

## Research

# Comparison of the effect of teaching coping skills and acupressure on premenstrual stress: a randomized controlled trial

Mojgan Mirghafourvand<sup>1</sup> · Somayeh Abdolalipour<sup>2</sup> · Amjad Mohamadi Bolbanabad<sup>3</sup> · Behnaz Manouchehri<sup>4</sup>

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## Abstract

**Background** Premenstrual syndrome (PMS) refers to significant clinical physical and psychological manifestations during the luteal phase of the menstrual cycle, leading to significant distress and impaired functional capacity. Given the side effects caused by pharmacotherapy, it seems logical to use non-pharmacological methods that can reduce symptoms such as menstrual stress. Thus, this study has been conducted to compare the effect of teaching coping skills and acupressure on premenstrual stress in undergraduate students of the Medical School of Azad University of Sanandaj-Iran.

**Method** This study is an experimental study that was designed in the form of three groups (two acupressure and coping strategy groups and one control group). The participants by moderate or severe degree based on the Symptoms Premenstrual Screening Tool entered the study. Students in the coping skills training group received intervention for 5 weeks and every week for 60 min. The second intervention group received acupressure intervention for 3 months and twice a day for 60 s each time, in a sitting position, with pressure on the 6th spleen point (SP6). Data collection tools included socio-demographic and obstetric characteristics questionnaire, as well as premenstrual stress questionnaire and stress coping styles questionnaire, which were completed before and 3 months after the intervention. ANCOVA test was used for comparing the variables of premenstrual stress and coping strategy between the investigated groups, controlling the scores of premenstrual stress and coping strategy before the intervention, as well as controlling those socio-demographic variables that had a significant difference between the two groups.

**Results** Based on the ANCOVA test adjusted based on the age of first menstruation and pre-intervention premenstrual stress scores, the mean post-intervention premenstrual stress scores in the acupressure group [adjusted mean difference (AMD): -20.6; 95% Confidence Interval (95% CI): -23.1 to -17.1;  $P < 0.001$ ] and coping strategy group [AMD: -20.5; 95% CI -23.4 to -16.7;  $P < 0.001$ ] were significantly lower than that of the control group. Also, based on the post-hoc test, there was no statistically significant difference in terms of the mean post-intervention PMS scores between the two acupressure and the coping strategy groups [AMD: -0.1; 95% CI -3.5-2.9;  $P = 0.995$ ]. Also, the mean post-intervention scores of task-oriented coping subscale [AMD: 30.8; 95% CI 25.6-36.1;  $P < 0.001$ ] as well as avoidance-oriented coping subscale [AMD: 18.2; 95% CI 14.6-21.8;  $P < 0.001$ ] were significantly higher than those of the control group, yet in terms of the emotion-oriented coping subscale [AMD: -26.9; 95% CI -31.1 to -22.7;  $P < 0.001$ ], the scores were significantly lower than those of the control group.

**Conclusion** Considering the effect of learning coping strategies and applying acupressure in reducing the symptoms of premenstrual stress, it seems that equipping people with coping skills allows them to cope with stressful situations

✉ Behnaz Manouchehri, manouchehribehnaz@gmail.com; Mojgan Mirghafourvand, mirghafourvand@gmail.com; Somayeh Abdolalipour, sm.abdolalipour@yahoo.com; Amjad Mohamadi Bolbanabad, Amohammadi1364@gmail.com | <sup>1</sup>Social Determinants of Health Research Center, Department of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran. <sup>2</sup>Department of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran. <sup>3</sup>Social Determinants of Health Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran. <sup>4</sup>Department of Midwifery, Faculty of Medicine, Islamic Azad University-Sanandaj Branch, Sanandaj, Iran.



such as premenstrual syndrome and show a better and more logical response and feel less anxiety, depression, physical problems, and social problems. Furthermore, acupressure can also be used as a non-invasive method alone or as a complementary medicine in reducing the symptoms of premenstrual stress in young girls.

**Trial registration** Iranian Registry of Clinical Trials (IRCT): IRCT20230618058517N1. Date of registration: 26/06/2023. URL: <https://irct.behdasht.gov.ir/search/result?query=IRCT20230618058517N1>

**Keywords** Premenstrual syndrome · Coping skills · Acupressure · Non-pharmacological interventions

## Abbreviations

ITT	Intention to treat
PSST	Premenstrual Symptoms Screening Tool
SCSQ	Stress Coping Styles Questionnaire
SD	Standard deviation
K-S	Kolmogorov–Smirnov
ANCOVA	Analysis of Covariance
AMD	Adjusted Mean Difference

## 1 Background

Premenstrual syndrome (PMS) refers to significant clinical physical and psychological manifestations during the luteal phase of the menstrual cycle, leading to significant distress and impaired functional capacity. These symptoms disappear within a few days after the onset of menstruation [1]. The prevalence of PMS increased by 46.5% from 652.5 million in 1990–956.0 million in 2019 all over the world [2]. Among these, about 3–10% of women experience severe symptoms that disrupt their daily activities [3]. PMS symptoms include changes in appetite, weight gain, abdominal pain, back pain, headache, swelling and breast tenderness, nausea, constipation, anxiety, irritability, anger, fatigue, restlessness, mood swings, and crying [1].

