Effect of Acupressure on Primary Dysmenorrhea: Review of Experimental Studies

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Primary dysmenorrhea is defined as cramping pain in the lower abdomen with no pelvic diseases, and it has a high prevalence in many countries. Acupressure is a widely used complementary treatment method for primary dysmenorrhea. This review examined experimental studies to determine the effects of acupressure on primary dysmenorrhea using the databases PubMed, Google Scholar, and CINAHL with the keywords "Acupressure" and "Dysmenorrhea". There were 2227 records in the databases, and 330 articles were published between 1989 and March 2020. Experimental studies in the English language were reviewed according to the PRISMA guidelines. This review included 28 published studies that were assessed using the Jadad score for quality. The studies were categorized as studies of acupressure at the LR3 point (n = 4), at the SP6 point (n = 9), at auricular points (n = 5), at multiple points (n = 8), and with devices (n = 2). Moreover, studies of self-acupressure (n = 9) were identified. The studies demonstrated that acupressure could reduce menstrual symptoms, the severity and duration of menstrual pain, distress, and anxiety. Furthermore, it helped improve the quality of life and well-being of patients and provide psychological support and self-care. Acupressure is an inexpensive, easy-to-apply, and non-pharmacological treatment and is useful for reducing primary dysmenorrhea, and women can apply this method anywhere by themselves. However, high-quality randomized controlled trials with larger samples are necessary to establish the evidence for acupressure as an effective intervention.

Keywords: Acupressure, Primary dysmenorrhea, Acupoints, Self-acupressure

INTRODUCTION

Primary dysmenorrhea (PD) is defined as cramping pain in the lower abdomen, which occurs before or during menstruation without pelvic diseases [1-4]. Excessive prostaglandin release causes uterine contraction and leads to uterine hypoxia and ischemia, which results in extreme abdominal cramps and pain [1,3,5].

The rates of PD are high in some countries, e.g., 85.7% in Saudi Arabia [6], 74.8% in Spain [7], 80.0% in China [8], 88.0% in Australia [9], and between 84.0% and 94.0% in Turkey [10-13]. Contraceptive pills and nonsteroidal anti-inflammatory drugs are commonly used in the treatment of PD [3,5,14,15]. Acupressure is a traditional Chinese medicine technique involving the use of fingers and palms for non-invasive nursing intervention [1,16-21]. The method is also easy to learn and teach, low-cost, and simple and does not have negative side effects, and every person can utilize this method anywhere by themselves [1,16-19]. Acupressure is

one of the complementary treatment methods for PD, which is widely used [14,20,22]. It can activate the flow of body energy and blood, stimulate endorphin production, and lead to pain relief [23-25]. In addition, acupressure can reduce the social and economic consequences of PD [17,26]. Therefore, this review examined experimental studies to determine the effects of acupressure on PD.

MATERIALS AND METHODS

1. Searching strategy and selection of studies

Articles related to the effect of acupressure on PD published between 1989 and March 2020 were reviewed using the PubMed, Google Scholar, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases with the keywords "Acupressure" and "Dysmenorrhea". The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) declaration guided the study process [27]. Eligibility assessment was performed independently

in a blinded standardized manner by the researchers. The authors independently reviewed all abstracts and titles. The inclusion criteria in this study were as follows: experimental human studies, studies in the English language, and full-text studies. Review articles, studies not in the English language, articles with descriptive, cross-sectional, and qualitative methods, letter to the editor, congress presentations, books, study protocols, and case reports were excluded from the review. There were 2227 records in the databases, and 330

articles were examined. Overall, 28 published studies met the inclusion criteria for this review. Details of the article selection process for the review are shown in Fig. 1.

2. Quality assessment

The quality of each study was assessed using the Jadad score, which is a tool used to assess the methodological quality of a clinical trial independently. Similar systematic reviews were assessed using this score [28,29]. The total

Fig. 1. Details of the article selection in process of the review.

Table 1. The studies of acupressure on LR3

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Bazar- ganipour et al., 2010 [26]	Iran Randomized clinical trial	To determine the effect of acupressure on LR3 point on dysmenorrhea.	- AMS* - BDS*	University students Experimental group: LR3 point (n = 88) Control group: placebo point (n = 84)	- A total of pressure was 20 minutes and 3 to 7 days before the start of menstruation. - The severity of dysmenorrhea was assessed in the first and fourth of the menstrual cycles using AMS.	- The severity of dysmenorrhea was significantly different in the fourth cycle. - The decrease in dysmenorrhea severity was significant in the experimental group.	2
Kafaei- Atrian et al., 2013 [14]	Iran Randomized controlled clinical trial	To determine the effect of acupressure on LR3 point on PD.	- VAS* - BDS	University students Experimental group: LR3 point (n = 27) Control group: placebo point (n = 32)	- A total of pressure was four times and 16 minutes during three cycles and the start of the bleeding day. - The pain was measured immediately and 30 minutes, 1, 2, 3, and 4 hours after the start of bleeding with VAS before and after an intervention.	- The pressure on LR3 point decreased pain reduction after the intervention compared to pre-intervention. - No significant difference in pain intensity between groups before and after the intervention.	2
Kafaei- Atrian et al., 2016 [34]	Iran Clinical trial	To determine the effect of acupressure at LR3 and placebo points on the anxiety level in students with PD.	- VAS - STAI*	University students Experimental group: LR3 point (n = 11) Control group: placebo point (n = 20)	- In the first cycle, pain intensity was measured at the start of bleeding, and students were educated to apply acupressure. - In the second and third cycles, students applied pressure by themselves at the bleeding onset during 16 minutes and two cycles. - After the third menstrual cycle, STAI was completed by the students before and after the intervention.	- Anxiety was associated with dysmenorrhea reduced after applying acupressure. - There was no difference between groups in apparent or hidden anxiety after the intervention.	2
Bazar- ganipour et al., 2017 [5]	Iran Randomized controlled clinical trial	To evaluate acupressure in LR3 and LI4 points in women with PD.	- WBFPs* - QOL*	University students Experimental group 1: LR3 point (n = 30) Experimental group 2: LI4 point (n = 30) Control group: placebo point (n = 30)	- In the first cycle, the pain intensity and the QOL forms were completed. - In the second cycle, a total of pressure for 20 minutes on the points was started at between three to seven days before menstruation until the bleeding day. - QOL, the intensity and duration of pain were measured on 1-5 hours, 6-10 hours, and ≥ 1 day. - In the third cycle, each participant applied acupressure by herself.	- The second and third cycles had a significant difference between the three groups in pain intensity and duration. - The pain intensity and duration in the placebo group were more than LR3 and LI4 groups in the second and third cycles. - The QOL in the placebo group were worse than LR3 and LI4 groups in the second and third cycles.	2

*AMS = Andersch and Milsom Scale; BDS = Beck Depression Scale; VAS = Visual Analog Scale for Pain; STAI = Spielberg Anxiety Questionnaire; WBFPs = Wong Baker Faces Pain Scale; QOL = The Quality of Life Short Form-12.

