



An Analysis of Menstrual Symptoms, Menstrual Attitudes, Physical Stress and Psychological Stress According to the Menstrual Cycle Phase

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Abstract

Background: Women undergo an array of menstrual symptoms, depending on the menstrual cycle period. This study aimed to gain a more objective understanding of the impact of menstruation by examining differences in menstrual symptoms, menstrual attitude, physical stress, and psychological stress across the menstrual cycle.

Methods: This study was conducted from Apr to Jun 2021 in the Gyeonggi Province of Korea. Women aged ≥ 20 yr were divided into premenstrual (n=17), menstrual (n=8), and postmenstrual periods (n=23). Menstrual symptoms and menstrual attitudes were assessed using questionnaires. Quantitative electroencephalography was used to assess the physical stress indices (left and right), and the psychological stress indices (left and right), with brainwave parameters quantified by frequency series power spectrum analysis. Data were compared using the non-parametric tests.

Results: More menstrual symptoms were experienced in the menstrual period than in the premenstrual period ($Z=2.16$, $P=.031$). Menstrual attitudes did not significantly differ among menstrual periods ($Z=1.20$, $P=.231$). Physical stress indices were high ($\geq 10 \mu V$) throughout the menstrual cycle and there were significant differences among the three periods (left: $\chi^2=4.00$, $P=.035$, right: $\chi^2=5.78$, $P=.046$). Psychological stress indices were $>1 \mu V$ during the premenstrual and menstrual periods.

Conclusion: Women experience more severe and diverse menstrual symptoms in the menstrual period than in other periods. Objective investigations are needed to inform an effective approach for addressing negative menstruation-related experiences.

Keywords: Menstruation; Symptoms; Premenstrual; Postmenstrual; Attitude; Stress

Introduction

Menstruation refers to periodic monthly uterine bleeding that occurs in women of childbearing age (1, 2). The menstrual cycle phases are characterized by predictable fluctuations of ovarian hor-

mones estradiol and progesterone (1). The menstrual cycle comprises periodic physiological changes and ranges from 21 d to 37 d, an average of 28 d (1, 2). An irregular menstrual pattern means any non-cyclical menstrual cycle that would



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keep changing and drift away from its monthly cycle (3). There are some women for whom the menstrual cycle may shorter than 21 d (possible diagnosis of *polymenorrhea* if shorter) or exceed 37 d (possible diagnosis of *oligomenorrhea* if longer) (1). Women undergo an array of menstrual symptoms, depending on the menstrual cycle period, and these symptoms vary across individuals (2, 4, 5). A previous study on the degree and patterns of menstrual symptoms reported that 80%–90% of women suffer from premenstrual syndrome (PMS), which includes symptoms such as weight gain, breast tenderness, and insomnia (6). PMS refers to a series of cyclical physical, emotional, cognitive, and behavioral symptoms that regularly recur during the late luteal phase of the menstrual cycle (3, 5). Mild psychological and emotional symptoms related to menstruation include anxiety, tension, depression, and a loss of self-control (6). Additionally, some women display menstrual psychosis, a transient mental episode that occurs simultaneously with hormonal changes during the menstrual cycle (7). Menstrual symptoms are generally related to the ovulatory process and begin before menstruation. Typical symptoms include a sensation of heaviness or dull pain in the lower abdomen, lower back, and breasts, along with persistent pain through the menstrual period. The severity and duration of these menstrual symptoms vary according to age (8, 9). However, under sociocultural influences in Korea, Korean women tend to endure menstrual symptoms, exhibiting poor symptom management and understanding of menstrual attitudes, which refer to the overall perception of menstruation (10).

