

Correlation between the modified Kupperman Index and the Menopause Rating Scale in Chinese women

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Background: The severity of menopausal symptoms can vary according to ethnicity and geography. Two common menopausal symptom scales, the modified Kupperman Index (KI) and the Menopausal Rating Scale (MRS), are accepted internationally. In this study, we evaluated the correlation between these scales and their relevance to women in the People's Republic of China.

Methods: We enrolled treatment-naïve women who visited the menopause outpatient department at a major teaching hospital in Shanghai, People's Republic of China. The women were required to complete two questionnaires, ie, the modified KI and the MRS. We assessed the correlation between the tools using a correlation analysis.

Results: We enrolled 277 women of average age 51.5 ± 4.8 years. There was a strong positive correlation between total scores on the modified KI and the MRS (0.74, 95% confidence interval 0.69–0.79) and subscores for the somatic and psychological domains (0.74 and 0.77, respectively), with a moderate correlation for urogenital symptoms. According to the modified KI, 15 (5.4%) women were categorized as asymptomatic, and when using the MRS, 33 (11.9%) were categorized as asymptomatic. Women categorized as having none/minimal symptoms by the MRS were diagnosed as having mild to severe symptoms using the modified KI. The highest agreement (74%) was found when symptoms were moderate.

Conclusion: The modified KI and the MRS do correlate in Chinese women, but the modified KI is more likely to identify menopausal symptoms than the MRS in screening if there is doubt about the diagnosis of menopause.

Keywords: Kupperman Index, Menopause Rating Scale, cross-sectional study, People's Republic of China

Introduction

Menopause is defined as the end of menstruation and fertility, occurring 12 months after the last menstrual period.^{1,2} It typically occurs in women who have reached middle age and beyond, although bilateral oophorectomy will induce menopause at a younger age. The gradual or sudden cessation of estradiol and progesterone production by the ovaries impacts many tissues, from brain to skin. Women may experience physical, emotional, and urogenital symptoms, with a significant impact on their daily personal, professional, and social lives.^{3,4} With economic development and an improvement in nutrition and living conditions, women are living for 20–30 years in a postmenopausal state.⁵ The average life expectancy of women in People's Republic of China is 77 years,⁶ and women generally enter menopause around 49 years of age.⁷ There are currently 120 million menopausal women in People's Republic of China, and this number is expected to reach 280 million in 2030.⁸ Given that the severity of menopausal symptoms

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impacts a woman's quality of life,⁸ it is important to be able to monitor menopausal symptoms accurately.

The Kupperman Index (KI)⁹ and the Menopause Rating Scale (MRS)^{10,11} are widely used internationally, including in People's Republic of China, and their role in clinical practice is well established. In European settings, the correlation between these two scales appears to be strong (correlation coefficient [r] = 0.91).^{12,13} However, given that the prevalence and severity of psychological, somatic, and urogenital symptoms may vary according to ethnicity, culture, and region,^{14,15} it is important to evaluate such symptom assessment tools in a local context. Therefore, we undertook this study to assess the degree of correlation between the MRS^{10,11} and the modified KI¹ in women in Shanghai, People's Republic of China.

Materials and methods

We conducted a cross-sectional study at the Department of Gynecology, the Sixth Affiliated People's Hospital of Shanghai Jiao Tong University, Shanghai, People's Republic of China, between April 2010 and October 2011. We enrolled women newly attending the outpatient clinic who were naïve to treatment with hormone replacement therapy or any traditional Chinese medicine indicated for menopause. Patients with known mental disorders were excluded. The study was approved by the ethics review board of the hospital and each participant provided their written informed consent prior to participation.

During the survey, all participants were required to fill in a demographic form that included information on age, education, income, marital status, occupation, menopausal status, and disease history. Menopausal status was categorized as perimenopause (climacteric transition with irregular menses) and menopause (last menstrual period at least 12 months prior to the survey). Each participant was also required to complete the Chinese version of the MRS (<http://www.menopause-rating-scale.info/languages.htm>) and the modified KI.¹

The order in which each participant completed the MRS and modified KI was entirely at random. Two experienced interviewers (SHF and LCB) provided all the surveys, and answered any questions raised by the participants.

