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## Assessment of sexual activity and menopausal symptoms in middle-aged Chinese women using the Menopause Rating Scale

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### ABSTRACT

**Objectives:** This study aimed to assess sexual activity and menopausal symptoms in middle-aged Chinese women and to correlate this with their vaginal maturation status (VMS).

**Methods:** 120 women aged 45–60 years were assigned to four groups: premenopause (Pre-M), perimenopause (Peri-M), early postmenopause (Post-EM), and late postmenopause (Post-LM). The menopausal symptoms were assessed using the Menopause Rating Scale. VMS was determined using the vaginal maturation index (VMI) and pH value. Sexual activity including sexual frequency and distress was measured using self-administered questionnaires.

**Results:** A high proportion (48.2%) of Post-LM women reported low sexual frequency, and a high proportion (24.2%) of Peri-M women reported sexual distress. Physical/mental exhaustion and sexual problems were the most prevalent symptoms, followed by sleeping problems and hot flushes/sweating rated as severe or very severe. Physical/mental exhaustion and sexual problems became more frequent as menopausal stages progressed ( $p < 0.05$  and  $p < 0.01$ , respectively). Hot flushes/sweating was more prominent in women in the Peri-M and Post-EM groups. The Post-LM group exhibited lower VMI and higher pH values than the Pre-M and Peri-M groups ( $p < 0.017$  and  $p < 0.001$ , respectively), and pH was positively correlated with sexual problems ( $r = 0.298$ ,  $p < 0.01$ ).

**Conclusions:** Advancing menopausal status is associated with prevalent physical/mental exhaustion and sexual problems in middle-aged Chinese women. Hot flushes/sweating is among the most frequent menopausal symptoms rated as severe or very severe. In addition, urogenital symptoms are correlated with pH in these women.

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### KEYWORDS

Menopausal symptoms;  
Menopause Rating Scale;  
sexual activity; Chinese  
women; middle-aged;  
vaginal maturation status

### Introduction

Menopausal symptoms are common during and after the menopausal transition<sup>1</sup>. These symptoms mainly result from a progressive decline in ovarian estrogen production and may be somatic, psychological, and sexual<sup>2,3</sup>. Their frequency and severity are associated with several factors, including age, lifestyle, marital and socioeconomic status, general health, and menopausal status<sup>4</sup>.

In middle-aged Chinese women, the prevalence of menopausal symptoms, particularly hot flushes, has been reported to be low in previous studies using general or menopause-specific quality-of-life questionnaires<sup>5,6</sup>. However, many more middle-aged women in China are now aware of menopause-related symptoms than ever before<sup>7,8</sup>. Despite this, the current usage rate of menopausal hormone therapy remains low and is often used only in the short term<sup>8,9</sup>. Sexual activity may decline during and after the menopausal transition<sup>10</sup>. This decline in sexual activity may be partially attributed to a reduced level of estrogen, which plays a central role in awareness and receptivity of sexual activity and the vaginal

maturation status (VMS)<sup>11,12</sup>. The vaginal maturation index (VMI) and vaginal pH are objective measures of the estrogen effect (EE) on the vaginal epithelia<sup>13</sup>. China is a nation with a long history of conservatism, and Chinese individuals, particularly females, are reluctant to discuss sexual topics<sup>14</sup>. Hence, studies investigating sexual activity and menopausal symptoms among middle-aged Chinese women are lacking. We conducted a cross-sectional study to compare sexual activity and the frequency and severity of menopausal symptoms using the Menopause Rating Scale (MRS) among middle-aged Chinese women at different menopausal stages. We also evaluated the association between menopausal symptoms, particularly urogenital symptoms, and VMS among these women.

### Methods

#### Participants

Middle-aged women who visited our gynecology outpatient clinic at the First Affiliated Hospital of Dalian Medical

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 Supplemental data for this article can be accessed [here](#).

