistent with other studies \cite{11, 20, 21}, both the internal consistency and test-retest reliability were demonstrated to be good. The Cronbach’s alpha for the Persian-MRS was 0.931, indicating a high level of internal consistency. This value indicates high correlations among items of the Persian-MRS.

Moreover, we believe that these satisfactory results of psychometric properties of the Persian-MRS may be particularly valuable to be used in health care settings when menopause symptoms were assessed. The MRS is a well-defined menopausal symptoms self-rating scale that requires only a few minutes to complete and it has sufficient potential to be used in health care settings.

**Conclusion**

This study indicates that the Persian-MRS is a valid and reliable scale. It is a concrete and informative instrument can be used to assess the menopausal symptoms and their severity. More specially, this instrument as a screening tool could be used to identify the pattern of symptoms among menopausal, peri-menopausal, and post-menopausal women in need to care and educate them on how to deal with the symptoms.

**Abbreviations**

SPSS: statistical package for social science software package, MRS: Menopause Rating Scale, HRQOL: Health related quality of life, EFA: Exploratory factor analysis, CFA: confirmatory factor analysis, ICC: Intra-class correlation coefficient, KMO: Kaiser-Meyer-Olkin test, PCA principal component analysis, Comparative Fit Index (CFI), Normed Fit Index (NFI); and Relative Fit Index (RFI)

**Declarations**
**Ethical approval**

Informed written consent was obtained from all participants. The study received ethical approval from the Ethics Committee of Tabriz University of Medical Sciences (NO: IR.TBZMED.REC.1397.932).

**Consent to publish**

Not applicable.

**Availability of supporting data**

The data collection tools and datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

**Competing interest**

The authors declare that they have no competing interest.

**Funding**

There is no funding source.

**Authors’ contribution**

LJ is the supervisor of the study, design the study and wrote the draft. RB conducted requirements for study design. MK analyzed the data and contributed to write the first draft of manuscript. MM contributed to the study design. All authors read and approved the paper.

**Acknowledgments**

We acknowledge the contributions of Tabriz University of Medical Sciences, Tabriz, Iran for providing facilities to the study. Also, we express our deep appreciation and sincere thanks to Prof. Lawrence W. Green for his comments and suggestions on an earlier draft of the manuscript.

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Tables
Table 1 characteristics of the study participants (n=160)
| Characteristics          | EFA sample (n=160) Number (%) | CFA sample (n=165) Number (%) |
|--------------------------|--------------------------------|--------------------------------|
| **Age**                  |                                |                                |
| 45-50                    | 107 (66.9)                     | 107 (64.8)                     |
| 51-55                    | 40 (25)                        | 45 (27.3)                      |
| 56-60                    | 13 (8.1)                       | 13 (7.9)                       |
| **Education**            |                                |                                |
| Illiterate               | 44 (27.5)                      | 38 (23.0)                      |
| Primary school           | 72 (45.0)                      | 38 (23.0)                      |
| Secondary school         | 10 (6.3)                       | 14 (8.5)                       |
| Diploma                  | 21 (13.1)                      | 22 (13.3)                      |
| University               | 13 (8.1)                       | 21 (12.7)                      |
| **Marriage status**      |                                |                                |
| Married                  | 154 (96.3)                     | 160 (97.0)                     |
| Single/ Widowed/ Divorced| 6 (3.7)                        | 5 (3.0)                        |
| **Number of pregnancy**  |                                |                                |
| 0                        | 7 (4.4)                        | 3 (1.8)                        |
| 1-3                      | 52 (32.5)                      | 65 (39.4)                      |
| ≥4                       | 101 (63.1)                     | 97 (58.8)                      |
| **BMI (Mean, SD)**       | 30.13 (4.7)                    |                                |
| ≤ 18.49                  | 2 (1.3)                        | 1 (0.6)                        |
| 18.5-24.9                | 26 (16.3)                      | 38 (23.0)                      |
| 25-29.9                  | 47 (29.4)                      | 62 (37.6)                      |
| ≥30                      | 85 (53.2)                      | 62 (37.8)                      |

Table 2 Exploratory factor analysis of the MRS
| Item no. | Item                                      | Correlation coefficient |
|---------|-------------------------------------------|-------------------------|
|         | Somatic symptoms                          | Psychological symptoms  |
| 1       | Heart discomfort                          | 0.793                   |
| 2       | Joint and muscular discomfort             | 0.777                   |
| 3       | Sleep problems                            | 0.748                   |
| 4       | Hot flushes, sweating                     | 0.713                   |
| 5       | Anxiety                                   | 0.877                   |
| 6       | Irritability                              | 0.860                   |
| 7       | Depressive mood                           | 0.766                   |
| 8       | Physical and mental exhaustion            | 0.656                   |
| 9       | Sexual problems                           | 0.501                   |
| 10      | Bladder problems                          | 0.8                     |
| 11      | Dryness of vagina                         | 0.8                     |

*Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.*

**Note Regarding Figures**

Figures 1 and 2, mentioned on pages 9 and 16, were omitted by the authors in this version of the paper.