Most symptoms occur in women aged 25–35, although it can be seen at any age between adolescence and menopausal ages as well [4]. Meanwhile, female students are more affected by PMS. It is believed that the amount of premenstrual syndrome is high among this population and it has a negative effect on their life and academic performance. For example, the prevalence of premenstrual syndrome among students in different countries is 65% in Egypt, 54.2% in Turkey, and 12% in Japan [5–7]. The difference in the prevalence of this syndrome can be attributed to the diagnostic criteria applied, the age group being investigated, and the degree of severity of the disorder [8].

The prevalence of premenstrual syndrome in Iran has been estimated from 68.9% in high school students and 54.9% in university students [9]. This geographical difference in the prevalence of premenstrual syndrome may be due to the difference in genetic factors, diet, and lifestyle among young girls [10–12]. Factors such as inactivity and lack of exercise, smoking, high alcohol use, consumption of sweets and caffeinated beverages, being single, low educational levels [13], and childhood trauma are the risk factors for PMS [14]. Many social factors, such as the negative attitude towards menstruation that comes from different beliefs and cultures of societies, also affect the incidence of PMS symptoms [15].

PMS has always been considered in terms of economic and social effects. The high prevalence of menstrual disorders has affected academic and social life. Students were absent from classes and some reported lower grades compared to others. Moreover, impairments in various aspects of quality of life such as meeting friends and colleagues, relationships with family members and partners were reported [16]. Studies showed that there are 17% reported decreased work efficiency, 19% increase in absenteeism, decreased accuracy and lack of concentration in performing tasks in women with premenstrual syndrome [17, 18].

Different methods are used to control menstrual stress and its accompanying complications, which are divided into two categories, pharmacological methods and non-pharmacological ones. Prostaglandin synthase inhibitors are effective for pain. The use of these drugs may be prohibited in patients suffering from gastric ulcers or increased hypersensitivity to aspirin; their side effects include nausea, indigestion, diarrhea, and sometimes fatigue [19]. Given the side effects of drug therapy, it seems logical to consider non-pharmacological methods that can help reduce symptoms such as menstrual tension [20].

Since the cause of this syndrome is unknown, there is no definitive treatment for it, and its treatment is symptomatic. Today, many women tend to treat their symptoms using complementary and natural medicine. In a study, it has been

reported that 80% of women who suffer from PMS want to receive alternative medicine treatments such as herbal medicines, acupressure, and acupuncture [21]. Acupressure, which is a branch of acupuncture, is a 5000-year-old treatment method. It is the third most frequently used method of pain relief in the world [22]. One of the main advantages of acupressure is its simplicity of use and the learnability and applicability of the patients themselves. Therefore, patients can use it with simple training to help treat and take care of themselves [23]. The mechanism of its effect is such that due to pressure, the small myelin fibers located in the muscles are activated and send stimuli to the spinal cord, and in this way, three nerve centers (spinal cord, midbrain, pituitary-hypothalamus axis) are activated, and show their relaxing effects. It seems that certain peptides are released as a result of acupressure, which have many properties, including fatigue-reducing and analgesic properties. These peptides justify the analgesic mechanism of acupressure to some extent. One of the interesting points about acupressure is that acupressure does not have any incompatibility with other treatment methods, and if a person is being treated with another method, he/she can receive acupressure as well [23, 24].

Another way to reduce pre-menstruation stress in girls is to use coping skills. Teaching coping skills is one of the effective methods among therapeutic approaches for dealing with various behavioral problems and correcting them among young people [25]. In teaching coping skills, the goal is to change problematic behaviors, create new behaviors, and adapt and adjust more to the environment. Coping skills are methods of dealing with problems that are consciously designed and implemented by the individual, and the result is solving the problem or increasing the psychological capacity of the individual to successfully overcome crises and stay away from the damage caused by mental crises [26]. Various researches show that learning coping styles helps to overcome physical and mental discomforts by controlling emotional pressure [27–29]. The physiology behind different coping styles is related to the serotonergic and dopaminergic input of the medial prefrontal cortex and the nucleus accumbens. Vasopressin and oxytocin neuropeptides also have an important use in the mechanism of coping styles [30].

In terms of health, women with menstrual stress are among vulnerable groups and need special health care to improve their health [31]. Some studies have conducted comparing the effect of acupuncture with other methods such as yoga [32] and of health belief model-based education [33] on reducing the symptoms of premenstrual syndrome, but no study proves its effect compared to coping skills training methods. Moreover, it has been proved that correct implementation of coping skills training among the young people can help develop adaptive coping skills by reducing their stress and anxiety levels [25]. However, there are very few studies conducted on the effect of coping skills on premenstrual stress. Therefore, the importance of dealing with this topic for improving women's health, reducing the economic consequences of this stress, and comparing the methods of coping skills and acupressure and their efficiency can be important and should be taken seriously from the health policy's point of view. Therefore, this study was conducted to compare the effect of teaching coping skills and acupressure on premenstrual stress in undergraduate students of Sanandaj Azad University-Iran.