**Table 1.** Sociodemographic characteristics of the women in the four groups.

	Pre-M group (n = 14)	Peri-M group (n = 33)	Post-EM group (n = 46)	Post-LM group (n = 27)
Age (years)	47.4 ± 2.1	50.0 ± 2.7	53.6 ± 3.2	59.0 ± 2.4
Education level				
Junior high school	5 (35.7)	13 (39.4)	22 (47.8)	14 (51.9)
Senior high school	5 (35.7)	11 (33.3)	17 (37)	12 (44.4)
College/above	4 (28.6)	9 (27.3)	7 (15.2)	1 (3.7)
Work status				
Employed	10 (71.4)	21 (63.6)	18 (39.1)	3 (11.1)
Retired/housewives	4 (28.6)	12 (36.4)	28 (60.9)	24 (88.9)
Place of residency				
Rural	4 (28.6)	5 (15.2)	8 (17.4)	2 (7.4)
Urban	10 (71.4)	28 (84.8)	38 (82.6)	25 (92.6)
Parity	1.00 ± 0.0	0.95 ± 0.31	1.13 ± 0.40	1.26 ± 0.53 <sup>a</sup>
Delivery mode				
Vaginal	14 (100)	32 (97)	44 (95.7)	22 (81.5)
Caesarean section	0 (0)	1 (3)	2 (4.3)	5 (18.5)
Physical activity (1–2/week)				
Yes	3 (21.4)	12 (36.4)	15 (32.6)	15 (55.6)
No	11 (78.6)	21 (64.6)	31 (67.4)	12 (44.4)
Hypertension				
Yes	1 (7.1)	3 (9.1)	5 (10.9)	4 (14.8)
No	13 (92.9)	30 (90.9)	41 (89.1)	23 (85.2)
BMI (kg/m <sup>2</sup> )				
<18.5	1 (7.1)	1 (3)	3 (6.5)	0 (0)
18.5–24.9	9 (64.3)	22 (66.7)	30 (65.2)	17 (63)
>25	4 (28.6)	10 (30.3)	13 (28.3)	10 (37)

Values are presented as either mean ± standard deviation or number (%). BMI, body mass index; Peri-M, perimenopause; Post-EM, early postmenopause; Post-LM, late postmenopause; Pre-M, premenopause.

Significant differences in age ( $p < 0.001$ ), work status age ( $p < 0.001$ ), and parity ( $p < 0.05$ ) among the groups.

<sup>a</sup> $p < 0.01$  compared to the Peri-M group.

University for routine checkups or common gynecological disorders were recruited for participation in this study. Exclusion criteria were cardiac, hepatic, and renal disorders, malignancy, cognitive dysfunction, and psychological and psychiatric disorders. All women were married, had completed at least primary education, had an intact uterus and ovaries, and had not received menopausal hormone therapy or herbal medicine for relief of menopausal symptoms. None were smokers or drinkers. In total, 120 women (mean age  $53.1 \pm 4.7$  years) participated in this study (see [Supplementary file S1](#) for a schematic diagram and [Supplementary file S2](#) for its legends). All participants provided written informed consent prior to participation.

### Study design

This study was a cross-sectional survey. Participants aged 45–60 years were recruited, classified into different age groups (45–50 years, 51–55 years, and 56–60 years)<sup>11</sup>, and assigned to four groups according to their menstrual status, defined according to the stages of the Reproductive Ageing Workshop (STRAW)<sup>15</sup>. The women were assigned to the premenopause group (Pre-M,  $n = 14$ ) if they had regular menstrual cycles, the perimenopause group (Peri-M,  $n = 33$ ) if they had variable menstrual cycles, the early postmenopause group (Post-EM,  $n = 46$ ) if they had experienced amenorrhea for at least 12 months but less than 5 years, and the late postmenopause group (Post-LM,  $n = 27$ ) if they had experienced amenorrhea for  $\geq 5$  years ([Supplementary file S1](#)). All participants were interviewed by the same investigator and completed a general questionnaire ([Supplementary file S3](#)) including demographic information, body weight/height and sexual activity, including sexual frequency, sexual distress

defined as negative feelings and anxiety surrounding one's sexual activity, and verbal communication about sexual matters during the previous month. Vaginal smears and pH values were obtained to evaluate VMS ([Supplementary file S4](#))<sup>11</sup>. The MRS, which has been validated in Chinese women, was adopted to assess the menopausal symptoms<sup>16</sup>. This study was approved by the ethical committee of the First Affiliated Hospital of Dalian Medical University.

### Menopause Rating Scale

The MRS is a menopause-specific health-related quality-of-life scale initially developed to measure the severity of menopause-related complaints. It has recently been used to assess menopausal symptoms in different populations across Europe and North America<sup>17</sup>. The MRS is a self-administered questionnaire consisting of 11 symptoms divided into three subscales: somatic, psychological, and urogenital including sexual problems (changes in sexual desire and satisfaction) and bladder problems (frequent urination and bladder incontinence) ([Supplementary file S5](#)). Details of this scale and its validation in Chinese women are published elsewhere<sup>16</sup>.