Table 2. Studies of acupressure on auricular points

Refer- ences	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Wang et al., 2009 [23]	Taiwan Rando- mized clinical trial	To evaluate the effects of auricular acupressure on relieving menstrual symptoms and decreasing nitric oxide for women with PD.	- MDQ* - Blood sample of nitric oxide	University students Experimental group: auricular acupressure using liver, kidney and endocrine points (n = 36) Control group: a plain adhesive patch placed on the same points with no seed attached (n = 35)	- Acupressure was applied 15 times on each point, three times a day, for a total of 20 days. - After the acupressure, assessments of MDQ and nitric oxide were performed at baseline and within the first two days of their next menstrual cycle.	- In the acupressure group, menstrual symptoms decreased significantly after auricular acupressure. - The mean score of MDQ in both groups reduced in the post-test. - No statistically significant difference between the groups in serum nitric oxide levels.	3
Wang et al., 2013 [35]	Taiwan Experi- mental design	To evaluate the effects of auricular acupressure on menstrual pain and menstrual distress with PD using objective and physiological measurements.	- VAS - MDQ - LSS* - Physiological parameters [blood pressure, heart rate, heart rate variability, a low-frequency, a high-frequency/ low-frequency/ high-frequency ratio]	University students Experimental group: auricular acupressure using internal, genitals, endocrine, shenmen, sympathesis, liver and kidney points (n = 32)	- Cowherb seeds with adhesive patches were embedded on the points two to three days before menstruation and removed if pain were relieved for 48 hours. - The pressure was initiated at the onset of menstrual pain during two menstrual cycles. - All participants were educated to press each point for one minute, four times per day, until they achieved relief of menstrual pain. - Heart rate variability parameters with a wrist monitor and menstrual pain were measured during the intervention and the follow-up phase.	- Significant differences between the intervention and follow-up phases were found for high-frequency and blood pressure on day 1. - No significant differences were found in menstrual pain and menstrual distress, heart rate variability, a low-frequency, low- frequency /high-frequency ratio, or a high- frequency on days 1, 2, and 3. - The MDQ was higher in the intervention phase. - LSS was found to be significantly higher during the intervention phase compared to the follow-up phase.	0
Yeh et al., 2013 [36]	Taiwan A placebo- controlled study	To evaluate the effects of auricular acupressure on menstrual pain and distress with dysmenorrhea.	- VAS - MDQ - MPQ*	Adolescent students Experimental group: shenmen, kidney, liver, internal genitals, central rim and endocrine points (n = 50) Control group: six sham points (n = 50)	- Adhesive plasters were used to stick cowherb seeds to the specific auricular points and removed after pressing 48 hours later. - All students had to press each point for one minute, four times a day for two days at the start of menstrual pain.	- Between the group, differences were found in VAS and MDQ after the interventions. - Within the group, differences were found in the VAS, MDQ, and MPQ during the interventions for both groups.	0

Table 2. Continued

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Yeh et al., 2013 [2]	Taiwan A pretest/ posttest control design	To investigate the effects of auricular acupressure alone and combined with an interactive Internet-based intervention for the management of menstrual pain and self-care with PD.	- VAS - MDQ - MPQ - ADSCS*	Adolescent students Experimental group 1: auricular acupressure on shenmen, kidney, liver, internal genitals, central rim, and endocrine points (n = 50) Experimental group 2: auricular acupressure combined with an interactive internet-based intervention (n = 50)	- Cowherb seeds were used to stimulate the auricular points at the onset of menstrual bleeding and removed after pain relief 48 hours. - All students were instructed to press each point for at least one minute, four times per day until pain relief. - An interactive website was provided students with nursing care instruction, counseling, and interactive communication for increasing knowledge about dysmenorrhea. - VAS, MDQ, MPQ, and ADSCS were completed in the pre and post-intervention.	- Significant differences were found in ADSCS scores between the groups and MPQ, VAS, MDQ, and ADSCS scores for each group. - Auricular acupressure alone and a combination of auricular acupressure and interactive internet-based education reduced menstrual pain and distress for PD.	0
Cha and Sok, 2016 [3]	Korea Randomized controlled trial	To examine the effect of auricular acupressure therapy on PD.	- VAS - MDQ	Adolescent students Experimental group: auricular acupressure on Jagung, Sinmun, Gyogam, and Naebunbi points (n = 45) Control group: placebo auricular points (n = 46)	- An auricular acupressure needle on skin paper tape was applied on an ear for three days during periods of PD. - In the control group, only the skin paper tape without an auricular acupressure needle was applied on the same points. - Abdominal and back pain with VAS and MDQ were measured before the intervention and at three days immediately after removal of the tape in both groups.	- There were significant differences in abdominal pain, back pain, PD, and MDQ scores between the two groups. - The mean scores on abdominal pain and back pain were decreased in the experimental group.	3

*MDQ = Menstrual Distress Questionnaire; LSS = The Chinese Version of the Life Stress Scale; MPQ = McGill Pain Questionnaire; ADSCS = Adolescent Dysmenorrheic Self-Care Scale.

Table 3. Studies of acupressure on SP6

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Chen and Chen, 2004 [1]	Taiwan Randomized trial	To assess the effects of acupressure at SP6 point on symptoms of PD.	- VAS - MDQ - MPQ - VASA*	Adolescent students Experimental group: SP6 point (n = 35) Control group: rest for 20 minutes (n = 34)	- A total of pressure was 20 minutes during each person's menstrual period by the researcher. - After the acupressure, VAS, MPQ, MDQ and VASA were completed in the pretest and one- month posttest. - The experimental group performed pressure by herself in the next menstrual period.	- Acupressure during the initial session reduced the pain and anxiety. - In the self-treatment follow-up session, acupressure significantly reduced menstrual pain but not anxiety. - The experimental participants stated that acupressure was helpful (87%), and most of them (94%) were satisfied with pain relief and psychological support.	2
Jun et al., 2007 [16]	Korea A non- randomized controlled trial	To evaluate the efficacy of SP6 acupressure for dysmenorrhea and identify its effects on temperature changes in CV2 and CV12 points.	- VAS - MAQ* - Stress question- naire	University students Experimental group: SP6 point (n = 28) Control group: a light touch on the SP6 point (n = 30)	- The experimental group received acupressure treatment within the first 8 hours of menstruation during a total of 20 minutes. - Skin temperature changes in the CV2 and CV12 points were assessed before and after 30 minutes following treatment in both groups by placing a strip skin thermometer. - The severity of dysmenorrhea was assessed before, immediately after, 30 minutes, 1, 2, and 3 hours following treatment in both groups.	- There was a significant difference in the severity of dysmenorrhea between the two groups immediately after and 30 minutes, 1 and 2 hours post-treatment. - Skin temperature was significantly elevated at 30 minutes after acupressure at the suprapubic CV2 point in the experimental group compared to the control group.	0
Wong et al., 2010 [18]	China Unspecified	To evaluate the effects of SP6 acupressure in reducing the pain level and menstrual distress on PD.	- VAS - MDQ - MPQ	University students Experimental group: SP6 point (n = 19) Control group: only rest (n = 21)	- A total of pressure was 20 minutes during the menstrual cycle and the initial intervention session. - Students were educated to perform acupressure to do twice a day from the first to third days of their menstrual cycle during three months after the first session.	- There was a statistically significant decrease in pain score for VAS and MPQ immediately after the pressure. - In the self-acupressure periods, VAS, MPQ, and MDQ scores were reduced significantly in the third month of post-intervention.	1
Kashefi et al., 2010 [17]	Iran Randomized controlled trial	To assess the effect of acupressure at SP6 point on PD.	- VAS - MPQ	University students Experimental group: SP6 point (n = 40) Control group: sham point (n = 41)	- During the first 24 hours of their initial menstrual cycle, the pressure was performed for 30 minutes and repeated for two menstrual cycles. - The severity of dysmenorrhea was assessed with VAS before the intervention, immediately after and 30 minutes, 1, 2, and 3 hours following the intervention.	- The severity of dysmenorrhea was decreased immediately after intervention in both groups during their first menstrual cycle. - During the first menstrual cycle, dysmenorrhea was reduced more in the experimental group rather than the control group at 30 minutes, 1, 2, and 3 hours after the intervention. - During the second menstrual cycle, dysmenorrhea was decreased in both groups. The severity of dysmenorrhea was decreased at all stages in the experimental group	2