The MRS consists of 11 items categorized into three subscales, ie, sweating/hot flushes, heart discomfort, sleep problems, joint and muscle problems, categorized as somatovegetative symptoms; depressive mood, irritability, anxiety, and physical/mental exhaustion, categorized as psychological symptoms; and sexual problems, bladder problems, and vaginal dryness, categorized as urogenital symptoms. Severity was rated and scored as none (0 points), mild (1 point),

moderate (2 points), severe (3 points), and very severe (4 points). The total score possible ranges from 0 to 44. Scores ranging from 0–4, 5–8, 9–15, and 16+ were used to rate the perceived menopausal symptoms as none/minimal, mild, moderate, and severe, respectively.^{10,16}

The modified KI^{1,17} consists of 13 items (see Appendix A). In addition to the same 11 items included in the original KI,⁹ the modified version adds urogenital symptoms, including urinary infection and sexual complaints. The original 11 items included sweating/hot flushes, palpitation, vertigo, headache, paresthesia, formication, arthralgia, and myalgia (categorized as somatic symptoms), and fatigue, nervousness, and melancholia categorized as psychological symptoms. A scale ranging from 0 to 3 points is used to describe the severity of the complaints. The weighting factors were the same as those used in the original KI, and provide two points for both urogenital symptoms. The total score ranges from 0 to 63, calculated as the sum of all items by the weighting factor. Scores ranging from 0–6, 7–15, 16–30, and >30 were used to rate the degree of severity as none, mild, moderate, and severe, respectively.¹

Statistical analysis

Numerical data were analyzed with descriptive methods and are expressed as the mean and standard deviation as well as the minimum, 5th percentile, 25th percentile, median, 75th percentile, 95th percentile, and maximum. Categorical variables included education, income, employment, marriage, and menopausal status. Differences between the modified KI and MRS were compared based on categorical variables. The unpaired Student's *t*-test was used for normally distributed data and the Mann–Whitney *U* test was used for skewed data. Spearman's rank correlation was performed to estimate the relationship between the modified KI and the MRS, and their subscores. Agreement regarding severity categorized by the two scales was calculated by the kappa score. The StatsDirect statistical package (<http://www.statsdirect.com>, Manchester, UK) was used for the analysis. A *P* value < 0.05 was considered to be statistically significant.

Results

A total of 279 women agreed to participate in the study, but only 277 (99.3%) completed the questionnaires (note that two women did not complete the MRS, so were excluded from the analysis). The demographic characteristics of the 277 study participants are provided in Table 1. The mean age of the women was 51.5 ± 4.8 years and most (195, 70.4%) ranged from 45 to 55 years of age. The age of natural menopause

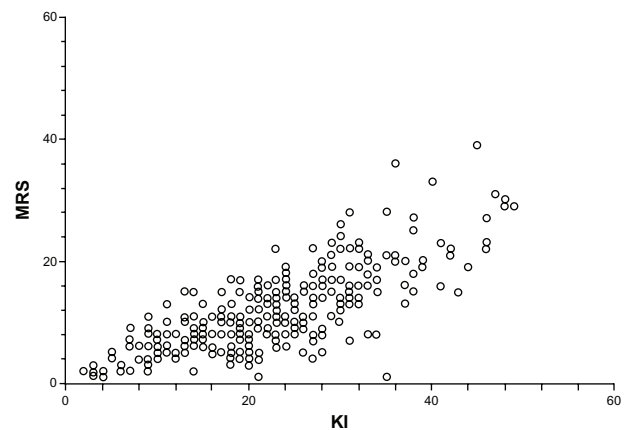
Table 1 Characteristics of the 277 study participants