### Statistical analysis

Quantitative values are expressed as the mean ± standard deviation or median and quartile range based on their distribution. Analysis of variance, followed by Bonferroni tests, was performed to analyze the differences among the groups. Repeated-measures analysis of covariance was performed to adjust for the confounding effects of age and work status on the MRS scores. The qualitative data are presented as percentages. A chi-square test, followed by pairwise

**Table 2.** Information regarding sexual activities of the women in the four groups.

	Pre-M group (n = 14)	Peri-M group (n = 33)	Post-EM group (n = 46)	Post-LM group (n = 27)
Sexual frequency				
1–2 episodes/week	6 (42.9)	11 (33.3)	15 (32.6)	4 (14.8)
1–2 episodes/month	7 (50)	18 (54.6)	20 (43.5)	10 (37)
<12 episodes/year	1 (7.1)	4 (12.1)	11 (23.9)	13 (48.2) <sup>a,b</sup>
Sexual distress				
Yes	1 (7.1)	8 (24.2) <sup>c,d</sup>	2 (4.3)	1 (3.7)
No	13 (92.9)	25 (75.8)	44 (95.7)	26 (96.3)
Verbal communication				
Yes	5 (35.7)	18 (54.5)	15 (32.6)	12 (44.4)
No	9 (64.3)	15 (45.5)	31 (67.4)	15 (55.6)

Values presented as number (%). Peri-M, perimenopause; Post-EM, early postmenopause; Post-LM, late postmenopause; Pre-M, premenopause.

Significant differences in sexual frequency and distress among the groups ( $p < 0.05$ ).

Bonferroni corrected  $p = 0.013$ .

<sup>a</sup> $p = 0.019$  compared to the Pre-M group.

<sup>b</sup> $p = 0.007$  compared to the Peri-M group.

<sup>c</sup> $p = 0.009$  compared to the Post-EM group.

<sup>d</sup> $p = 0.03$  compared to the Post-LM group.

comparisons, was performed to compare the differences among the four groups. A Spearman's correlation test was performed to analyze the correlations between the MRS scores and VMS (VMI and pH value).  $p < 0.05$  was considered statistically significant.

## Results

Among the 120 women, the proportions of women in the Pre-M, Peri-M, Post-EM, and Post-LM groups were 11.7%, 27.5%, 38.3%, and 22.5%, respectively. The sociodemographic characteristics of the women are presented in Table 1. Statistically significant differences in age and work status were observed among the four groups of women ( $p < 0.001$ ). Parity significantly differed among the women in the four groups ( $p < 0.05$ ) and was higher in the women in the Post-LM group than in the women in the Peri-M group ( $p < 0.05$ ). Approximately 7–14% of the women in each group were prescribed medications to treat hypertension. The groups were comparable in the other demographic factors. The husband-related health status was comparable among the groups (data not shown).

Information regarding the sexual activity of the women is presented in Table 2. The proportion of women reporting a higher frequency of sexual activity (1–2 episodes per week) gradually decreased from the Pre-M to Post-LM groups whilst a low frequency of sexual activity (<12 episodes per year) gradually increased as the women progressed through the menopausal stages ( $p < 0.05$ ). A significant difference was observed between the women in the Post-LM group and those in the Pre-M ( $p = 0.019$ ) and Peri-M ( $p = 0.007$ ) groups. The frequency of sexual distress significantly differed among the women in the four groups ( $p < 0.05$ ). The women in the Peri-M group were more likely to report experiencing sexual distress than those in the Post-EM and Post-LM groups ( $p = 0.009$  and  $p = 0.03$ , respectively). The Bonferroni corrected  $p$ -value in the post hoc analyses was  $p = 0.013$ . Approximately 50% of the women in each group did not discuss sexual matters with their husbands.

The proportion of women who reported any degree of any menopausal symptom was 97%, with 59.2% rating at

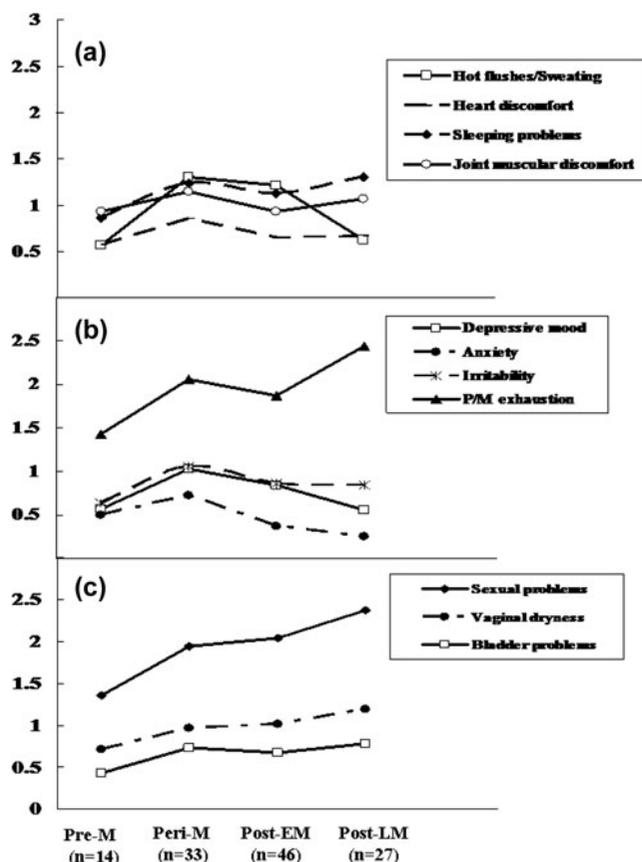
least one symptom as severe or very severe. The most frequent symptoms were physical and mental (P/M) exhaustion, sexual problems as defined in the genitourinary syndrome of the menopause, and sleeping problems. Of note, hot flushes and sweats were the most frequent symptoms described as severe or very severe whilst joint muscular discomfort was more frequent overall (Table 3). The proportion of women presenting severe total MRS scores was 20.8%, and the proportions of women presenting severe somatic, psychological, and urogenital subscale scores were 3.9%, 15.8%, and 49.2%, respectively.