## 1.1 Objectives

To determine and compare the effect of teaching coping skills and acupressure on premenstrual stress in undergraduate students of Sanandaj Azad University-Iran.

To determine the effect of teaching coping skills on coping skills scores in undergraduate students of Sanandaj Azad University-Iran.

## 2 Methods

### 2.1 Study design and participants

The present study is an experimental one, which is designed in the form of three groups (two intervention groups and one control group) with two stages pre-test and post-test. This study has been conducted on the undergraduate midwifery students of the School of Medicine, Sanandaj Azad University, and has been registered on the Iranian Registry of Clinical Trials (IRCT) with the code IRCT20230618058517N1.

The inclusion criteria for the study included willingness to participate in the study, suffering from premenstrual syndrome of moderate to severe degree (score 0–3 based on PSST questionnaire), being single, having regular menstrual periods that last  $28 \pm 7$  days. Exclusion criteria included suffering from physical and mental diseases confirmed by a

specialist, taking other medications, receiving complementary treatment, physical disabilities, and experiencing severe mental health crises over the past 3 months.

## 2.2 Sampling and random allocation

The method of sampling was a simple convenience one; the researcher first went to each undergraduate midwifery class and after providing full explanations about the research topic, the goals, and the method of the study for the students, if they were willing to cooperate, the pre-menstrual questionnaire was completed by them after obtaining written consent. Thus, in the first stage, the premenstrual syndrome questionnaire was given to 290 students. At this stage, 10 students were excluded from the study for not completing the questionnaire. After reading the questionnaires, people who met the criteria for premenstrual syndrome were identified for entering the study and about 190 people were excluded from the study for not meeting the criteria for premenstrual syndrome. As many as 90 of the students who were in the moderate or severe group (based on the answers to the questionnaire) and met the other inclusion criteria, completed the socio-demographic and obstetric information questionnaire, the questionnaire related to premenstrual stress, and the coping strategies questionnaire.

The participants were randomly divided into three groups of 30 people using the random block method; the coping strategy group, the acupressure group, and the control group (Fig. 1). To ensure allocation concealment, interventions were written on paper and placed inside opaque sequentially numbered envelopes. The envelopes were opened in the order of participants' entry into the study, revealing the type of intervention received by each participant. Blocking and preparation of the envelopes were done by a person not involved in the sampling process.