| Characteristics | n | % |
|-----------------------------------|-----|------|
| Age group (years) | | |
| <45 | 30 | 10.8 |
| 45–55 | 195 | 70.4 |
| >55 | 52 | 18.8 |
| Marital status | | |
| Married | 272 | 98.2 |
| Divorced | 3 | 1.1 |
| Widowed | 1 | 0.4 |
| Never married | 1 | 0.4 |
| Occupational status | | |
| Employed | 126 | 45.5 |
| Unemployed | 11 | 4.0 |
| Pensioner | 140 | 50.5 |
| Educational status (years) | | |
| <10 (primary school) | 64 | 23.1 |
| 10–15 (middle school) | 122 | 44.0 |
| >15 (university) | 90 | 32.5 |
| Missing | 1 | 0.4 |
| Income (RMB/per month) | | |
| <3000 | 161 | 58.1 |
| 3000–5000 | 71 | 25.6 |
| >5000 | 43 | 15.5 |
| Missing | 2 | 0.8 |
| Menopause status | | |
| Perimenopause | 107 | 38.6 |
| Menopause | 169 | 61.0 |
| Natural menopause | 125 | 74.0 |
| Surgical menopause | 44 | 26.0 |
| Missing | 1 | 0.4 |
| History of disease | | |
| Obesity | 6 | 2.2 |
| Hypertension | 36 | 13.0 |
| Metabolic disorder | 10 | 3.6 |
| Diabetes mellitus | 18 | 6.5 |

Abbreviations: RMB, Ren Min Bi (currency of People's Republic of China).

was 50.7 ± 3.3 years. Two hundred and seventy-two (98.2%) of the women were married.

The MRS score ranged from 1 to 39, with a mean of 12.04 ± 6.82 . The modified KI score ranged from 2 to 49, with a mean of 22.58 ± 9.93 . Spearman's rank correlation coefficient (Rho) for the MRS and modified KI was 0.74 (95% confidence interval [CI] 0.69–0.79, Figure 1), indicating a strong positive correlation. Positive correlations were also found in the subscales for somatovegetative symptoms and psychological symptoms (0.74 and 0.77, respectively), and

Scatter plot of total score from KI and MRS**Figure 1** Correlation between the MRS and the KI using Spearman's rank correlation coefficient.

Note: Rho = 0.74; 95% confidence interval for Rho (Fisher's Z-transformed) 0.69–0.79.

Abbreviations: KI, Kupperman Index; MRS, Menopause Rating Scale.

a moderately positive correlation was found in the subscales for urogenital symptoms (0.61, Table 2). The correlation coefficient was not affected by age, occupational status, education, or menopausal status.

The minimum, 5th percentile, 25th percentile, median, 75th percentile, 95th percentile and maximum for the KI and MRS and their subscores are listed in Table 3. Participants are categorized according to symptom severity (normal, mild, moderate, severe) on both scales in Table 4. The kappa score was 0.38 (95% CI 0.30–0.46) and the strength of agreement was considered to be “fair”. According to the modified KI, 15 (5.4%) of the women were asymptomatic, while 33 (11.9%) were asymptomatic according to the MRS. Nineteen women categorized as having none/minimal symptoms by the MRS, were assessed to have mild to severe symptoms when using the modified KI, and of 54 women diagnosed as having mild symptoms on the KI, 16 (29.6%) were categorized as having moderate symptoms on the MRS. Of 65 women diagnosed as having mild symptoms on the MRS, 36 (55.4%) were diagnosed as having moderate to severe symptoms on the KI. These data indicate a difference between the MRS and the modified KI, with the highest agreement (74%) found when symptoms

Table 2 Correlation between the modified KI and MRS

| | Total score | Somatic symptoms | Psychological symptoms | Urogenital symptoms |
|----------------|--------------|------------------|------------------------|---------------------|
| MRS mean (SD) | 12.04 (6.82) | 5.0 (2.82) | 4.45 (3.45) | 2.61 (2.29) |
| KI mean (SD) | 22.58 (9.93) | 14.19 (6.92) | 4.68 (2.81) | 3.79 (3.16) |
| Rho value | 0.74 | 0.74 | 0.77 | 0.61 |
| 95% CI for Rho | 0.69–0.79 | 0.68–0.79 | 0.72–0.82 | 0.53–0.68 |

Abbreviations: KI, Kupperman Index; MRS, Menopause Rating Scale.