The MRS scores are presented in Supplementary file S6. The total mean scores of the women in the Peri-M group were higher than those in other groups ( $p = 0.09$ ). Scores on the urogenital subscale gradually increased in the women from the Pre-M to Post-LM stages ( $p < 0.05$ ). According to the Bonferroni tests, the difference between the Post-LM and Pre-M groups was significant ( $p < 0.05$ ), and a similar trend was observed between the Post-EM and Pre-M groups ( $p = 0.16$ ). Analysis of covariance was performed to adjust for age and work status, after which the significant difference in the urogenital subscale scores in the four groups was maintained ( $p < 0.05$ ).

The MRS scores of the 11 individual menopausal symptoms were analyzed across the menopausal groups (Figure 1). The joint muscular discomfort, sleeping problems, vaginal dryness, and bladder problems scores were slightly lower in the Pre-M group than those in the other groups. According to the Bonferroni analyses, the P/M exhaustion scores were higher in the Post-LM group than those in the Pre-M group ( $p < 0.01$ ) (Figure 1b) whilst sexual problems (as defined in genitourinary syndrome of the menopause) scores were higher in the postmenopausal groups than those in the Pre-M group ( $p < 0.01$  and  $p < 0.05$ , respectively) (Figure 1c). However, the scores of the remaining symptoms in the Peri-M and Post-EM groups were slightly higher (Figure 1). The hot flushes/sweating and anxiety scores reached significance among the four groups ( $p < 0.05$ ) respectively (Figure 1a, 1b). After Bonferroni analyses, the anxiety score in the Peri-M group tended to be higher than that in the Post-LM group ( $p = 0.056$ ).

**Table 3.** Frequency and severity of menopausal symptoms in 120 middle-aged women.

Menopausal symptom	Any degree, n (%)	Severe (n)	Very severe (n)	Severe + very severe (%)
<b>Somatic</b>				
Hot flushes, sweating	66 (55.0)	19	2	17.5
Heart discomfort	73 (60.8)	4	0	3
Sleeping problems	77 (64.2)	22	0	18.3
Joint muscular discomfort	88 (73.3)	6	0	5
<b>Psychological</b>				
Depressive mood	64 (53.3)	6	1	5.8
Irritability	74 (61.7)	8	0	6.7
Anxiety	44 (36.7)	6	0	5
Physical and mental exhaustion	111 (92.5)	48	2	41.7
<b>Urogenital</b>				
Sexual problems	116 (96.7)	32	1	27.5
Vaginal dryness	74 (61.7)	12	0	10
Bladder problems	64 (53.3)	2	0	0.8