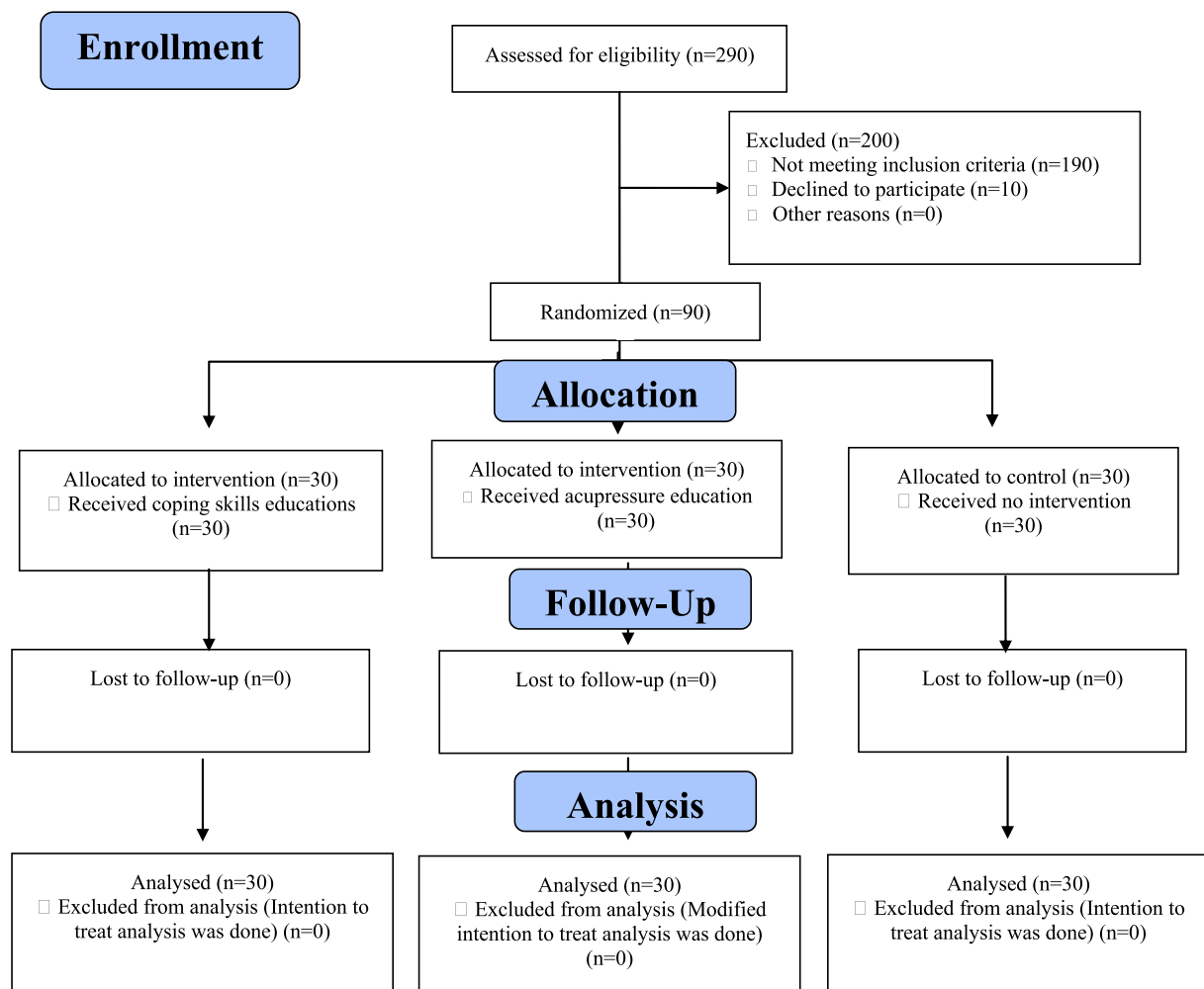


Fig. 1 Flow diagram of the study

## 2.3 Intervention

The students were taught coping strategies and how to perform acupressure by a researcher (a master's degree student in midwifery). The coping skills students were taught coping skills for 5 weeks each week for 60 min in five groups of six people. The students were asked to apply the coping strategies for 3 months. The training of corresponding skills is given in Table 1. Then the test group was asked to use the principles that they received in the training when they experienced the symptoms of premenstrual syndrome stress, and at the beginning of each training session, the students were asked to express the previous training and express the skills in the presence of the researcher so that possible ambiguities are resolved and at the end of 3 months, the students completed the questionnaire of stress and corresponding skills again.

For the acupressure group, the steps of performing acupressure and the duration of the program were explained, and at the end of the training session, acupressure was conducted by the students under the supervision of the researcher to ensure the correctness and accuracy of the procedure. Then acupressure was performed for 3 months, twice a day in two shifts, morning and evening, for 60 s each time in a sitting position with pressure on the 6th spleen point (SP6), depending on the duration of PMS, by the person herself at home or in the dormitory. Reminders and how to perform the exercises were supervised by one of the researchers who was in close contact with the students. After 3 months, on the last day of the menstrual cycle, the students completed the stress questionnaire again. Also, these questionnaires were given to the control group after 3 months. It is worth noting that at the end of the study, to comply with the ethical points in the control group, all the educational booklets and pamphlets as well as the steps of performing acupressure were explained and provided to them so that they could use the educational materials in their monthly cycle.

## 2.4 Sample size

We calculated the required sample size using the formula for the comparison of two independent means. The sample was calculated using G-Power software. According to the information available in the study conducted by Babakhani et al. [34] regarding the mean score of premenstrual syndrome and considering  $M1 = 29.4$ ,  $M2 = 21.5$ ,  $SD1 = 7.6$ ,  $SD2 = 6.8$ , Two-sided  $\alpha = 0.05$  and Power = 95%, the number of samples for each group was calculated to be 23 people. Considering a 20% attrition of the final sample, as many as 30 individuals were considered for each group.

## 2.5 Data collection

The data were collected by self-report method and using questionnaires of socio-demographic characteristics, Premenstrual Symptoms Screening Tool (PSST), premenstrual stress questionnaire, and Stress Coping Styles Questionnaire (SCSQ).

## 2.6 Questionnaire of socio-demographic characteristics

It includes questions related to age, age of first period, length of cycle and period of bleeding, education of parents, and number of people in the household. Content validity was used to determine scientific validity. Thus, after carefully studying the latest scientific sources related to the research topic, the forms were provided using the opinions of the supervisors and advisors. Then, it was given to seven experts in the field of reproductive health and midwifery for evaluation, and after considering the suggestions and making the necessary corrections, the final tool was used. Since the questions of the questionnaires are clear and are used in similar studies many times, they are thus confirmed in terms of reliability.

## 2.7 Premenstrual symptoms screening tool (PSST)

The Premenstrual Symptoms Screening Tool (PSST) has been developed by Steiner et al. [35]. It is a simple and useful tool for identifying women suffering from severe PMS/PMDD who are likely to respond to treatment. The PSST questionnaire included 14 questions that have two parts: the first part includes 9 physiological and behavioral symptoms and the second part assesses the impact of these symptoms on individuals' lives and includes 5 questions. The questionnaire was based on four criteria (not at all, mild, moderate, and severe). They were scored from 0 to 3 and the total scores ranged from 0 to 42. The scores above 13 indicate a moderate to severe grade [35]. The validity and reliability of this tool in Iran

Table 1 Content of coping skills training sessions

Session	Purpose	Content	Training method	Duration
First	Raising awareness about menstruation	Teaching the physiology of menstruation and premenstrual syndrome, including the concept, symptoms, and negative effects caused by it on different aspects of life and ways to deal with it	Speech Group discussion	60 min
Second	Raising awareness about stress	Discussing stress and its symptoms and its relationship with PMS	Speech PowerPoint	60 min
Third	Raising awareness about anger	Training about anger and ways to control it	Speech PowerPoint	60 min
Fourth	Raising awareness about coping skills	Training coping skills and their types	Speech PowerPoint	60 min
Fifth	Raising awareness about tension	Training tension control skills and reviewing a summary of the contents of the previous sessions	Group discussion Speech PowerPoint Group discussion	60 min

have been confirmed by Hariri et al. [36]. The reliability of the questionnaire in this study was measured to be 0.9 using Cronbach's alpha.