Table 3 Descriptive statistics using the KI and MRS and their subscores

| | MRS | | | | KI | | | |
|-----------------|------------------|------------------------|---------------------|-------|------------------|------------------------|---------------------|-------|
| | Somatic symptoms | Psychological symptoms | Urogenital symptoms | Total | Somatic symptoms | Psychological symptoms | Urogenital symptoms | Total |
| Minimum | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 5th percentile | 1 | 0 | 0 | 3 | 2 | 1 | 0 | 6 |
| 25th percentile | 3 | 2 | 1 | 7 | 9 | 3 | 2 | 16 |
| Median | 5 | 4 | 2 | 11 | 14 | 5 | 4 | 22.5 |
| 75th percentile | 7 | 7 | 4 | 16 | 19 | 7 | 6 | 29 |
| 95th percentile | 11 | 11 | 7 | 24 | 26 | 10 | 10 | 41 |
| Maximum | 13 | 16 | 12 | 39 | 33 | 12 | 15 | 49 |

Abbreviations: KI, Kupperman Index; MRS, Menopause Rating Scale.

were moderate, and the same results were obtained in the subgroup of patients aged 45–55 years.

When the categories of none/minimal and mild symptom severity were combined (KI score range 0–15 and MRS score range 0–8), more women (98 versus 69) were diagnosed as having none/minimal to mild symptoms on the MRS, whereas 45 of the 98 women were diagnosed as having moderate to severe symptoms on the KI, and 16 of the 69 women were diagnosed as having moderate to severe symptoms on the MRS.

In Table 5, total scores for the modified KI and MRS are listed independently according to the variables that might be involved. Our results show that modified KI scores were higher in less well educated women ($P = 0.038$) including postmenopausal women ($P = 0.034$), while higher MRS scores were found in women who had undergone surgical menopause ($P = 0.003$).

Discussion

We investigated the correlation between the MRS and the modified KI in a treatment-naïve Chinese population with access to a hospital outpatient menopause clinic. We found a good relationship between total scores on these two menopause symptom scales as well as subscores for the psychological and somatic domains.

The original KI has been used for several decades to assist the physician's summary of the severity of

climacteric complaints.¹⁸ However, it has been criticized for including some nonspecific items, such as headache and vertigo, that are thought to be of little practical relevance, and for not including urogenital symptoms, which are now thought to be common in menopausal women.^{12,19} The MRS, on the other hand, uses standardized scales to measure the severity of symptoms of aging and the impact of these symptoms on health-related quality of life. Several studies have indicated that the MRS is more user-friendly and relevant than the KI in European populations,^{18,20} although the correlation between these two scales appears to be excellent in western countries.^{12,13} However, it has been observed that Asian and Arabic women have fewer and less severe menopausal symptoms than their western counterparts.^{14,21,22}

The modified KI used in our study is updated from the original index and is widely used in People's Republic of China.^{1,17} Compared with the MRS, the criteria of the KI are believed to be more objective, especially the scoring system, in which quantitative indicators are used. In addition, the modified version adds urogenital symptoms in the form of sexual complaints and urinary infection, and so overcomes the limitations of the original KI. In a small study reported earlier, the correlation between the modified KI and MRS was 0.78 in a Chinese population.²³ In our study, we obtained a similar correlation (Rho 0.74), and did further analyses to examine the differences between these tools. We found

Table 4 Comparison of the modified KI and the MRI based on severity classification in all participants

| KI | MRS | | | | | | | |
|------------------|--------------------|--------|------------|--------|-----------------|--------|--------------|--------|
| | None/minimal (0–4) | | Mild (5–8) | | Moderate (9–15) | | Severe (>15) | |
| | n | % | n | % | n | % | n | % |
| None (0–6) | 14 | 42.42 | 1 | 1.54 | 0 | 0.00 | 0 | 0.00 |
| Mild (7–15) | 10 | 30.30 | 28 | 43.08 | 16 | 15.38 | 0 | 0 |
| Moderate (16–30) | 8 | 24.24 | 33 | 50.77 | 77 | 74.04 | 35 | 46.67 |
| Severe (>30) | 1 | 3.03 | 3 | 4.61 | 11 | 10.58 | 40 | 53.33 |
| Total | 33 | 100.00 | 65 | 100.00 | 104 | 100.00 | 75 | 100.00 |

Abbreviations: KI, Kupperman Index; MRS, Menopause Rating Scale.