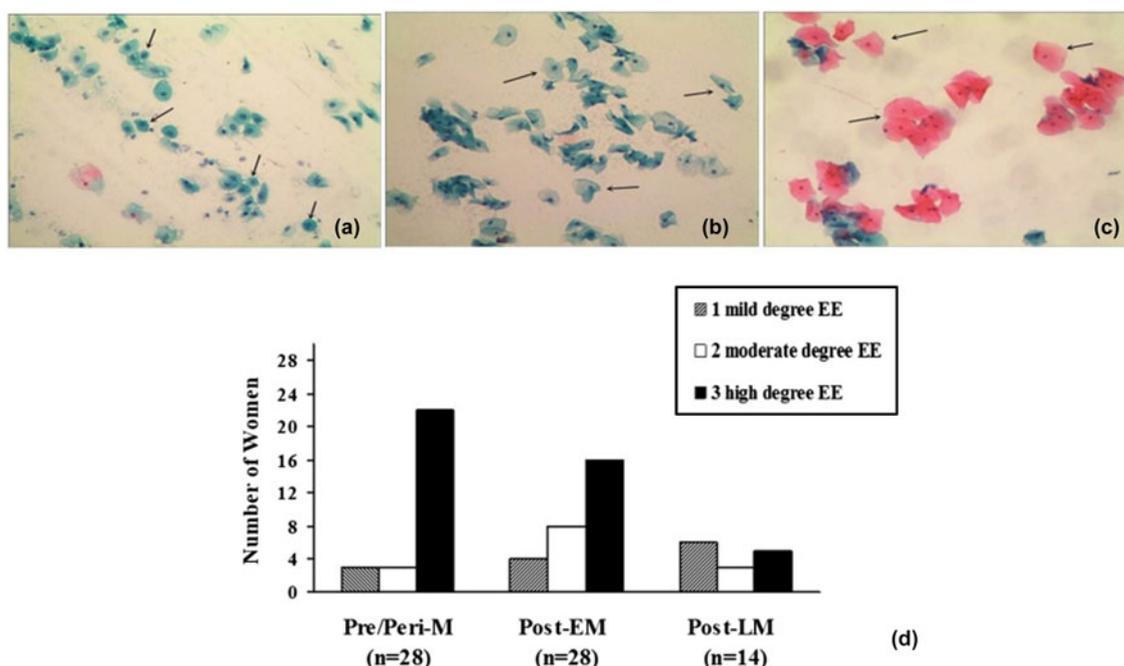
**Figure 1.** The Menopause Rating Scale of 11 menopausal symptoms within three subscales: (a) somatic subscale; (b) psychological subscale; (c) urogenital subscale. Significant differences in hot flushes and sweating, physical and mental (P/M) exhaustion, anxiety, and sexual problems among the four groups ( $p < 0.05$ ,  $p < 0.05$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively), Post hoc Bonferroni tests of P/M exhaustion between the Post-LM and Pre-M groups ( $p < 0.01$ ) (b) and of sexual problems between the Pre-M group and the Post-EM and Post-LM groups ( $p < 0.05$  and  $p < 0.01$ , respectively) (c). A tendency of anxiety between the Peri-M and Post-LM groups ( $p = 0.056$ ) (b). Peri-M, perimenopause; Post-EM, early postmenopause; Post-LM, late postmenopause; Pre-M, premenopause.

Among the 120 eligible women, 78 were randomly selected and subjected to vaginal smears to evaluate their VMS. Demographic features were no different between these women and those who did not provide a vaginal smear (data not shown). In total, 70 women were analyzed for the VMI. Eight women were excluded for an uneven distribution of exfoliated cells that could not be evaluated. The women

in the Pre-M and Peri-M groups were combined into one group (Pre/Peri-M group,  $n = 28$ ) for the analyses (Figure 2). The VMI, which was classified as a mild (Figure 2a), moderate (Figure 2b), or high (Figure 2c) degree of the EE, significantly differed among the three groups ( $p < 0.05$ ). A high degree of the EE was observed in 78.6% and a mild degree of the EE in 10.7% of the women in the Pre/Peri-M group. In contrast, a high degree of the EE was observed in only 35.7% and a mild degree in 42.9% of the women in the Post-LM group ( $p = 0.016$ ). The Bonferroni corrected  $p$ -value in the subgroup analyses was  $p = 0.017$ . The mean vaginal pH values were significantly different among the three groups ( $p < 0.001$ ). They were higher in the Post-LM group ( $6.61 \pm 0.70$ ) than those in the Pre/Peri-M ( $5.59 \pm 0.87$ ) and Post-EM ( $5.74 \pm 0.82$ ) groups ( $p = 0.000$  and  $p = 0.002$ , respectively). Furthermore, the VMI was weakly negatively correlated with the scores of the urogenital subscale ( $r = -0.281$ ,  $p < 0.05$ ). In contrast, the pH value was positively correlated with the urogenital subscale and sexual problems scores ( $r = 0.251$ ,  $p < 0.05$  and  $r = 0.298$ ,  $p < 0.01$ , respectively).

## Discussion

In this pilot study, we investigated sexual activity, sexual distress, and menopausal symptoms among middle-aged Chinese women at different menopausal stages using the MRS. Participants aged 45–60 years were recruited in this study. A small percentage (14/120) of women with a mean age of 47.2 years was included in the Pre-M group. Bonferroni tests were performed for the post hoc analyses, which substantially supported the validity of our results. We found that low sexual frequency was present in a high proportion of Post-LM women, and sexual distress was reported in a high proportion of Peri-M women. Advancing menopausal status was associated with prevalent P/M exhaustion and sexual problems in middle-aged Chinese women. This study is the first to assess menopausal symptoms in middle-aged Chinese women on the mainland using the MRS, which evaluates both the frequency and severity of the symptoms. Importantly, we found that hot flushes/sweating were among the most frequent menopausal symptoms rated as severe or very severe. In addition, urogenital symptoms were correlated with the VMI and pH of the women.