Investigations using measures that enable a more objective approach to elucidating the impact of menstruation are needed. Previous studies have primarily used self-report questionnaires for menstrual symptoms and menstrual attitudes (11-17); these studies rarely performed objective assessments or provided data based on scientific approaches. Although one study (18) attempted to examine objective factors such as distributional changes in body temperature during menstruation

using digital infrared thermographic imaging, participants were required to acclimatize to the ambient temperature for approximately 10 min after fully undressing, highlighting the need for a more convenient and user-friendly method. Quantitative electroencephalography (QEEG) is a noninvasive and user-friendly method for measuring EEG using a headband probe that could be used as an easy means to investigate changes across the menstrual cycle.

Therefore, we aimed to objectively and neuroscientifically investigate the physical and psychological changes women experience throughout their menstrual cycle by analyzing the differences in menstrual symptoms, menstrual attitude, and physical and psychological stress as QEEG findings in the premenstrual, menstrual, and postmenstrual periods.

Materials and Methods

Design

We conducted a cross-sectional, descriptive, analytical study.

Participants

Participants comprised a convenience sample of women who worked at a kindergarten in the Gyeonggi Province of Korea. Women were included if they were aged ≥ 20 yr and had one of menstrual cycle phases (premenstrual, menstrual, or postmenstrual phase). The exclusion criteria were a history of genital surgery (e.g., hysterectomy), presence of factors that may influence menstruation (e.g., the use of contraceptive pills, pregnancy, or lactation), recent menopausal symptoms, and menopausal status. Further, since data was collected via a questionnaire survey, those with poor literacy were excluded. Only those who voluntarily provided informed consent to participate were enrolled. After further excluding one participant in the premenstrual period who showed carelessness in her responses, 48 participants were divided into a premenstrual period group ($n=17$), menstrual period group ($n=8$), and postmenstrual period group ($n=23$) based on their

menstrual cycle phase at the time of participation. The sample size was based on a previous study to compare perimenstrual (premenstrual, menstrual, postmenstrual) period among 31 Korean women (12). In the present study, the premenstrual period was defined as the week before the first day of menstruation; the menstrual period was defined as the first to last day of menstruation; and the postmenstrual period was defined as the day after the end of menstruation to the day before the premenstrual period (13).

Measurements

General characteristics

We collected self-reported data on general characteristics, including age, health status, height, body weight, menarche age, menstrual cycle, duration of menstrual flow, menstrual bleeding volume, menstrual cycle regularity, and methods used to alleviate menstrual cramps.

Menstrual symptoms

Menstrual symptoms were assessed using the Korean version (14) of Moos Menstrual Distress Questionnaire (MDQ) (13, 15). The MDQ is a standard tool for measuring cyclical menstrual symptoms (16). The participants answered 37 items about the expression and severity of menstruation-related symptoms periodically experienced during the premenstrual and menstrual periods using a six-point scale, ranging from 0 (none) to 5 (very severe). A higher total score indicates more severe menstrual distress symptoms. The reliability was .97 for the original tool (13, 14) and .971 for the version used in our study.

Menstrual attitudes

Menstrual attitude was assessed as the overall perception of menstruation, shaped by physical, psychological, and hormonal changes experienced during the menstrual cycle, and sociocultural beliefs (17) using the Korean version (18) of Menstrual Attitude Questionnaire (MAQ) (17). The MAQ comprises 33 items in five domains: menstruation as a debilitating event, menstruation as a bothersome event, anticipation and prediction of

the onset of menstruation, menstruation as a natural event, and denial of any effect of menstruation. Each item is rated on a seven-point scale, ranging from 1 (strongly agree) to 7 (strongly disagree). Total scores are calculated for each domain; thus, they can be interpreted independently. The reliability was 0.95–0.97 for the original tool (17), 0.80 in another study (18), and 0.69 in our study.