Table 5 Comparison of the modified KI and MRS based on different factors

| Variable | MRS mean (SD) | KI mean (SD) |
|------------------------|---------------|---------------|
| Age (years) | | |
| <45 | 11.33 (6.32) | 20.23 (11.5) |
| 45–55 | 11.93 (6.73) | 22.69 (9.69) |
| >55 | 12.85 (7.47) | 23.56 (9.88) |
| Occupation | | |
| Employed | 11.80 (6.81) | 21.93 (10.0) |
| Laid off | 10.73 (4.94) | 21.82 (10.27) |
| Pensioner | 12.35 (6.99) | 23.24 (9.88) |
| Education | | |
| <10 years (primary) | 13.58 (8.03) | 24.66 (10.90) |
| 10–15 years (middle) | 11.82 (6.61) | 22.62 (9.92) |
| >15 years (university) | 11.31 (6.02) | 21.17 (9.05)* |
| Income (RMB/month) | | |
| <3000 | 12.48 (7.32) | 23.13 (10.29) |
| 3000–5000 | 11.35 (5.76) | 22.49 (9.51) |
| >5000 | 11.77 (6.59) | 20.67 (9.22) |
| Menopausal status | | |
| Perimenopause | 11.16 (6.38) | 20.36 (10.60) |
| Menopause | 12.64 (7.03) | 24.05 (9.25)* |
| Natural menopause | 11.64 (6.66) | 23.35 (9.39) |
| Surgical menopause | 15.53 (7.35)* | 26.02 (8.61) |

Note: * $P < 0.05$.

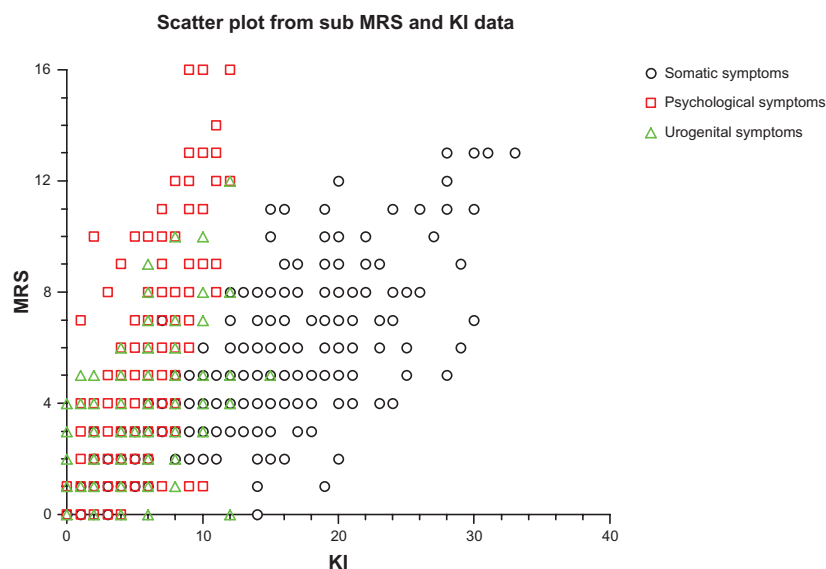
Abbreviations: KI, Kupperman Index; MRS, Menopause Rating Scale; SD, standard deviation; RMB, Ren Min Bi (currency of People's Republic of China).

that the MRS was more likely to categorize as none/minimal symptoms which had been classified as moderate to severe using the modified KI. When combining none/minimal and mild (KI 0–15, MRS 0–8) we also found that more women were diagnosed as none/minimal to mild with the MRS

than with the KI. One of the possible explanations for this difference is that somatic symptoms are more common in Asian women, especially hot flushes and sweating,⁷ which are thought to be the most important menopausal symptoms and have a 4-point weighting score on the modified KI. Therefore, the modified KI would be more likely to identify these menopausal symptoms on screening of Chinese women. Use of the KI for self-evaluation should be beneficial for patients in monitoring their symptoms and seeking help from health care providers as necessary. It may also help practitioners to determine the severity of symptoms and provide appropriate treatment. However, given that our study was conducted only in treatment-naïve women at their initial visit to a menopause clinic, the results do not provide any evidence of treatment effectiveness, which may be another reason to use these scales.