**Figure 2.** Vaginal maturation index in women in the three groups. (a) A mild estrogen effect. The arrows indicate the basal cells from the vaginal wall. (b) A moderate estrogen effect. The arrows indicate intermediate cells from the vaginal wall. (c) A high estrogen effect on the vaginal epithelium. The arrows indicate superficial and squamous cells from the vaginal wall<sup>11</sup>. (d) Number of women with different types of estrogen effects among the three groups. A significant difference was observed among the three groups ( $p < 0.05$ ). A significant difference was observed between the Pre/Peri-M and Post-LM groups ( $p = 0.016$ ). Bonferroni corrected  $p$ -value in subgroup analysis was  $p = 0.017$ . EE, estrogen effect; Post-EM, early postmenopause; Post-LM, late postmenopause; Pre/Peri-M, premenopause and perimenopause.

Menopausal symptoms and sexual activity experienced by middle-aged women may be associated with sociodemographic factors, parity, lifestyle, and chronic medical diseases<sup>4,18–20</sup>. In this study, only a small proportion of women in each group received medications to treat hypertension and no women were of high parity.

Post-LM women reported less frequent sexual intercourse than the women in the Pre-M and Peri-M groups, consistent with previous reports from China, Thailand, and the USA<sup>21–23</sup>. Reasons for this might include the effects of VMS as well as direct effects of low estrogen levels on vaginal dryness, sexual awareness, and arousal<sup>12,24,25</sup>.

Sexual distress is defined as negative feelings and anxiety surrounding one's sexual activity. It has been shown that sexual distress lessens as years since menopause increases<sup>26</sup>. We found a similar trend by assessing sexual distress using self-administered questionnaires. More Peri-M women (24.2%) were distressed about their sexual activity than the Post-LM women (3.7%). However, the percentage of women who reported sexual distress was low among the premenopausal and postmenopausal women, respectively, compared with those in a previous study in which sexual distress was evaluated using a female sexual distress scale<sup>26</sup>. Our finding requires confirmation with a study using a female sexual distress scale to assess sexual distress. Chinese women rarely share their feelings about sex with their partners<sup>27</sup>, which could be attributed to traditional Chinese culture and attitudes toward sex as previously discussed<sup>14</sup>.

The prevalence of any menopausal symptoms was 97.5% in all women, similar to studies involving midlife women in mainland China<sup>6</sup> and Macau<sup>28</sup>. Exhaustion was the most

prevalent symptom among all women. This complaint has been reported as the most prevalent symptom in previous studies of Chinese and Brazilian women<sup>2,6</sup>. Sexual problems overall were the second most prevalent symptom rated as severe or very severe, a finding similar to two recent studies of postmenopausal Chinese women<sup>18,29</sup>. Although in our study postmenopausal women reported a decrease in sexual desire leading to reduced frequency of sexual activity, they did not report an increase in sexual distress. This discrepancy may partly be explained by the perception of sexual activity in postmenopausal women<sup>30</sup>. Other prevalent symptoms included joint and muscle discomfort and sleep disorders, consistent with previous findings<sup>5,28,29,31,32</sup>.

Menopausal symptoms, particularly the severe symptoms, could be harmful to women's health and influence their quality of life<sup>31,32</sup>. In a recent study, hot flashes were the commonest symptoms leading middle-aged Chinese women to seek treatment, followed by insomnia and bone and joint pain<sup>32</sup>. It has been reported that hot flashes and sweating are more prevalent among Caucasian women than Asian women<sup>5,31</sup>; however, for the first time, our study has shown that hot flashes/sweating are among the most frequent symptoms rated as severe or very severe in middle-aged Chinese women. This finding is consistent with a recent review of menopausal symptoms in Asian women which showed the prevalence of vasomotor symptoms in Asian women is comparable to that described in women in western countries<sup>33</sup>.

The severe somatic and psychological subscale scores of all women in the present study were similar to those reported in studies investigating community populations in

Asia but were less prevalent than those reported in studies conducted in Europe. However, the women in this study had more prevalent severe urogenital subscale scores than women in Asia and Europe<sup>17</sup>. These discrepancies may be explained by ethnic differences or a higher percentage of postmenopausal women in the present study.