Table 3. Continued

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Mirbagheri et al., 2011 [20]	Iran Randomized controlled trial	To evaluate the effect of acupressure at SP6 on PD.	- VAS	University students Experimental group: SP6 point (n = 15) Control group: light touch on the SP6 point (n = 15)	<ul style="list-style-type: none"> - A total of pressure was 20 minutes during the menstrual cycle. - The severity of dysmenorrhea was assessed before the intervention, immediately after 30 minutes, 1, 2, and 3 hours following treatment. 	<ul style="list-style-type: none"> - Acupressure was effective in 73% of the intervention group. - In the experimental group, the VAS score was decreased in the following treatment. - Significant differences were found between the two groups immediately after and three hours after treatment. 	1
Charandabi et al., 2011 [19]	Iran Randomized controlled trial	To determine the effect of acupressure at SP6 on the severity of menstrual symptoms and the duration of resting time as well as the number of ibuprofen consumption in the two types of PD.	- VAS - MSQ* - SSS*	University students Experimental group 1: applied on SP6 point that students had a spasmodic type of dysmenorrhea (n = 17) Experimental group 2: applied on SP6 point that students had congestive type (n = 17) Control group 1: spasmodic group had no intervention (n = 18) Control group 2: congestive group had no intervention (n = 18)	<ul style="list-style-type: none"> - In both groups were allowed to consume ibuprofen (400 mg) every 6 hours. - The students recorded the severity of menstrual symptoms, duration of resting time, and the number of the used ibuprofen. - No intervention was carried out in the first cycle. - During the next two cycles, the pressure was applied for 20 minutes at the time of pain. 	<ul style="list-style-type: none"> - After the treatment, the severity of menstrual symptoms and duration of pain was significantly reduced in the intervention group in comparison to the control group in both spasmodic and congestive dysmenorrhea in the second and third cycles. - After treatment, both in spasmodic and congestive dysmenorrhea, the average number of used ibuprofen was significantly lower in the intervention group than the control group. 	2
Zafari et al., 2011 [33]	Iran Random clinical test	Comparing the effectiveness of acupressure at SP6, fish oil capsules, and ibuprofen in treating PD.	Questionnaire form - Unspecified	University students Experimental group 1: Received 1000 mg of fish oil capsule every day (n = 60) Experimental group 2: given 400 mg ibuprofen pills (n = 76) Experimental group 3: acupressure was applied on SP6 point (n = 60)	<ul style="list-style-type: none"> - The experimental group 1 received 1000 mg of fish oil capsule every day for the duration of two successive cycles. - The experimental group 2 was given 400 mg ibuprofen pills when the pain started for two months. - The experimental group 3 was applied acupressure on SP6 point at the onset of the pain during 20 minutes. 	<ul style="list-style-type: none"> - There was a statistically significant difference in the intensity and duration of pain in all the three groups before and after the intervention. - The average intensity of pain was the same for the acupressure and the fish oil groups. - The group taking ibuprofen was the most satisfied, followed by the acupressure and the fish oil groups. - All three groups needed the same quantity of extra painkillers during the treatment duration. 	1

Table 3. Continued

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Gharloghi et al., 2012 [24]	Iran Crossover clinical trial	To determine the effects of acupressure at SP6 point and SP8 point on pain severity of PD and the associated systemic symptoms.	- MPQ	Health care personnel Experimental group 1: one cycle acupressure on SP6 point, one cycle SP8 point (n = 21) Experimental group 2: one cycle acupressure on SP8 point, once cycle SP6 point (n = 21)	- A total of pressure was 20 minutes during the first three days of the menstrual period and for two consecutive cycles. - The participants completed MPQ before pressure, immediately after, 30 minutes, 1, and 2 hours after applying acupressure.	- The reductions in pain severity were significant for all intervals and at both SP6 and SP8 points. - For all intervals, acupressure at the SP8 point reduced pain severity significantly more than the SP6 point. - The severity of seven systemic symptoms accompanying dysmenorrhea diminished significantly after the application of the SP6 point. - The severity of all these symptoms, except nausea, diminished significantly with acupressure at the SP8 point.	2
Elakkiya, 2015 [40]	India Experimental design	To evaluate the effect of acupressure at SP6 on PD.	Unspeci- fied	Adolescent students Experimental group: SP6 point (n = 30) Control group: no intervention (n = 30)	Unspecified	- In the experimental group, 50% had moderate pain and half of them had severe pain in the pretest. Overall, 53% were mild pain and 47% had moderate pain in the posttest. - In the control group, 50% had moderate pain, half of them had severe pain during the pre- test. In the post-test, 3% had mild pain, almost half of them (47%) had moderate pain, and half of them had severe pain.	0

*VASA = Visual Analog Scale for Anxiety; MAQ = Menstrual Attitudes Questionnaire; MSQ = Menstrual Symptoms Questionnaire; SSS = Symptom Severity Scale.