## 2.8 Premenstrual stress questionnaire

This questionnaire is a standard one. The number of questions in the questionnaire was 17 and the scores ranged from 17 to 85. The questionnaire was based on 5 criteria (not at all, mild, moderate, severe, and disabling) on a five-point scale [37]. To determine the reliability of the premenstrual stress questionnaire, a pilot study was conducted on 20 eligible individuals and the reliability of the questionnaire was measured to be 0.81 using Cronbach's alpha coefficient.

## 2.9 Stress coping styles questionnaire

The Stress Coping Styles Questionnaire is a 48-item tool that was developed by Parker & Endle (1990). This questionnaire is used to measure the styles of coping with stress among teenagers and adults in stressful crises; it has three subscales or styles. The scores of each subscale are obtained by summing up the questions. The subscales of stress coping styles questionnaire include task-oriented coping style, emotion-oriented coping style, and avoidance-oriented coping style. The scoring of this questionnaire is conducted based on a five-point Likert scale (1 = never to always = 5). The range of changes in the three types of coping behavior is such that the score of each of the three coping behaviors, i.e., task-oriented, emotion-oriented, and avoidance-oriented, ranges from 16 to 80. That is, each of the coping methods includes 16 questions. A person's dominant way of coping is determined by the score she receives on the test. It means that whichever of the behaviors gets a higher score, that behavior is considered as the person's coping method [38]. In a study on the Iranian population, to obtain the reliability of the stress coping styles questionnaire in the group of students, Cronbach's alpha was used. Cronbach's alpha values are as follows: in the task-oriented coping subscale, the values were 0.92 for boys and 0.85 for girls, in the emotion-oriented subscale, the values were 0.82 for boys and 0.85 and in the avoidance-oriented subscale, the values were 0.85 for boys and 0.82 for girls [39]. In the present study, Cronbach's alpha for the pre-and post-intervention values were 0.62 and 0.7 for the task-oriented subscale, 0.51 and 0.68 for the emotion-oriented coping subscale, and 0.73 and 0.8 for the avoidance-oriented coping subscale.

## 2.10 Data analysis

The data obtained at this stage were analyzed using SPSS V-24. Data were entered into the software by two independent researchers (double data entry approach). Kolmogorov–Smirnov test was used to determine the normal distribution of the data. The data had a normal distribution for all variables in this study. Descriptive statistics including frequency (percentage) and mean (standard deviation) were used to describe socio-demographic and obstetric characteristics. The scores before intervention for menstrual stress and coping skills were compared between groups using one-way ANOVA, and the scores before and after intragroup intervention for coping skills were compared using a paired t-test. ANCOVA test was used to compare variables of premenstrual stress and coping strategies between the study groups by controlling the baseline scores and the variable age of first menstruation. The analysis was conducted using the modified intention to treat (ITT) method.  $P < 0.05$  was considered to be significant.

## 3 Results

The sampling process began on May 22, 2023, and was finished on July 22, 2023. A total of 90 people participated in this study in three groups including a coping strategy intervention (30 people), acupressure intervention (30 people), and control group (30 people). The mean (SD: standard deviation) of age in the coping strategy group was 21.5 (2.2) and in the acupressure group it was 22.3 (2.9) and in the control group, it was 22.8 (2.3). There was no significant statistical difference between the three groups in terms of age ( $p = 0.410$ ). The mean (SD) of the first menstruation age in the coping strategy group was 13.4 (1.3), and in the acupressure group it was 12.8 (1.1), and in the control group, it was 12.6 (0.9). There is a significant statistical difference between the three groups in terms of the mean age of the first menstruation ( $P = 0.009$ ). In terms of other socio-demographic and obstetric variables, there was no significant difference between the groups (Table 2).

**Table 2** Socio-demographic and obstetric characteristics of the study participants

Variables	Acupressure n=30	Coping skills n=30	Control n=30	P-value
	Mean (SD)			
Age (Year)	22.3 (2.9)	21.5 (2.2)	22.8 (2.3)	0.410 <sup>a</sup>
Age in first menstruation (Year)	12.8 (1.1)	13.4 (1.3)	12.6 (0.9)	0.009 <sup>a</sup>
Bleeding duration	5.3 (1.4)	5.4 (1.1)	5.7 (0.9)	0.143 <sup>a</sup>
Length of cycle	27.8 (4.8)	28.6 (2.5)	28.5 (3.5)	0.443 <sup>a</sup>
Number of household members	4.3 (1.1)	4.7 (1.5)	4.9 (1.3)	0.150 <sup>a</sup>
Father's education	Number (Percent)			0.463 <sup>b</sup>
Illiterate/Primary	1 (3.3)	1 (3.3)	1 (3.3)	
High school	6 (20.0)	12 (40.0)	5 (16.7)	
Diploma	12 (40.0)	8 (26.7)	10 (33.3)	
University	11 (36.7)	9 (30.0)	14 (37.8)	
Mother's education	N (%)			0.224 <sup>b</sup>
Illiterate/Primary	3 (10.0)	1 (3.3)	0 (0)	
High school	13 (43.3)	11 (36.7)	8 (26.7)	
Diploma	11 (36.7)	10 (33.3)	13 (43.3)	
University	8 (26.6)	3 (10.0)	9 (30.0)	