Physical stress and psychological stress

Physical stress indices (left, right) and psychological stress indices (left, right) assessed via QEEG during the premenstrual, menstrual, and postmenstrual periods. One of the authors performed QEEG, a board-certified neurofeedback practitioner, using a 2-channel neurofeedback system (NeuroHarmony M, Braintech Corp., Korea). Left and right measurements were taken simultaneously at the prefrontal cortex (Fp1, Fp2), and the left earlobe was used as the reference electrode. We performed a frequency series power spectrum analysis using the Fast Fourier Transform to quantify the intensity, frequency, and ratios of delta, theta, slow alpha, fast alpha, slow beta, and fast beta waves. For the physical stress index, a value of 10 μ V or higher was considered to indicate a state of physical tension and diminished ability to overcome stress, with greater values indicating greater physical stress (19). For the psychological stress index, a value of 1 μ V or higher was considered to indicate a state of psychological distraction due to stress and anxiety, with greater values indicating greater psychological stress (19). The reliability of this tool has been established at .916 ($P<.001$) (20), with reference to the Grass System (USA).

Data collection

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Seoul University of Buddhism (No. 27004121AN01-202003-HR-062-01).

Data was collected from Apr to Jun 2021, after obtaining permission from the kindergarten and informed consent for participation from all participants. To reduce unnecessary tension, we arranged

to collect data during the best time for the participants, and we collected data by visiting the kindergarten in person. A structured study information sheet was provided to the participants, along with a detailed oral explanation to allow the participants to make an informed decision. The self-administered questionnaires and QEEG took <10 min to complete. For each participant, we explained the results of their questionnaires and QEEG findings, providing them with a results report.

Data analysis

Data were analyzed using IBM SPSS Statistics ver. 22.0 software (IBM Co., Armonk, NY, USA). Participants' general characteristics were summarized

using descriptive statistics, and the reliability of the assessment tools was tested using Cronbach's alpha coefficient. Differences in the nominal variables of general characteristics and study parameters between menstrual cycle period groups were analyzed using the Mann-Whitney U test and Kruskal-Wallis test. A P-value <0.05 was considered statistically significant.

Results

General characteristics

The participants' general characteristics are summarized below (Table 1).

Table 1: General characteristics

Characteristic	Category	Premenstrual period	Menstrual pe-	Postmenstrual pe-	χ^2 (P)
		(n=17)	riod (n=8)	riod (n=23)	
		n (%) or Mean \pm SD			
Age (yr)		38.1 \pm 9.9	37.6 \pm 14.9	42.7 \pm 10.6	2.57 (.277)
Health status	Good	7 (41.2)	2 (25.0)	12 (52.2)	0.57 (.754)
	Moderate	8 (47.0)	1 (12.5)	9 (39.1)	
	Poor	2 (11.8)	5 (62.5)	2 (8.7)	
Height (cm)		162.5 \pm 6.4	159.8 \pm 6.8	160.4 \pm 7.0	1.27 (.530)
Body weight (kg)		59.1 \pm 7.3	60.9 \pm 16.6	59.4 \pm 8.1	0.01 (.990)
Menarche age (years)		14.5 \pm 1.6	13.0 \pm 1.1	14.6 \pm 1.3	0.98 (.384)
Menstrual cycle (days)		29.5 \pm 1.7	28.3 \pm 0.8	29.4 \pm 5.1	1.59 (.451)
Duration of menstrual flow (days)		5.2 \pm 1.4	5.4 \pm 1.7	5.1 \pm 1.4	0.36 (.837)
Menstrual bleeding volume	Very large	2 (11.8)	0 (0.0)	0 (0.0)	1.14 (.567)
	Large	5 (29.4)	1 (12.5)	6 (26.1)	
	Moderate	7 (41.2)	6 (75.0)	13 (56.5)	
	Small	2 (11.8)	1 (12.5)	4 (17.4)	
	very small	1 (5.8)	0 (0.0)	0 (0.0)	
Menstrual cycle regularity	Regular	13 (76.5)	3 (37.5)	18 (78.3)	5.07 (.079)
	Irregular	4 (23.5)	5 (62.5)	5 (21.7)	
Methods used to alleviate menstrual cramps (multiple choices)	Enduring Pain	9 (52.9)	3 (37.5)	14 (60.9)	1.29 (.524)
	Taking painkillers	4 (23.5)	5 (62.5)	4 (17.4)	
	Taking a rest	1 (5.9)	0 (0.0)	5 (21.7)	
	Applying heat	4 (23.5)	2 (25.0)	1 (4.3)	