Table 4. Studies of acupressure on multiple points

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Pouresmail and Ibrahimzadeh, 2002 [32]	Iran Unspecified	To compare the effects of acupressure using a combination of points and ibuprofen on the severity of PD.	- VMS* - VLAS*	Adolescent students Experimental group 1: LI4, SP15, ST36, SP6, LR3 points (n = 72) Experimental group 2: sham acupressure as a placebo (n = 72) Experimental group 3: ibuprofen group took 9 tablets (400 ml) (n = 72)	- Ibuprofen group took 9 tablets for three days starting 24 hours before the onset of the menstrual cycle. - Acupressure and sham acupressure were applied on LI4, SP15, ST36, SP6, LR3 and started 24 hours before the menstrual cycle. - The severity of pain was assessed before and after the treatment.	- Three therapeutic techniques were significantly effective in reducing pain. - The efficacy of acupressure and ibuprofen was similar with no significant difference. - The efficacy of acupressure was significantly better than the placebo.	1
Chen and Chen, 2010 [22]	Taiwan Randomized trial	To examine a comparison between LI4 and SP6 matched points and LI4, ST36 single point on menstrual distress, pain and anxiety perception.	- VAS - MDQ - MPQ - VASA	Adolescent students Experimental group 1: ST36 point (n = 30), Experimental group 2: LI4 point (n = 33) Experimental group 3: LI4 and SP6 matched points: (n = 36) Control group: Rest for 20 minutes (n = 35).	- A total of pressure was 20 minutes for the first three menstrual days. - During the six-month follow-up period at home, each experimental group applied acupressure by herself. - After receiving the acupressure treatment, VASP, MPQ, MDQ and VASA were completed in the pretest, after one, three and six-months.	- During the six-month follow-up, LI4 and SP6 matched points reduced the pain, distress and anxiety. - LI4 point was found effectively to reduce menstrual pain during the follow-up period, but no significant difference for reducing menstrual distress and anxiety perception. - ST36 points had no significant effects of reducing menstrual pain, distress and anxiety perception.	2
Archana et al., 2011 [39]	India Unspecified	To assess the changes in heart rate variability in PD and to find out the effect of acupressure in the symptoms of dysmenorrhea.	- VAS - Heart rate variability - Very low frequency - Low frequency - High- frequency	Women in hospital (n = 30) Experimental group 1: in the pre-therapy group, acupressure on SP6, LR4 and ST41 points. Experimental group 2: in the post-therapy group: acupressure on SP6, LR4 and ST41 points. Control group: no pressure	- In the pre-therapy group, heart rate variability, very low frequency, low frequency, high-frequency and VAS were measured when experiencing pain during the period of menstruation before the acupressure on SP6, LR4 and ST41 points. - In the post-therapy group, acupressure on SP6, LR4 and ST41 points were applied during pain, after then heart rate variability, very low frequency, low frequency, high-frequency, and VAS were measured. - In the control group, heart rate variability, very low frequency, low frequency, high-frequency were measured when not menstruating and not experiencing dysmenorrhea.	- High-frequency was significantly lowered in the post-therapy group. - Acupressure therapy increased the low frequency/high-frequency ratio and low frequency in the post-therapy group. - Pain intensity was significantly reduced after the application of acupressure in the post-therapy group.	0

Table 4. Continued

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Soja et al., 2011 [41]	India Quasi experimental pre-test post- test control group	To determine the effect of acupressure on severity of menstrual discomforts.	- MDC*	Adolescent students Experimental group: acupressure on Kidney 2 (KI2) and SP6 points (n = 40) Control group: no intervention (n = 40)	- The acupressure was applied twice a day (morning and afternoon) during three minutes bilaterally on each leg on SP6 point and bilateral application of pressure on KI2 point for three minutes on the first day of menstruation. The total duration of one intervention was 12 minutes. - MDC was used to assess the discomfort before and after the intervention in the experimental group and also twice a day (morning and afternoon) on the first day of menstruation in the control group.	- Intervention was effective in reducing the menstrual discomfort (headache, lower leg, lower back and lower abdomen pain) significantly in the experimental group.	0
Chen et al., 2015 [25]	Taiwan Randomized trial	To examine the effects of acupressure on menstrual distress and low back pain in dysmenorrhea.	- VAS - MDQ - ODI*	University students Experimental group: SP6, BL32 and LR3 points (n = 65) Control group: menstrual health education (n = 64)	- Students received acupressure at SP6, BL32 and LR3 points three times a week for 30 minutes per session during 12 months. - The control group was received only menstrual health education. - Both groups completed VAS, MDQ and ODI before intervention and posttest in 30 minutes, 4, 8 and 12 months.	- During the 12-month follow-up, the experimental group had significantly lower menstrual distress, low back pain, VAS, MDQ and ODI scores than the control group. - The experimental group reported a reduction in menstrual distress and low back pain.	2
Behbahani et al., 2016 [4]	Iran Randomized clinical trial	To compare the effects of acupressure at abdominal meridian, self- care behaviors training, and ibuprofen on the intensity of PD.	- VAS - MPQ	University students Experimental group 1: abdominal meridian (n = 40) Experimental group 2: self-care group behaviors training (n = 40) Control group: received ibuprofen 400 mg (n = 40)	- The pressure was applied to the abdominal meridian point during 20 minutes over the first and second days of menstruation for two cycles. - The self-care behavior group included isometric exercises that duration was 8 weeks. Food recommendations and educational contents gave on the books during the next two menstrual cycles. - The pain intensity was assessed 30 minutes, 1 and 2 hours in all groups.	- A significant difference was found in the intensity of pain before and after the intervention in all three groups. - Both acupressure and self-care behavior groups were more effective compared to the consumption of ibuprofen.	1
Maryanti and Keb, 2017 [42]	Indonesia Experimental design	To determine the effectiveness of sacral plexus massage, warm compress and acupressure in reducing the intensity of dysmenorrhea pain.	- NRS*	Adolescent students Experimental group 1: sacral plexus massage (n = 5) Experimental group 2: warm compress (n = 5) Experimental group 3: acupressure on bladder meridian (n = 5) Control Group: without treatment (n = 5)	- Acupressure was applied to bladder meridian for 3 to 5 minutes during the three cycles. - The protocols of massage, acupressure and warm compress were unspecified.	- The mean of pain intensity in the control group was higher than all experimental groups. - Acupressure is the most effective treatment among the three methods to reduce the pain intensity of dysmenorrhea.	0

Table 4. Continued

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Blödt et al., 2018 [15]	Germany Randomized pragmatic trial	To investigate the effective- ness of app- based self- acupressure in women with menstrual pain.	-NRS -SEC*	Women Experimental group: application-based self- acupressure on SP6, LI4 and LR3 points (n = 102) Control group: Usual care (n = 107)	- The women were reminded by the application to apply acupressure starting 5 days before the menstruation and carry out the acupressure twice a day or at least once a day for 6 consecutive menstruation cycles. - The worst pain intensity, duration of pain, medication intake, sick leave days, and body efficacy expectation were assessed at the first, second, third and sixth menstruation cycles.	- The mean pain intensity difference during the third menstruation was statistically significant in the acupressure group. - The worst pain intensity, the number of days with pain, use of pain medication at the third and sixth menstruation cycles were lower in the acupressure group. - The number of sick leave days and body efficacy expectations did not differ between groups. - Application-based self-acupressure resulted in a decrease of menstrual pain compared to usual care.	2

*VMS = The Verbal Multidimensional Scoring; VLAS = The Visual Linear Analog Scale; MDC = Menstrual Discomfort Check List; ODI = Oswestry Disability Index; NRS = Numeric Rating Scale; SEC = Self-Efficacy Scale.

score ranged from 0 to 5 points. A study was considered high quality if it scored 2 or higher and low quality if it scored lower than 2 [30,31]. The methodological quality of all studies was also evaluated separately by two reviewers.