<sup>a</sup>One-way ANOVA; <sup>b</sup>Chi-square**Table 3** Comparison of premenstrual stress scores between the study groups

Groups	Before intervention			After intervention		
	Mean	SD	P-value <sup>a</sup>	Mean	SD	P-value <sup>b</sup>
Acupressure	42.5	13.9	0.865	23.6	4.6	< 0.001
Coping skills	42.7	9.3		23.7	3.2	
Control	43.9	6.7		44.2	7.2	
Comparison between groups	MD	95%CI	P-value <sup>c</sup>	AMD	95%CI	P-value <sup>c</sup>
Acupressure versus Control	− 1.4	− 7.8–5.2	0.946	− 20.6	− 23.1 to − 17.1	< 0.001
Coping skills versus Control	− 1.2	− 7.7–5.3	0.963	− 20.5	− 23.4 to − 16.7	< 0.001
Acupressure versus Coping skills	0.2	− 6.3–6.7	1.000	− 0.1	− 3.5–2.9	0.995

<sup>a</sup>One-way ANOVA; <sup>b</sup>ANCOVA test with adjusting the baseline values of premenstrual stress scores and first menstrual age; <sup>c</sup>Post-hoc test

Before the intervention, the mean (SD) of the premenstrual stress score in the coping strategy group was 42.7 (9.3), in the acupressure group it was 42.5 (13.9) and in the control group it was 43.9 (6.7); based on the one-way ANOVA test, there was no statistically significant difference between the three groups ( $P = 0.865$ ). After the intervention, the mean (SD) of premenstrual stress score was 23.7 (3.2) in the coping strategy group, 23.6 (4.6) in the acupressure group, and 44.2 (7.2) in the control group. Based on the ANCOVA test adjusted based on the age of the first menstruation and the scores of pre-intervention scores, the mean scores of post-intervention premenstrual stress in the acupressure group [adjusted mean difference (AMD): − 20.6; 95% Confidence Interval (95% CI): − 23.1 to − 17.1;  $P < 0.001$ ] and coping strategy group [AMD: − 20.5; 95% CI − 23.4 to − 16.7;  $P < 0.001$ ] were significantly lower than that of the control group. Also, based on the post-hoc test, there was no statistically significant difference in terms of the mean post-intervention premenstrual stress scores between the two groups of acupressure and the coping strategy [AMD: − 0.1; 95% CI − 3.5–2.9;  $P = 0.995$ ] (Table 3).

The mean (SD) of the pre-intervention coping strategy skill score in the task-oriented coping subscale was 56.1 (11.7) in the coping strategy group and 30.5 (12.9) in the control group. As for the emotion-oriented coping subscale, in the coping strategy group, it was 45.6 (10.2) and in the control group, it was 61.1 (14.5). As for the avoidance-oriented coping subscale in the coping strategy group, it was 45.4 (6.5) and in the control group it was 32.3 (7.3); based on the one-way ANOVA test, there was a statistically significant difference between the three groups ( $P < 0.001$ ). The mean (SD) of post-intervention of the coping strategy skill score in the task-based subscale in the coping strategy group was 75.4 (4.8) and in the control group, it was 31.8 (12.1). As for the emotion-based subscale in the coping strategy group, it was 24.2 (3.9)

and in the control group, it was 60.8 (13.5). In the avoidance-based subscale, it was 57.9 (5.1) in the coping strategy group and 34.5 (6.2) in the control group. Based on the ANCOVA test adjusted based on the age of first menstruation and pre-intervention scores, the mean post-intervention scores in task-oriented coping subscale [AMD: 30.8; 95% CI 25.6–36.1;  $P < 0.001$ ] and avoidance-oriented coping subscale [AMD: 18.2; 95% CI 14.6–21.8;  $P < 0.001$ ] were significantly higher than that of the control group. As for the emotion-oriented coping subscale [AMD: –26.9; 95% CI –31.1 to –22.7;  $P < 0.001$ ], it was significantly lower than that of the control group. Also, based on the paired t-test, the difference between scores before and after the intervention within a group in the coping strategy group was significant for all three subscales ( $P < 0.001$ ) (Table 4).

## 4 Discussion

The results of this study showed that the symptoms of premenstrual stress after the intervention in the two groups of acupressure and coping strategy significantly reduced compared to the control group, although the effect of these two methods was not significantly different. Also, the results showed that the task-oriented and avoidance-oriented subscale scores in the coping strategy group were significantly higher than those of the control group, and in the emotion-oriented subscale, they were significantly lower than those of the control group.