SD, standard deviation

The mean age \pm standard deviation (SD) in the premenstrual, menstrual, and postmenstrual period groups was 38.1 ± 9.89 yr, 37.6 ± 14.94 yr, and 42.7 ± 10.57 yr, respectively. Fifteen women (88.2%) in the premenstrual group and 21 women (91.3%) in the postmenstrual group considered themselves to have moderate health status, while five women (62.5%) in the menstrual group considered themselves to be in poor health; however, there were no significant differences among the groups ($P > 0.05$). The most common method of coping with menstrual pain was to endure the symptoms in the premenstrual ($n=9$, 52.9%) and postmenstrual period groups ($n=14$, 60.9%) and taking medications in the menstrual group ($n=5$, 62.5%), but the difference between the groups

failed to reach significance ($P > .05$). There were no significant differences in the three groups according to the general characteristics, confirming homogeneity of the groups ($P > .05$).

Menstrual symptoms and attitudes

Table 2 shows the periodic menstrual symptoms experienced according to the menstrual cycle period. The mean menstrual symptom score was significantly higher in the menstrual period (79.6, SD=39.5) than that in the premenstrual period (43.4, SD=40.4) ($Z=2.16$, $P=.031$). Menstrual attitudes did not significantly differ between premenstrual and menstrual period groups ($Z=1.20$, $P=.231$).

Table 2: Comparison of menstrual symptoms and attitude between premenstrual and menstrual periods

Variable	Premenstrual period (n=17)	Menstrual pe- riod (n=8)	Z (P)
	Mean \pm SD		
Menstrual symptoms	43.4 \pm 40.4	79.6 \pm 39.5	2.16 (.031)
Menstrual attitudes	154.8 \pm 12.5	162.5 \pm 14.8	1.20 (.231)
Menstruation as a debilitating event	54.2 \pm 6.1	57.9 \pm 7.0	1.20 (.231)
Menstruation as a bothersome event	27.9 \pm 3.3	29.1 \pm 4.2	0.70 (.482)
Anticipation and prediction of the onset of menstruation	26.9 \pm 4.3	28.9 \pm 2.4	1.43 (.152)
Menstruation as a natural event	23.2 \pm 2.5	22.5 \pm 3.1	0.38 (.701)
Denial of any effect of menstruation	22.5 \pm 5.1	24.1 \pm 4.9	0.76 (.448)

SD, standard deviation

Physical stress and psychological stress

Table 3 shows the physical stress and psychological stress as QEEG findings according to menstrual cycle phase. The physical stress indices (left and right) were 10 μ V or higher in all three periods; the left and right values were the highest in the premenstrual period (30.3 ± 23.0 μ V and 32.1 ± 20.8 μ V), and there were significant differences

among the three groups (left: $\chi^2=4.00$, $P=.035$, right: $\chi^2=5.78$, $P=.046$). The psychological stress indices (left and right) were higher than 1 μ V in the premenstrual and menstrual periods, and there were no significant differences among the three groups (left: $\chi^2=3.05$, $P=.218$, right: $\chi^2=4.49$, $P=.106$).

Table 3: Comparison of physical and psychological stress indices by menstrual cycle phase

<i>Index</i>	<i>Premenstrual period (n=17)</i>	<i>Menstrual period (n=8)</i>	<i>Postmenstrual period (n=23)</i>	χ^2 (<i>P</i>)
	Mean \pm SD			
Physical stress (left)	30.3 \pm 23.0	20.6 \pm 17.1	15.9 \pm 9.6	4.00 (.035)
Physical stress (right)	32.1 \pm 20.8	20.4 \pm 19.2	17.0 \pm 12.2	5.78 (.046)
Psychological stress (left)	1.8 \pm 3.6	1.4 \pm 1.9	0.7 \pm 0.3	3.05 (.218)
Psychological stress (right)	1.8 \pm 3.4	1.7 \pm 2.1	0.7 \pm 0.3	4.49 (.106)