3. Features of the studies

The characteristics of the 28 studies are presented in Tables 1, 2, 3, 4, and 5. The studies were conducted in 8 different countries, mostly in Iran [4,5,14,17,19,20,24,26,32-34] and Taiwan [1,2,22,23,25,35,36]. The other countries were Germany [15], China [18], Korea [3,16], United States of America (USA) [37,38], India [39-41], and Indonesia [42]. The sample size of the studies ranged from 20 to 216 women. Of the studies, 23 studies involved students, 4 studies involved women, and 1 study involved health care personnel.

The same inclusion criteria were used in all studies for acupressure as follows: duration of bleeding between 3 and 8 days, menstrual intervals of 21 and 35 days, lack of any disease and abdominal/pelvic surgery, absence of any severe psychological stress, no usage of oral or other contraceptives or drugs, absence of any lesion, varices, or inflammatory skin disease at the location of pressure application, and no genital disease.

RESULTS

The studies were categorized as studies of acupressure at the LR3 point (n = 4 articles), at the SP6 point (n = 9 articles), at auricular points (n = 5 articles), at multiple points (n = 8 articles), and with devices (n = 2 articles). Moreover, studies of self-acupressure (n = 9) were identified. The World Health Organization standard nomenclature for acupuncture points was used [43].

1. Studies of acupressure at the LR3 point

Four studies were conducted with university students in Iran. The severity of dysmenorrhea in the first and last cycles was compared to that when acupressure was applied in the LR3 and placebo groups to evaluate the pain intensity [5,14,26] and anxiety level [34]. Three studies found that acupressure at the LR3 point decreased the pain intensity, and pain reduction was determined by comparing post-intervention with pre-intervention pain [5,14,26]. In two of the studies, students were taught acupressure techniques so that they can apply acupressure themselves, and they found that acupressure could relieve pain during menstruation [5] and help reduce anxiety [34].

2. Studies of acupressure at auricular points

Studies involving students in Taiwan were performed to investigate the effects of auricular acupressure on PD

Table 5. Studies of acupuncture with devices

References	Country/ design of the study	Objective	Data collection tools	The sample of the study	Method	Results	Jadad score
Lewers et al., 1989 [37]	USA Unspecified	To replicate a previous study to determine the effectiveness of acupuncture-like transcutaneous electrical nerve stimulation in treating PD.	- PRI* - MPQ - VAS	Women Experimental group: acupuncture-like Transcutaneous electrical nerve stimulation (TENS) treatment (n = 10) Control group received a placebo pill (n = 11)	- The experimental group was received 30 minutes of acupuncture-like TENS treatment on ST36, SP6, BL21 and BL29 points - The PRI and VAS were completed before treatment; immediately post-treatment; 30, 60, 120, and 180 minutes post-treatment and the next morning upon awakening	- Both the PRI and the VAS were showed a statistically significant difference between the pretreatment and each post-treatment. But no found statistically significant differences among the six post-treatment. - It was a statistically significant reduction in pain for the control and experimental groups in all measurements. - Both groups showed at least a 50% reduction in pain immediately post-treatment.	1
Taylor et al., 2002 [38]	USA Randomized clinical trial	To develop and test the safety and effectiveness of acupuncture the Relief Brief in decreasing the pain and symptom distress associated with dysmenorrhea.	- The Relief Brief Acu- pressure Device - MPSI* - DSIDI* - NRS	Women Experimental group: the Relief Brief acupuncture device (n = 28) Control group: standard treatment (n = 26)	- The Relief Brief was a cotton Lycra panty with lower abdominal and lower back latex foam acupads that provided pressure to acupressure points. - The Relief Brief acupressure device was applied for 30 minutes from the onset of menstrual during two post-treatment menstrual cycles and a total of three days. - The severity of menstrual pain, use of pain medication and adverse effects of wearing the Relief Brief were assessed before treatment and two treatment menstrual cycles.	- An acupressure device was effective and safe for the treatment of PD. - Greater relief in the worst menstrual pain, lower pain symptom intensity, and lower pain medication use were detected in the experimental group compared to the control group at the first and the second treatment cycle.	2

*PRI = The Pain Rating Index; MPSI = Menstrual Pain Symptom Intensity; DSIDI = The Dysmenorrhea Symptom Intensity and Distress Inventory.

using cowherb seeds with adhesive patches, which were embedded at auricular points ($n = 4$) [2,23,35,36]. In a study in Korea, needles on skin paper tape were applied to the ear ($n = 1$) [3]. The Menstrual Distress Questionnaire was used to evaluate dysmenorrhea severity, and liver, kidney, and endocrine auricular points were commonly used to relieve dysmenorrhea in the studies.

Dysmenorrhea is known to be associated with stress, which increases the severity of pain with activation of sympathetic responses and inhibition of parasympathetic responses. Both stress and pain activate the sympathetic nervous system, which increases heart rate, muscle contraction, and blood pressure. In a study of auricular acupressure in Taiwan, there were significant differences between the intervention and follow-up phases for the high-frequency component in heart rate variability and blood pressure. Moreover, the study showed that auricular acupressure increased parasympathetic activity. It is beneficial to maintain autonomic function homeostasis to relieve menstrual pain and distress under stress conditions [35]. According to three studies, the effectiveness of acupressure at auricular points was superior to acupressure at placebo auricular points in decreasing the menstrual symptoms of women [3,23,36]. In a study in Taiwan, auricular acupressure with an interactive internet-based intervention was given to students to increase their knowledge about dysmenorrhea. The combination intervention was better than auricular acupuncture alone in improving self-care behaviors and reducing menstrual pain and distress in PD [2].

3. Studies of acupressure at the SP6 point

The effects of acupressure at the SP6 point on PD were investigated in five studies in Iran [17,19,20,24,33] as well as studies in India [40], Taiwan [1], China [18], and Korea [16].

The studies found that acupressure alleviated menstrual pain during the initial and follow-up sessions in the experimental group compared with the control group with no intervention [1,18,19,40]. Two studies demonstrated that acupressure reduced menstrual pain in students who were educated on self-acupressure techniques [1,18]. In addition, three studies showed that the severity of dysmenorrhea was markedly decreased in the experimental group compared with the control group [16,17,20].