According to the results of this study, the premenstrual stress in the acupressure and the coping strategy groups after the intervention were significantly lower than the control group. Based on the results of a review study that included studies that investigated the effect of acupressure on different points of the body, this medicine can be a complementary treatment to deal with PMS. [40]. Trial results of the study conducted by Ezadi et al. [41], which was conducted to investigate the effect of acupressure on the SP6 on the intensity of menstrual pain in women, showed that the average intensity of menstrual pain measured with a visual scale in the acupressure group in the first, second and third month after the intervention had a significant reduction compared to the control group [41]. Also, in the study by Simsek et al. [33], no significant difference was observed between the mean premenstrual stress post-test scores of the training group + acupressure and the training group [33].

The results of the trial conducted by Bastani et al. [42], which investigated the effect of acupressure on the sleep quality of female students suffering from premenstrual syndrome, were in line with those of the present study. Based on the findings of their study, applying acupressure on the HT7 point (a bone in the wrist) as a non-pharmacological method can be effective in improving the sleep quality of girls with premenstrual syndrome [42]. The study by Chen et al. [43] was conducted on 129 teenage girls suffering from dysmenorrhea, for the girls in the intervention group, acupressure was applied to SP6, BL32, and Liver 3 points 3 times a week for 30 min. In the results of the aforementioned study, it was reported that the acupressure applied in the intervention group is effectively used to relieve the

**Table 4** Inter and intra-group comparison of pre-and post-intervention coping skills scores

Variable	Coping skills (n=30) Mean (SD <sup>†</sup> )	Control (n=30) Mean (SD <sup>†</sup> )	Mean Difference (95% Confidence Interval)	Inter-group comparison P-value
Task-orientated coping style (Score range: 16–80)				
Before intervention	56.1 (11.7)	30.5 (12.9)	25.6 (19.1–31.9)	$< 0.001^a$
After intervention	75.4 (4.8)	31.8 (12.1)	30.8 (25.6–36.1)	$< 0.001^b$
Intra-group comparison (P-value)	$< 0.001^c$	$< 0.001^c$		
Emotion-orientated coping style (Score range: 16–80)				
Before intervention	45.6 (10.2)	61.1 (14.5)	–15.5 (–21.9 to –8.9)	$< 0.001^a$
After intervention	24.2 (3.9)	60.8 (13.5)	–26.9 (–31.1 to –22.7)	$< 0.001^b$
Intra-group comparison (P-value)	$< 0.001^c$	0.380 <sup>c</sup>		
Avoidance-orientated coping style (Score range: 16–80)				
Before intervention	45.4 (6.5)	32.3 (7.3)	13.1 (9.5–16.7)	$< 0.001^a$
After intervention	57.9 (5.1)	34.5 (6.2)	18.2 (14.6–21.8)	$< 0.001^b$
Intra-group comparison (P-value)	$< 0.001^c$	$< 0.001^c$		

<sup>a</sup>One-way ANOVA; <sup>b</sup>ANCOVA test with adjusting the baseline values and first menstrual age; <sup>c</sup>Paired t-test

symptoms in teenagers suffering from dysmenorrhea [43]. In another study, it was also reported that the acupressure applied on LI4 and BL32 points reduces labor pain [44]. Therefore, it can be stated that acupressure is effective in reducing premenstrual symptoms and dysmenorrhea, but the pressure on which points are superior to other points needs more comparative studies.

In the present study, the symptoms of premenstrual syndrome in the group of coping strategies were significantly reduced in comparison with the control group, but this difference was not significant between the two groups of acupressure and coping strategies. Although numerous studies have been conducted in different ways they showed that coping strategies had a great effect in reducing anxiety [45, 46]. In the study of Babakhani et al. [34], a significant decrease in the severity of PMS was observed in the intervention group compared to the control group about 3 months after the end of the intervention, indicating the effectiveness of resilience counseling in reducing PMS symptoms [34]. Motavalli et al. [47] has studied the effect of coping methods in reducing anxiety among girls with premenstrual syndrome. The results revealed that the coping strategies had a significant effect on reducing anxiety [47]. The study by Behbahani et al. [48] was conducted to compare the effectiveness of three methods of acupressure, self-care training, and the use of ibuprofen in reducing menstrual pain in girls aged 18–25 years, pain reduction in the acupressure and self-care training groups was significantly higher than that of the ibuprofen group, but there was no significant difference between the two acupressure and self-care training groups [48]. In a qualitative study conducted by Perz & Ussher [49], three main themes reflecting women's strategies for coping with premenstrual stress were extracted from their interviews, including "self-monitoring and awareness" (including recognizing and accepting premenstrual changes); "coping through self-regulation" (including avoiding stress and conflict, escaping demands and responsibilities, or taking care of oneself); and "coping as intersubjective experience" (including shared understanding or interpretation of an experience between two or more people) [49].