Our study found a strong correlation between subscores for the somatic and psychological domains, but a moderate correlation for urogenital symptoms. This is relevant considering that most women were in early menopause (1–2 years), during which vasomotor symptoms are the most common symptoms, while urinary genital symptoms usually appear during middle menopause (2–5 years) in the Chinese population.⁷

We also tested for differences between total scores obtained on the MRS and the modified KI independently based on each variable, and found the modified KI was related to menopausal status and education. In addition to a detailed explanation of its rating system, the potential reasons for this might be related to the Chinese setting, where less

**Figure 2** Correlation between subscores on the MRS and KI.

Notes: ○ Somatic symptoms, $Rho = 0.74$ (0.68–0.79); □ psychological symptoms, $Rho = 0.77$ (0.72–0.82); △ urogenital symptoms, $Rho = 0.61$ (0.53–0.68).

Abbreviations: KI, Kupperman Index; MRS, Menopause Rating Scale.

well educated women do not have much knowledge about menopause and their symptoms might be severe when they finally seek medical advice.

In conclusion, we found that the modified KI and the MRS correlate well in Chinese women. However, there is some discrepancy when they are used to diagnose menopause, with the modified KI being more likely than the MRS to identify symptoms of menopause when used for screening of Chinese women.

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Disclosure

The authors report no conflicts of interest in this work.

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Appendix

Table A1 Modified Kupperman Index¹

| Name: | | Date | | | | | |
|---|------------------|----------------|---------------------------|--|--|-----------|----------------|
| Which of the following symptoms apply to you at this time? Please provide the raw score according to the severity of each symptom. For symptoms that do not apply, please fill in “0” | | | | | | | |
| Symptoms | Weighting factor | Severity scale | | | | Score | |
| | | 0 | 1 | 2 | 3 | Raw score | Weighted score |
| Sweating | ×4 | None | <3 times/day | 3–9 times/day | ≥10 times/day | | |
| hot flushes | | | | | | | |
| Paresthesia | ×2 | None | Relationship with climate | Feel tingling, burning, pricking, or numbness frequently | Lose sense of warm and pain | | |
| Insomnia | ×2 | None | Once in a while | Frequent need sleeping pill | Affects life and work | | |
| Nervousness | ×2 | None | Once in a while | Frequent | Frequent, cannot control | | |
| Melancholia | ×1 | None | Once in a while | Frequent, can self-control | Losing faith in life | | |
| Vertigo | ×1 | None | Once in a while | Frequent | Affects daily life | | |
| Fatigue | ×1 | None | Once in a while | Feel difficult when climbing the 4th floor | Affects daily life | | |
| Arthralgia, myalgia | ×1 | None | Once in a while | Frequent, not affecting function | Affects function | | |
| Headache | ×1 | None | Once in a while | Frequent | Requires treatment | | |
| Heart palpitation | ×1 | None | Once in a while | Frequent, not affecting daily life | Requires treatment | | |
| Formication | ×1 | None | Once in a while | Frequent | Requires treatment | | |
| Sexual complaints | ×2 | Normal | Reduced libido | Sexual problems | Loss of libido | | |
| Urinary tract infection | ×2 | None | Once in a while | More than 3 times per year, not requiring medication | More than 3 times per year, needing medication | | |

Notes: Raw score, severity score of each symptom; weighted score, raw score × weighting factor; total score, sum of the weighted score. Classification of the modified Kupperman Index is "no complaint" (total score 0–6), "mild" (total score 7–15), "moderate" (total score 16–30), or "severe" (total score > 30).

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