In another study, the severity of dysmenorrhea and skin temperature changes at the CV2 and CV12 acupoints before treatment and 0.5, 1, 2, and 3 hours following treatment were evaluated in both the experimental and control groups. The results showed that skin temperature was significantly elevated at the suprapubic CV2 point after acupressure at SP6 in the experimental group, and there was an increase in blood flow to the lower abdomen [16].

A study in Iran compared the average pain intensity between the acupressure, fish oil, and ibuprofen groups. The group taking ibuprofen was the most satisfied, followed by the acupressure and the fish oil groups, and all groups needed the same quantity of extra painkillers during the treatment duration [33].

A study compared acupressure at the SP6 and SP8 points before, immediately after, and 0.5, 1, and 2 hours after applying acupressure. It was found that the reductions in pain severity were significant for all measurements at the SP6 and SP8 points; however, pain intensity was more effectively reduced by acupressure at the SP8 point compared with the SP6 point. In addition, the severity of seven systemic symptoms (exhaustion, vomiting, paralysis, diarrhea, headache, neural, and faint) accompanying dysmenorrhea was reduced significantly after acupressure at the SP6 and SP8 points [24].

4. Studies of acupressure at multiple points

Seven of the studies applied acupressure at multiple points, including LI4, SP15, ST36, SP6, and LR3 in an Iranian study [32], SP6, LI4, and ST36 in a Taiwanese study [22], SP6, LR4, and ST41 in an Indian study [39], SP6 and KI2 in an Indian study [41], SP6, BL32, and LR3 in a Taiwanese study [25], the abdominal meridian in an Iranian study [4], the bladder meridian in an Indonesian study [42], and SP6, LI4, and LR3 in a German study [15].

A study in Iran assessed pain intensity in three groups: acupressure, self-care behavior (isometric exercise, food recommendations, and educational contents), and ibuprofen. The study found that there was a significant difference in the mean intensity of pain before and after the intervention in all three groups; however, both acupressure and self-care behavior were more effective compared with ibuprofen [4].

In Iran, a study comparing the pain in three groups (sham acupressure as a placebo, acupressure, and ibuprofen) reported that the three therapeutic techniques were highly effective in reducing pain. In addition, acupressure was significantly better than placebo, and acupressure and ibuprofen showed similar effects [32].

A study in Indonesia found that the most effective treatment to reduce pain intensity in dysmenorrhea was acupressure compared with warm compress or sacral plexus massage [42]. During a 12-month follow-up period in a study in Taiwan, menstrual distress and back pain were significantly lower in the acupressure group compared with the control group, which received only a menstrual health education [25].

During a 6-month follow-up period, a randomized trial was conducted in Taiwan with adolescent students divided into three experimental groups for self-acupressure (group

1: ST36, group 2: LI4, and group 3: LI4 and SP6 matched points) and a control group with rest for 20 minutes without treatment. Pain, distress, and anxiety were reduced in group 3, and menstrual pain was alleviated in group 2 [22].

In a study involving women in India, changes in heart rate variability (high-frequency component, low-frequency component, low-frequency/high-frequency ratio) and pain intensity were assessed before and after acupressure in three groups. In group 1 and group 2, heart rate variability and VAS were measured when experiencing pain during menstruation. In group 2, after acupressure was applied at the SP6, LR4, and ST41 points during pain, all variables were measured again. In the control group, heart rate variability was assessed for women who did not experience dysmenorrhea. The pain intensity and high-frequency component were significantly decreased after acupressure, whereas the low-frequency component and low-frequency/high-frequency ratio were increased. The study demonstrated that acupressure was effective in regulating autonomic alterations [39]. In another study involving students in India, the effect of acupressure on the severity of menstrual discomfort was determined in two groups. Acupressure was applied in the morning and afternoon bilaterally on each leg at the SP6 and KI2 points for 3 minutes on the first day of menstruation in the experimental group. The control group did not receive any intervention except for data collection twice a day. The study reported that menstrual discomfort symptoms such as headache and lower back, lower leg, and lower abdomen pain were significantly reduced in the experimental group. Post-test severity scores were lower than pre-test severity scores in the experimental group [41].

A randomized pragmatic trial was performed with women; in the experimental group, participants were reminded by a smartphone application to apply acupressure at the SP6, LI4, and LR3 points by themselves, and the control group received no intervention. The intensity and duration of pain, medication intake, and the number of days with pain were assessed in the first, second, third, and sixth menstruation cycles. Pain intensity, the number of days with pain, and the use of pain medication were lower in the acupressure group in the third and sixth menstruation cycles [15].

5. Studies of acupressure with devices

In the USA, a study was conducted with the Relief Brief acupressure device, which is a cotton Lycra panty with lower abdominal and lower back latex foam acupads that provide pressure to acupressure points for 30 minutes. It was found that the device was effective and safe for the treatment of PD. The intensity of menstrual pain, menstrual pain symptoms (abdominal pain, cramps, and backache), and the use of pain medication were decreased in the acupressure

group compared with the control group in the first and the second treatment cycle [38]. In another study in the USA, the experimental group received acupressure for 30 minutes with acupuncture-like transcutaneous electrical nerve stimulation (TENS) at the ST36, SP6, BL21, and BL29 points. The intensity of pain was measured before, immediately after, and 30, 60, 120, and 180 minutes after acupressure and the next morning upon awakening. There was a statistically significant reduction in pain in the control and experimental groups for all measurements. However, there was no statistically significant difference in pain relief between the groups [37].

6. Studies of self-acupressure

In this review, 9 of 28 studies in Iran [5,37], Taiwan [1,2,22,35,36], Germany [15], and China [18] involved self-administered acupressure, and in the remaining 19 studies, acupressure was applied by trained personnel. In Germany, 1 of 9 studies involved app-based self-acupressure [15]. Acupressure was performed at different points (LI4, SP6, ST36, LR3, and auricular acupressure) and started at different times [1,2,5,15,18,22,35,36]. In four studies, pain intensity was reduced in the self-acupressure group compared with the control group, which received no intervention or pressure at the placebo point [1,5,18,22]. Furthermore, anxiety associated with dysmenorrhea was reduced following acupressure in one study [37]. In another study, app-based self-acupressure resulted in a decrease in menstrual pain compared with usual care, which was defined as all medical and non-medical treatments [15]. Three of the studies that applied auricular acupressure reported that auricular acupressure relieved menstrual pain and distress in PD [2,35,36].

DISCUSSION

This review aimed to determine the effects of acupressure on PD based on experimental studies. The results of 28 studies were categorized under six subheadings (acupressure at the LR3 point, acupressure at the SP6 point, acupressure at auricular points, acupressure at multiple points, acupressure with devices, and self-acupressure). The literature review revealed that acupressure could reduce menstrual symptoms, the severity and duration of menstrual pain, distress, and anxiety in different countries.