SD, standard deviation

Discussion

We analyzed menstrual symptoms, menstrual attitudes, physical stress, and psychological stress according to the menstrual cycle phase in women. We found that the mean menstrual symptom score was significantly higher in the menstrual period than in premenstrual period. Menstrual symptoms refer to the experience of physical and psychological changes, and impairments in the activities of daily living, in the premenstrual and menstrual periods (21). The severity of some menstrual symptoms, such as physical discomfort (e.g., headaches, cramps, backache, and other symptoms), reduced concentration, lowered school or job performance, behavioral changes (e.g., avoidance of social activities, staying at home, other changes), autonomic reactions (e.g., fainting, cold sweats, other reactions), water retention, and negative affect, was high during the menstrual period. These menstrual symptoms are generally similar to those reported in previous studies (22, 23). However, many previous studies examined PMS, which generally begins 7 d prior to the menstrual flow and resolves with menstrual flow. As a result, the definition of the severity and duration of symptoms varies across studies (8), rendering direct comparisons with our phase-specific findings difficult.

In the present study, menstrual attitudes did not significantly differ according to the menstrual period. The current literature suggests the interrelationship between attitudes toward menstruation and perimenstrual symptoms (16, 22, 24). A study of 1,809 Chinese female college students found

that three types of attitudes toward menstruation (Debilitating, Predictable and Bothersome) were correlated with menstrual symptoms (25). Furthermore, the more serious the PMS, that is, the more severe the menstrual symptoms, the higher the menstrual attitude score (26, 27). Additionally, menstrual attitudes and perceptions vary across cultures. Especially, some taboos and sociocultural restrictions still present concerns regarding menstruation (28, 29). Our that the participants employ passive strategies to cope with menstrual discomfort in the premenstrual and menstrual periods is consistent with previous reports that women in Korea have poor coping strategies for menstrual discomfort despite a severe level of discomfort, and they cope by simply enduring and controlling pain (e.g., the use painkillers, abdominal heat packs, lying down, and abdominal massage) (4, 30). Attitudes toward menstruation are shaped by personal knowledge and experience, social learning, and cultural beliefs (31). Thus, education should be provided to female adolescents and their parents (32). Moreover, our results call for a comprehensive understanding of the menstrual symptoms, which vary by the menstrual cycle phase, and the development of effective coping strategies in order to promote a positive attitude towards menstruation.

Finally, our participants showed a state of physical stress on QEEG at all menstrual cycle periods, and higher left and right physical stress values in the premenstrual period than in other periods. Additionally, the psychological stress indices indicated a state of mental distraction due to stress and

anxiety in the premenstrual and menstrual periods. Although the left and right psychological stress values were highest in the premenstrual period, differences among the three periods did not reach significance. Numerous studies have explored the mechanisms of menstrual symptoms from the perspective of stress (1), and the autonomic nervous system (including the sympathetic and parasympathetic systems) has received special attention (33). Menstruation is a phenomenon that occurs due to the physiological action of the nervous and hormonal systems connected to the central nervous system and hypothalamic-pituitary-ovarian axis (34). The measurement of brainwave indices is particularly beneficial for examining brain functions and states; physiological changes of the brain can be easily measured in various environmental conditions (35). Thus, we utilized QEEG as a more objective approach to investigating physical and psychological changes from a stress perspective by menstrual cycle phase, providing neuroscientific foundations for promoting physical and psychological well-being.