Our data for the total and urogenital scores are supported by previous studies showing that Peri-M women more commonly experience somatic and psychological symptoms and that urogenital symptoms are more pronounced in postmenopausal women<sup>29,34,35</sup>. We found that hot flushes, sweating, and anxiety were more severe in the women in the Peri-M and Post-EM groups, consistent with previous findings<sup>31,34</sup>. In contrast, P/M exhaustion and sexual problems were more prevalent with advancing menopause, as were joint and muscle discomfort and sleep problems<sup>3</sup>.

We found a decline in the VMI and a significant increase in the pH value with age and menopausal status among women in this study, consistent with previous data<sup>11</sup>. The vaginal pH value may be a better measure than the VMI in clinical evaluations of the vaginal ecosystem<sup>36</sup>. Indeed, the vaginal pH significantly differed among the women at different menopausal stages and was associated with both the MRS scores of the urogenital subscale and sexual problems in our study.

In this study, middle-aged Chinese women at different menopausal stages were compared, and their menopausal symptoms and VMS were determined using the MRS. The participants were assigned to different menopausal groups according to the menstrual cycle bleeding criteria of the STRAW system<sup>15</sup>, commonly used to distinguish menopausal stages in healthy middle-aged women<sup>4,34</sup>.

This study has limitations. This was a cross-sectional study. The participants were women attending a gynecological clinic for routine checkups or common disorders, and the sample size was relatively small. If the sample of women was larger, significant differences in the total MRS and somatic subscale scores may have been observed among the groups. Moreover, the participants in this study may have been more symptomatic than other women, prompting them to visit the clinic. Thus, our findings cannot be generalized to the wider population. The significant differences in the menopausal symptoms were discovered by performing Bonferroni tests of the middle-aged women across menopausal stages. Therefore, these findings may serve as a basis for larger prospective studies in community-dwelling middle-aged women.

In conclusion, amongst middle-aged Chinese women, P/M exhaustion and sexual problems are highly frequent symptoms and become more prevalent with advancing menopause. Hot flushes/sweating are among the most frequent menopausal symptoms rated as severe or very severe and are more pronounced in Peri-M and Post-EM women. In addition, the urogenital symptoms correlate with the pH of these women. Further studies are needed to verify our findings.

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**Conflict of interest** The authors have no conflicts of interest to declare.

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## References

1. Speroff LF, Marc A, *Menopause and the Perimenopausal Transition. Clinical Gynecologic Endocrinology and Infertility*. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2005:621–89
2. Oppermann K, Fuchs SC, Donato G, Bastos CA, Spritzer PM. Physical, psychological, and menopause-related symptoms and minor psychiatric disorders in a community-based sample of Brazilian premenopausal, perimenopausal, and postmenopausal women. *Menopause* 2012;19:355–60
3. Blumel JE, Chedraui P, Baron G, et al. Menopausal symptoms appear before the menopause and persist 5 years beyond: a detailed analysis of a multinational study. *Climacteric* 2012;15: 542–51
4. Chedraui P, Perez-Lopez FR, Mendoza M, et al. Severe menopausal symptoms in middle-aged women are associated to female and male factors. *Arch Gynecol Obstet* 2010;281:879–85
5. Yang D, Haines CJ, Pan P, et al. Menopausal symptoms in mid-life women in southern China. *Climacteric* 2008;11:329–36
6. Chen Y, Lin SQ, Wei Y, Gao HL, Wu ZL. Menopause-specific quality of life satisfaction in community-dwelling menopausal women in China. *Gynecol Endocrinol* 2007;23:166–72
7. Zang H, Shi H, Speroff L. Low-dose hormone therapy in postmenopausal women in China. *Climacteric* 2010;13:544–52
8. Jin F, Tao M, Teng Y, Shao H, Li C, Mills E. Knowledge and attitude towards menopause and hormone replacement therapy in Chinese women. *Gynecol Obstet Invest* 2015;79:40–5
9. Chu K, Song Y, Chatooh ND, et al. The use and discontinuation of hormone replacement therapy in women in South China. *Climacteric* 2018;21:47–52
10. Woods NF, Mitchell ES, Smith-Di Julio K. Sexual desire during the menopausal transition and early postmenopause: observations from the Seattle Midlife Women's Health Study. *J Womens Health (Larchmt)* 2010;19:209–18
11. Zhang C, Cui L, Zhang L, Shi C, Zang H. Sexual activity and function assessment in middle-aged Chinese women using the female sexual function index. *Menopause* 2017;24:669–76
12. Genazzani AR, Monteleone P, Gambacciani M. Hormonal influence on the central nervous system. *Maturitas* 2002;43:511–17
13. Nilsson K, Risberg B, Heimer G. The vaginal epithelium in the postmenopause—cytology, histology and pH as methods of assessment. *Maturitas* 1995;21:51–6
14. So HW, Cheung FM. Review of Chinese sex attitudes and applicability of sex therapy for Chinese couples with sexual dysfunction. *J Sex Res* 2005;42:93–101
15. Harlow SD, Gass M, Hall JE, et al. Executive summary of the Stages of Reproductive Aging Workshop +10: addressing the unfinished agenda of staging reproductive aging. *Climacteric* 2012;15:105–14
16. Wang XY, Yang HY, Nie GN, et al. [Study on the reliability and validity of the Chinese Menopause Rating Scale (CMRS)]. *Zhonghua Liu Xing Bing Xue Za Zhi* 2008;29:882–6
17. Research. Berlin Center for Epidemiology and Health. Objectives of MRS. MRS-The menopause rating scale. Available at <http://www.menopause-rating-scale.info/objectives.htm>. 2013 a,b.
18. Li L, Wu J, Pu D, et al. Factors associated with the age of natural menopause and menopausal symptoms in Chinese women. *Maturitas* 2012;73:354–60