In the studies, the total duration of acupressure ranged from 12 and 30 minutes with pressure applied at different points. Acupressure was started at different times before menstruation or after the bleeding day. In addition, pain intensity was measured at different times, i.e., immediately after acupressure, 0.5, 1, 2, 3, and 4 hours after acupressure, and during several menstrual cycles (1, 2, 3, 4, 6, 8, and 12 months). Moreover, in the experimental studies, various data

collection tools were used to assess pain (VAS, AMS, MPQ, etc.).

Acupressure can be given by health care providers with appropriate teaching and training. However, various factors could affect outcome measurements. Intervention is given by pressing acupoints with fingers, hands, seeds, or devices using force. However, there is a lack of standard procedure or clinical protocol in acupressure treatment, such as guidelines for the frequency, duration of time, and selection of points. Therefore, further research should be conducted to ensure the consistency of techniques, which would facilitate evidence-based practice [44].

Abaraogu et al. reviewed 6 studies (n = 461) that examined SP6 acupressure for the relief of PD symptoms, as well as the patients' experiences with this intervention. According to this meta-analysis, SP6 acupressure performed by trained personnel significantly decreased pain intensity immediately after intervention, and pain relief remained up to 3 hours after intervention. However, self-acupressure required multiple monthly cycles to achieve considerable pain reduction. SP6 acupressure applied by trained personnel appears to be effective for some PD symptoms. The findings indicated that self-administered acupressure is promising for the alleviation of PD symptoms, and high-quality research is needed [45].

Based on the literature and evidence from clinical trials, practical guidelines for the application of finger pressure and the accuracy of acupoints should be further developed in the future. Health care providers should continue to provide acupressure treatment to relieve pain from PD; however, high-quality trials are needed to develop evidence-based guidelines for acupressure in PD [44]. Furthermore, high-quality randomized controlled trials with larger samples are necessary to establish the evidence for acupressure as an effective intervention [46,47].

The study has some limitations. First, the results of quality assessment in the trials were not good, and the efficacy was not estimated. As 14 of the studies had a Jadad score below 2, most of the studies were of low quality. Second, the experimental studies were carried out with different methodological designs, including different acupressure points, outcome measures, and evaluation tools. As a standard protocol was not used, it is difficult to compare the study findings.

CONCLUSIONS

In this review, 14 of the 28 studies were of low quality according to the Jadad score. However, the methodologies of studies differed in terms of the applied acupressure at different points, times, and intervals, total duration of pressure, sample size, and data collection tools for assessing pain. The evaluated studies in this review demonstrated that

anxiety, distress, the severity and duration of menstrual pain, abdominal and back pain, menstrual discomfort, and the severity of systemic symptoms were decreased. In addition, the comfort, relaxation, and satisfaction of women were increased with acupressure at different points. Nevertheless, high-quality research is needed with larger samples.

AUTHORS' CONTRIBUTIONS

The conception and design of the study: Aslı Karakuş Selçuk, Emre Yanikkerem. Acquisition of data: Aslı Karakuş Selçuk, Emre Yanikkerem. Analysis and interpretation of data: Aslı Karakuş Selçuk, Emre Yanikkerem. Drafting the article or revising it critically for important intellectual content: Aslı Karakuş Selçuk, Emre Yanikkerem. Final approval of the version to be submitted: Aslı Karakuş Selçuk, Emre Yanikkerem.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Chen HM, Chen CH. Effects of acupressure at the Sanyinjiao point on primary dysmenorrhoea. *J Adv Nurs* 2004;48:380-7.
2. Yeh ML, Hung YL, Chen HH, Lin JG, Wang YJ. Auricular acupressure combined with an internet-based intervention or alone for primary dysmenorrhea: a control study. *Evid Based Complement Alternat Med* 2013;2013:316212.
3. Cha NH, Sok SR. Effects of auricular acupressure therapy on primary dysmenorrhea for female high school students in South Korea. *J Nurs Scholarsh* 2016;48:508-16.
4. Behbahani BM, Ansari-pour L, Akbarzadeh M, Zare N, Hadianfard MJ. Comparison of the effects of acupressure and self-care behaviors training on the intensity of primary dysmenorrhea based on McGill pain questionnaire among Shiraz University students. *J Res Med Sci* 2016;21:104.
5. Bazarganipour F, Taghavi SA, Allan H, Hosseini N, Khosravi A, Asadi R, et al. A randomized controlled clinical trial evaluating quality of life when using a simple acupressure protocol in women with primary dysmenorrhea. *Complement Ther Med* 2017;34:10-5.
6. Rafique N, Al-Sheikh MH. Prevalence of primary dysmenorrhea