The results of this study also showed that the mean scores of the coping strategy group in the subscales of task-oriented and avoidance-oriented after the intervention were significantly higher than the control group, but the scores of the intervention group were lower than the control group in the subscale of emotion-oriented. The highest mean score in the coping strategy group after the intervention was related to the task-oriented subscale, and in the control group, it was related to the emotion-oriented subscale. When people face problems, they show different reactions, from cognitive-emotional reactions to behavioral ones. These reactions may lead to problem-solving or avoidance [47]. Emotion-oriented coping strategy is less effective than other coping strategies, but active and task-oriented coping strategies lead to better adaptation to illness or any stressful situation [50]. For example, the study conducted by Ghasemipour et al. [51], showed that the more severe the premenstrual symptoms and the more they interfere with daily functioning, the more ineffective coping strategies people adopt [51]. According to Lazarus and Folkman's interactional theory of stress and coping, individuals are constantly appraising stimuli in their environment. When stimuli are appraised as threatening, challenging, or harmful (i.e., stressors), the resulting distress initiates coping strategies to manage emotions or attempts to directly address the stressor itself [52]. Learning coping and adaptation skills leads to favorable resolution of stressors and the elicitation of positive emotions in the individual, thereby increasing the individual's ability to manage intense emotion [53].

The study by Valenti et al. [54] was conducted on the assumption that task-oriented and emotion-oriented coping style has a direct relationship and avoidance coping style has an inverse relationship with the degree of adaptation to university life among Italian students. The results of the study concerning the task-oriented and emotion-oriented coping styles were in line with the hypotheses of the study, while the avoidance-oriented coping strategies did not predict the level of adaptation to academic life or any of its specific sub-dimensions [54]. Recently, it has been argued, that the studies conducted on coping styles wrongly combine avoidance and escape behaviors in a single category. Avoidance is people's anticipation of a negative or stressful situation, minimizing the possibility of experiencing a potentially stressful stimulus, while escape involves trying to remove oneself from a previously experienced stressor. In addition, it has been emphasized that neither avoidance nor escape behaviors can be considered maladaptive coping styles because although none of these two solve problems or stressful factors, they are useful in reducing negative impacts on people's well-being [55].

Teaching appropriate coping skills to patients and their caregivers can have a noticeable effect on their understanding of their condition, the severity of symptoms, and related psychological distress. In the coping approach, it is believed that if the therapist cannot change the patient's living conditions, he/she can change attitudes towards the disease, life events, and life stresses. The therapist can strengthen self-efficacy by coping effectively with the pain and problematic events; in this way, it leads to the reduction of the feeling of helplessness and helps to improve the negative mood [56].

## 4.1 Strengths and limitations of the study

This is the first study that compared the effect of acupressure and other strategies in reducing premenstrual stress. Also, the use of standard questionnaires and the absence of attrition in the samples due to continuous and regular follow-up are other strengths of the study. Since the level of accuracy of the participants while answering the questions and their mental state affected the way they answered, and it was not possible to fully control these factors, this can be considered as one of the limitations of the study. Also, since sampling was conducted only from the students of Sanandaj Azad University, the generalizability to other women's societies needs more extensive studies. Regarding the application of the findings, it can be stated that acupressure is a non-pharmacological, inexpensive, simple, and side-effect-free method and can be used in girls and young women as a complementary treatment along with pharmacological treatment or only in people whose conditions do not allow drugs and chemicals. Also, the use of coping strategies allows them to show a better and more logical reaction in stressful situations such as the period before menstruation, manage the situation better, and as a result, feel less anxiety, depression, physical problems, and social problems.

## 4.2 Implication of results

Stress coping skills training can be an effective intervention in reducing premenstrual symptoms. This emphasizes the need for these interventions in clinical practice. Health care providers should use these interventions in care and educational sessions. In addition, since acupressure is a non-pharmacological, cost-effective, simple, effective, and side-effect-free method, and more importantly, it is a practical method that can be performed anywhere and anytime by women themselves and healthcare providers who are somehow related. Both of those interventions can be applied in girls and young women along with drug treatment or alone in people who do not have the conditions to use drugs and chemicals.

## 5 Conclusion

Training coping strategies and applying acupressure are equally effective in reducing the symptoms of premenstrual tension. Training coping skills caused an increase in scores in the subscale of task-oriented coping and avoidance-oriented coping and a decrease in scores in the subscale of emotion-oriented coping in the intervention group compared to the control group. It can be claimed that equipping people with coping skills allows them to react better and more logically in stressful situations such as premenstrual syndrome and feel less anxiety, depression, physical problems, and social problems. In addition, acupressure can be used as a non-invasive method alone or as a complementary medicine to reduce the symptoms of premenstrual tension in young girls.

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**Author contributions** All of the authors contributed to the conception, and design of the study and revised the manuscript. SA and BM drafted the manuscript under the direct supervision of MM (Corresponding author). AMB and MM conducted the statistical analysis. All authors read and approved the final manuscript.

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**Availability of data and materials** The datasets generated and/or analyzed during the current study are not publicly available due to limitations of ethical approval involving the patient data and anonymity but are available from the corresponding author at reasonable request.

## Declarations

**Ethics approval and consent to participate** This study has been approved by the ethics committee of the Islamic Azad University-Sanandaj Branch (ethics code: IR.IAU.SDJ.REC.1401.100, approval date: 21/02/2023). Informed written consent was obtained from all participants. All methods were carried out following relevant guidelines and regulations.

**Consent for publication** Not applicable.

**Competing interests** The authors declare no competing interests.

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