However, it is important to consider the limitations of this study when interpreting and generalizing its findings. In this study, the difference in the number of subjects in the three groups according to menstrual cycle phase. Our findings on differences across menstrual cycle phases and brainwave indices cannot be directly compared with previous reports. Subsequent studies should accumulate a more diverse and larger sample to allow the interpretation of results with consideration of various demographic and menstrual characteristics. Moreover, given that most women experience 400 menstrual cycles within their reproductive lifespan (36), studies should include time-series repeated objective measurements by menstrual cycle period and utilize prospective longitudinal designs to approach the cyclical menstrual process to further promote the generalization of findings. Finally, modern menstruation is in a sense not only abnormal and from an evolutionary point of view unnatural, but indirectly carcinogenic (37). Modern hormonal therapy should not be feared but embraced as the solution. In this light, future studies could

be a reflection of cortisol, progesterone and estradiol concentrations and implement the suggested intervention during the cyclical menstrual process (4, 37).

Conclusion

Women experience varying levels of menstrual symptoms according to the menstrual cycle period, with more severe menstrual symptoms in the menstrual period than in the premenstrual period. However, the physical stress indices on QEEG is higher in the premenstrual period than in the menstrual period, suggesting the need for an in-depth comparison between premenstrual and menstrual periods of a more diverse and larger sample with consideration of various demographic and menstrual characteristics. Future studies should identify objective differences in physical and psychological changes according to the menstrual cycle period and effectively elucidate the negative experiences of menstruation.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflicts of interest

The authors declare no conflicts of interest.

References

1. Schmalenberger KM, Tauseef HA, Barone JC, et al (2021). How to study the menstrual cycle: Practical tools and recommendations. *Psychoneuroendocrinology*, 123:104895.
2. Meng Y, Chang L, Hou L, et al (2022). Menstrual attitude and social cognitive stress influence autonomic nervous system in women with premenstrual syndrome. *Stress*, 25:87–96.
3. Wei S-M, Schiller CE, Schmidt PJ, et al (2018). The role of ovarian steroids in affective disorders. *Curr Opin Behav Sci*, 23:103–112.
4. Ozgocer T, Ucar C, Yildiz S. (2022). Daily cortisol awakening response and menstrual symptoms in young females. *Stress Health*, 38:57–68.
5. Ryu A, Kim TH. (2015). Premenstrual syndrome: A mini review. *Maturitas*, 82:436–440.
6. Freeman EW. (2003). Premenstrual syndrome and premenstrual dysphoric disorder: Definitions and diagnosis. *Psychoneuroendocrinology*, 28 Suppl 3:25-37.
7. Brockington I. (2005). Menstrual psychosis. *World Psychiatry*, 4:9–17.
8. Dickerson LM, Mazyck PJ, Hunter MH. (2003). Premenstrual syndrome. *Am Fam Physician*, 67: 1743–1752.
9. Woods NF, Lentz MJ, Mitchell ES, et al (1997). PMS after 40: Persistence of a stress-related symptom pattern. *Res Nurs Health*, 20:329–340.
10. Shin MA, Jeong MH. (2006). The relationship between premenstrual syndrome and menstrual attitudes of college students. *J Korean Acad Soc Nurs Edu*, 12:43–51.
11. Kim JS. (1998). The Relations among Premenstrual Syndrome, Menstrual Attitude, Neuroticism, and Stress [Master's Thesis]; Seoul National University: Seoul.
12. Kim HW. (2004). Perimenstrual symptoms of Korean women living in the USA: applicability of the WDHD (women's daily health diary) on prospective report. *J Korean Acad Nurs*, 34:1395–1401.
13. Moos RH. (1968). The development of a menstrual distress questionnaire. *Psychosom Med*, 30:853–867.
14. Kim JE. (1995). Comprehensive Understanding of Perimenstrual Discomfort: A Triangulation of Methods and Perspectives [Doctoral Dissertation]; Seoul National University: Seoul.
15. Moos RH. (1985). *Perimenstrual Symptoms: A Manual and Overview of Research with the Menstrual Distress Questionnaire*; Social Ecology Laboratory, Stanford University: Palo Alto, CA.
16. Ghiasi A, Kerama A, Mollaahmad, L. (2018). The relationship between attitudes toward menstruation and perimenstrual symptoms among female students of Shahroud University of Medical Sciences, Northeast Iran. *Shiraz E-Med J*, 19:e65714.
17. Brooks-Gunn J, Ruble DN. (1980). The menstrual attitude questionnaire. *Psychosom Med*, 42: 503–512.
18. Hwang DS, Cho JH, Lee CH, et al (2008). A study of DIII in women with premenstrual syndrome. *J Korean Obstet Gynecol*, 21:111–120.
19. Weon HW, Son HK. (2021). The effect of physical and psychological stress quotient on emotion quotient in introvert-extrovert preschooler. *Journal of the Korea Academia-Industrial Cooperation Society*, 22: 208–215.
20. Kim YJ. (2000). Development of a Brain-Cycle Learning Model Based on the Electroencephalographic Analysis of Learning Activities and Its Application to Science Learning [Doctoral Dissertation]; Seoul National University: Seoul.
21. Kim HW, Kwon MK. (2004). Study on the validity and reliability of MMDQ (Moos Menstrual Distress Questionnaire) among middle school students. *Korean Parent Child Health J*, 7:111–120.
22. Chen, H.M.; Chen, C.H (2005). Related factors and consequences of menstrual distress in adolescent girls with dysmenorrhea. *Kaohsiung J Med Sci*, 21:121–127.
23. Cecily J, Shaji H. (2014). Severity of primary dysmenorrhea and menstrual distress among university students in Kingdom of Saudi Arabia. *Int J Health Sci Res*, 4:209–215.
24. Alonso C, Coe CL. (2001). Disruptions of social relationships accentuate the association between emotional distress and menstrual pain in young women. *Health Psychol*, 20:411–416.
25. Yongai Z, Xiaomei L, Haimiao Z, et al (2015). Reliability and validity evaluation of the Chinese version of the menstrual symptom scale. *Nurs Res*, 50:374–377.
26. Li J. (2020). Survey on the influence of personality traits, menstrual attitude and sex hormones levels on premenstrual syndrome in female college students. *Matern Child Health Care China*,