- and its relationship with body mass index. *J Obstet Gynaecol Res* 2018;44:1773-8.
7. Fernández-Martínez E, Onieva-Zafra MD, Parra-Fernández ML. Lifestyle and prevalence of dysmenorrhea among Spanish female university students. *PLoS One* 2018;13:e0201894.
8. Chia CF, Lai JH, Cheung PK, Kwong LT, Lau FP, Leung KH, et al. Dysmenorrhoea among Hong Kong university students: prevalence, impact, and management. *Hong Kong Med J* 2013;19:222-8.
9. Subasinghe AK, Happo L, Jayasinghe YL, Garland SM, Gorelik A, Wark JD. Prevalence and severity of dysmenorrhoea, and management options reported by young Australian women. *Aust Fam Physician* 2016;45:829-34.
10. Aktaş D. Prevalence and factors affecting dysmenorrhea in female university students: effect on general comfort level. *Pain Manag Nurs* 2015;16:534-43.
11. Midilli TS, Yasar E, Baysal E. Dysmenorrhea characteristics of female students of health school and affecting factors and their knowledge and use of complementary and alternative medicine methods. *Holist Nurs Pract* 2015;29:194-204.
12. Potur DC, Bilgin NC, Komurcu N. Prevalence of dysmenorrhea in university students in Turkey: effect on daily activities and evaluation of different pain management methods. *Pain Manag Nurs* 2014;15:768-77.
13. Yilmaz B, Sahin N. The effects of a dysmenorrhea support program on university students who had primary dysmenorrhea: a randomized controlled study. *J Pediatr Adolesc Gynecol* 2020;33:285-90.
14. Kafaei Atrian M, Abbaszadeh F, Sarvieh M, Sarafraz N, Asghari Jafarabadi M. Investigating the effect of pressure on third liver point on primary dysmenorrhea: a randomized controlled clinical trial. *Iran Red Crescent Med J* 2013;15:848-53.
15. Blödt S, Pach D, Eisenhart-Rothe SV, Lotz F, Roll S, Icke K, et al. Effectiveness of app-based self-acupressure for women with menstrual pain compared to usual care: a randomized pragmatic trial. *Am J Obstet Gynecol* 2018;218:227.e1-9.
16. Jun EM, Chang S, Kang DH, Kim S. Effects of acupressure on dysmenorrhea and skin temperature changes in college students: a non-randomized controlled trial. *Int J Nurs Stud* 2007;44:973-81.
17. Kashefi F, Ziyadlou S, Khajehei M, Ashraf AR, Fadaee AR, Jafari P. Effect of acupressure at the Sanyinjiao point on primary dysmenorrhea: a randomized controlled trial. *Complement Ther Clin Pract* 2010;16:198-202.
18. Wong CL, Lai KY, Tse HM. Effects of SP6 acupressure on pain and menstrual distress in young women with dysmenorrhea. *Complement Ther Clin Pract* 2010;16:64-9.
19. Charandabi SM, Nashtaei MS, Kamali S, Majlesi R. The effect of acupressure at the Sanyinjiao point (SP6) on primary dysmenorrhea in students resident in dormitories of Tabriz. *Iran J Nurs Midwifery Res* 2011;16:309-17.
20. Mirbagher-Ajorpaz N, Adib-Hajbaghery M, Mosaebi F. The effects of acupressure on primary dysmenorrhea: a randomized controlled trial. *Complement Ther Clin Pract* 2011;17:33-6.
21. Tanriverdi S, Saritaş S. The effect of acupressure on post-operative pain of lumbar disc hernia: a quasi-experimental study. *Complement Ther Clin Pract* 2018;32:12-6.
22. Chen HM, Chen CH. Effects of acupressure on menstrual distress in adolescent girls: a comparison between Hegu-Sanyinjiao matched points and Hegu, Zusanli single point. *J Clin Nurs* 2010;19:998-1007.
23. Wang MC, Hsu MC, Chien LW, Kao CH, Liu CF. Effects of auricular acupressure on menstrual symptoms and nitric oxide for women with primary dysmenorrhea. *J Altern Complement Med* 2009;15:235-42.
24. Gharloghi S, Torkzahrani S, Akbarzadeh AR, Heshmat R. The effects of acupressure on severity of primary dysmenorrhea. *Patient Prefer Adherence* 2012;6:137-42.
25. Chen HM, Wang HH, Chiu MH, Hu HM. Effects of acupressure on menstrual distress and low back pain in dysmenorrheic young adult women: an experimental study. *Pain Manag Nurs* 2015;16:188-97.
26. Bazarganipour F, Lamyian M, Heshmat R, Abadi MA, Taghavi A. A randomized clinical trial of the efficacy of applying a simple acupressure protocol to the Taichong point in relieving dysmenorrhea. *Int J Gynaecol Obstet* 2010;111:105-9.
27. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Götzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med* 2009;6:e1000100.
28. Chung YC, Chen HH, Yeh ML. Acupoint stimulation intervention for people with primary dysmenorrhea: systematic review and meta-analysis of randomized trials. *Complement Ther Med* 2012;20:353-63.
29. Olivo SA, Macedo LG, Gadotti IC, Fuentes J, Stanton T, Magee DJ. Scales to assess the quality of randomized controlled trials: a systematic review. *Phys Ther* 2008;88:156-75.
30. Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJ, Gavaghan DJ, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials* 1996;17:1-12.
31. Halpern SH, Douglas MJ. Appendix: Jadad scale for reporting randomized controlled trials. In: Halpern SH, Douglas MJ, eds. *Evidence-based Obstetric Anesthesia*. Oxford: Blackwell Publishing Ltd, 2005:237-8.
32. Pouresmail Z, Ibrahimzadeh R. Effects of acupressure and ibuprofen on the severity of primary dysmenorrhea. *J Tradit Chin Med* 2002;22:205-10.
33. Zafari M, Tofighi M, Aghamohammady A, Behmanesh F, Rakhshae Z. Comparison of the effect of acupressure, fish oil capsules and ibuprofen on treatment of primary dysmenorrhea.

- Afr J Pharm Pharmacol 2011;5:1115-9.
34. Kafaei-Atrian M, Mirbagher-Ajorpaz N, Sarvieh M, Sadat Z, Asghari-Jafarabadi M, Solhi M. The effect of acupressure at third liver point on the anxiety level in patients with primary dysmenorrhea. *Iran J Nurs Midwifery Res* 2016;21:142-6.
 35. Wang YJ, Hsu CC, Yeh ML, Lin JG. Auricular acupressure to improve menstrual pain and menstrual distress and heart rate variability for primary dysmenorrhea in youth with stress. *Evid Based Complement Alternat Med* 2013;2013:138537.
 36. Yeh ML, Hung YL, Chen HH, Wang YJ. Auricular acupressure for pain relief in adolescents with dysmenorrhea: a placebo-controlled study. *J Altern Complement Med* 2013;19:313-8.
 37. Lewers D, Clelland JA, Jackson JR, Varner RE, Bergman J. Transcutaneous electrical nerve stimulation in the relief of primary dysmenorrhea. *Phys Ther* 1989;69:3-9.
 38. Taylor D, Miaskowski C, Kohn J. A randomized clinical trial of the effectiveness of an acupressure device (relief brief) for managing symptoms of dysmenorrhea. *J Altern Complement Med* 2002;8:357-70.
 39. Archana R, Philominal V, Thirumeni S. Effect of acupressure and changes in heart rate variability in dysmenorrhoea. *Recent Res Sci Technol* 2011;3(10):1-6.
 40. Elakkiya C. An experimental study to assess the effectiveness of acupressure on dysmenorrhea among adolescent girls in Hilton Matriculation Higher Secondary School at Chrompet, Chennai. *Int J Innov Res Dev* 2015;4:8-10.
 41. Soja SL, Nayak BS, Lobo DJ. A study to evaluate the effectiveness of acupressure on menstrual discomforts among adolescent girls. *Int J Nurs Educ* 2011;3:107-10.
 42. Maryanti SA, Keb M. The effectiveness of acupressure in reducing the pain intensity of dysmenorrhea. *IOSR J Nurs Health Sci* 2017;6:77-83.
 43. WHO Regional Office for the Western Pacific. Standard acupuncture nomenclature, part 1. Rev. ed.. Available at: https://apps.who.int/iris/bitstream/handle/10665/207635/Standard_acupuncture_nomenclature_1991_partI_eng.pdf?sequence=1&isAllowed=y [Date accessed: June 24, 2020]
 44. Chen YW, Wang HH. The effectiveness of acupressure on relieving pain: a systematic review. *Pain Manag Nurs* 2014;15: 539-50.
 45. Abaraogu UO, Igwe SE, Tabansi-Ochiogu CS. Effectiveness of SP6 (Sanyinjiao) acupressure for relief of primary dysmenorrhea symptoms: a systematic review with meta- and sensitivity analyses. *Complement Ther Clin Pract* 2016;25:92-105.
 46. Cho SH, Hwang EW. Acupressure for primary dysmenorrhoea: a systematic review. *Complement Ther Med* 2010;18:49-56.
 47. Song HJ, Seo HJ, Lee H, Son H, Choi SM, Lee S. Effect of self-acupressure for symptom management: a systematic review. *Complement Ther Med* 2015;23:68-78.