19. Gharaibeh M, Al-Obeisat S, Hattab J. Severity of menopausal symptoms of Jordanian women. *Climacteric* 2010;13:385–94
20. Sierra B, Hidalgo LA, Chedraui PA. Measuring climacteric symptoms in an Ecuadorian population with the Greene Climacteric Scale. *Maturitas* 2005;51:236–45
21. Pongsatha S, Morakot N, Chaovitsaree S. Sexual in menopausal women comparing perimenopausal and postmenopausal women. *J Med Assoc Thai* 2012;95:1489–94
22. Lo SS, Kok WM. Sexuality of Chinese women around menopause. *Maturitas* 2013;74:190–5
23. Avis NE, Zhao X, Johannes CB, Ory M, Brockwell S, Greendale GA. Correlates of sexual function among multi-ethnic middle-aged women: results from the Study of Women's Health Across the Nation (SWAN). *Menopause* 2005;12:385–98
24. Thomas HM, Bryce CL, Ness RB, Hess R. Dyspareunia is associated with decreased frequency of intercourse in the menopausal transition. *Menopause* 2011;18:152–7
25. Worsley R, Bell RJ, Gartoulla P, Davis SR. Prevalence and predictors of low sexual desire, sexually related personal distress, and hypoactive sexual desire dysfunction in a community-based sample of midlife women. *J Sex Med* 2017;14:675–86
26. Berra M, De Musso F, Matteucci C, et al. The impairment of sexual function is less distressing for menopausal than for premenopausal women. *J Sex Med* 2010;7:1209–15
27. Lianjun P, Aixia Z, Zhong W, Feng P, Li B, Xiaona Y. Risk factors for low sexual function among urban Chinese women: a hospital-based investigation. *J Sex Med* 2011;8:2299–304
28. Chou MF, Wun YT, Pang SM. Menopausal symptoms and the menopausal rating scale among midlife Chinese women in Macau, China. *Women Health* 2014;54:115–26
29. Lan Y, Huang Y, Song Y, et al. Prevalence, severity, and associated factors of menopausal symptoms in middle-aged Chinese women: a community-based cross-sectional study in southeast China. *Menopause* 2017;24:1200–7
30. Ling DC, Wong WC, Ho SC. Are post-menopausal women "half-a-man"?: sexual beliefs, attitudes and concerns among midlife Chinese women. *J Sex Marital Ther* 2008;34:15–29
31. Mitchell ES, Woods NF. Hot flush severity during the menopausal transition and early postmenopause: beyond hormones. *Climacteric* 2015;18:536–44
32. Sun D, Shao H, Li C, Tao M. An analysis of the main reasons that perimenopausal and postmenopausal women in China have for seeking outpatient treatment and factors influencing their symptoms: a single-center survey. *Clin Exp Obstet Gynecol* 2015;42:146–51
33. Islam RM, Bell RJ, Rizvi F, Davis SR. Vasomotor symptoms in women in Asia appear comparable with women in Western countries. A systematic review. *Menopause* 2017;24:1313–22
34. Travers C, O'Neill SM, King R, Battistutta D, Khoo SK. Greene Climacteric Scale: norms in an Australian population in relation to age and menopausal status. *Climacteric* 2005;8:56–62
35. Ojeda E, Monterrosa A, Blumel JE, Escobar-Lopez J, Chedraui P. Severe menopausal symptoms in mid-aged Latin American women can be related to their indigenous ethnic component. *Climacteric* 2011;14:157–63
36. Tuntiviriyapun P, Panyakhamlerd K, Triratanachai S, et al. Newly developed vaginal atrophy symptoms II and vaginal pH: a better correlation in vaginal atrophy? *Climacteric* 2015;18:246–51
37. Consultation WHO Expert. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet* 2004;363:157–63