- 35:924–927.
27. Larki M, Salavati A, Azmoude E. (2022). The relationship between menstrual patterns and menstrual attitude dimensions among women of reproductive age: cross-sectional survey. *Sultan Qaboos Univ Med J*, 22:241–246.
 28. Sakar T, Özkan H, Saraç MN, et al (2015). Cultural behaviors and practices of students during menstruation. *J Turk Fam Phys*, 6:114–123.
 29. Leena S. (2016). A descriptive study on cultural practices about menarche and menstruation. *J Health Allied Sci NU*, 6:10–13.
 30. Jun EM. (2003). A study on menstrual symptoms, coping and relief of symptoms in female college students. *Korean J Women Health Nurs*, 9:161–169.
 31. Wong LP, Khoo EM. (2011). Menstrual-related attitudes and symptoms among multi-racial Asian adolescent females. *Int J Behav Med*, 18:246–253.
 32. Öztürk R, Güneri SE. (2021). Symptoms experiences and attitudes towards menstruation among adolescent girls. *J Obstet Gynaecol*, 41:471–476.
 33. Kahle S, Miller JG, Lopez M, et al (2016). Sympathetic recovery from anger is associated with emotion regulation. *J Exp Child Psychol*, 142:359–371.
 34. Zhu Y, Wu X, Zhou R, et al (2021). Hypothalamic-pituitary-end-organ axes: hormone function in female patients with major depressive disorder. *Neurosci Bull*, 37:1176–1187.
 35. Huang HY, Lo PC. (2009). EEG dynamics of experienced Zen meditation practitioners probed by complexity index and spectral measure. *J Med Eng Technol*, 33:314–321.
 36. Blanchard K. (2003). Life without menstruation. *Obstetrician & Gynecologist*, 5:34–37.
 37. Goldstuck ND. (2020). Modern menstruation: is it abnormal and unhealthy? *Medical Hypotheses*, 144:10995.