

Effect of Acupressure on Plasma Cortisol Levels in Primary Dysmenorrhea: A Randomized Controlled Trial

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Abstract: *Objectives:* This study aimed to investigate the effect of acupressure on plasma cortisol levels in primary dysmenorrhea. *Methods:* A total of 30 adult females with primary dysmenorrhea were randomized into 2 groups. Group (A) received hot packs on lower abdomen and back for 2 successive menstrual cycles (n=15), while group (B) received the same hot packs in addition to acupressure at the spleen point (SP6) for 2 successive menstrual cycles (n=15). The primary outcome was plasma cortisol level while the secondary outcome was short form of McGill pain questionnaire. The outcome measures were evaluated pre-treatment, after 1 month and after 2 months of treatment. *Results:* Plasma cortisol level revealed non-significant differences within both groups as well as between groups at all measuring periods (p>0.05). McGill pain questionnaire results revealed significant reductions at both post 1 month and post 2 months when compared to pre-treatment (p<0.05), while they showed non-significant differences between post 1 month and post 2 months within both groups (p>0.05). Comparing both groups revealed that there were non-significant differences in McGill pain questionnaire results at all measuring periods (p>0.05), except for present pain intensity scores that showed a significant reduction at post 2 months of treatment in favour of group (B) (p<0.05). *Conclusions:* Acupressure has no effective plasma cortisol level reduction in primary dysmenorrhea however it is effective in treating females with primary dysmenorrhea through reducing scores of present pain intensity.

Key words: Acupressure • Cortisol Levels • Short Form of McGill Pain Questionnaire • Primary Dysmenorrhea

INTRODUCTION

Primary dysmenorrhea is known as painful periods, or menstrual cramps, is pain during menstruation; its usual onset occurs around the time that menstruation begins or 1 to 2 years after menarche. The pain is usually in the pelvis or lower abdomen. Other symptoms may include back pain, diarrhea or nausea, which typically last less than three days [1].

The estimated prevalence of dysmenorrhea is high, although it varies widely, ranging from 45 to 93% of women of reproductive age [2] and the highest rates are reported in adolescents [3]. Since it is accepted as a normal aspect of the menstrual cycle and therefore is tolerated, women do not report it and do not seek medical care [4]. Some women (3 to 33%) have very severe pain,

severe enough to render them incapacitated for 1 to 3 days each menstrual cycle, requiring absence from school or work [5].

Stress is significantly associated with the incidence of dysmenorrhea and this association is even stronger among women with a history of dysmenorrhea. Stress related hormones, including adrenaline and cortisol, appear to influence prostaglandin synthesis, which suggests that stress may have both direct and secondary effects on prostaglandin concentrations in the myometrium. Prostaglandins affect uterine muscle and vascular tone and an imbalance of prostaglandins has been linked to the occurrence of dysmenorrhea [6].

Several methods have been used to control menstrual pain, such as non-steroidal anti-inflammatory drugs (NSAIDs), which are the first-line for primary

dysmenorrhea therapy, as well as oral contraceptive agents and analgesics [7]. However, the long-term administration of these drugs leads to many side-effects, such as nausea, dyspepsia, peptic ulcer and diarrhea [8].

Acupressure is one of the complementary alternative therapies that have been conducted in many studies in the management of primary dysmenorrhea [9]. It is a pressure point, hand-mediated energy healing technique, which is considered as useful strategy for the management of multiple symptoms, along with beneficial physical comforts, satisfaction and economy [10]. It can reduce muscle pain, tension, improve circulation and lead to release of endorphins. It also allows muscle fibers to relax, allows blood to flow more freely, thus cause toxins to be released and eliminated. Therefore, acupressure help in allowing women to potentially reduce their menstrual pain and need for medications [11].

Regarding the effect of acupressure on cortisol levels, which act as an indicator for pain intensity, there was only a previous study which evaluated the acute effect of acupressure on cortisol levels in primary dysmenorrhea (immediately after, 30 minutes after, one hour after and two hours after the intervention) [12]. However, none of the previous studies have investigated the effect of acupressure for 2 successive menstrual cycles on cortisol levels in females having primary dysmenorrhea. Therefore, this study was an attempt to determine the effect of acupressure on cortisol levels in primary dysmenorrhea.

MATERIALS AND METHODS

Study Design: The study was designed as a prospective, randomized, controlled trial. Ethical approval was obtained from the institutional review board at Faculty of Physical Therapy, Cairo University. The study followed the Guidelines the Guidelines of Declaration of Helsinki on the conduct of human research. It was conducted between September 2019 and March 2020.

Participants: A sample of 30 females was recruited from the Gynecological Outpatient Clinic, Agouza Hospital, Cairo University, by Egypt. To be included in the study, the participants were chosen adult females. They had regular menstruation (3-8 days in duration, with 21-35 days in-between). All females were virginal and non-smokers. Their age ranged from 18 to 28 years and their body mass index (BMI) ranged from 18 to 25 kg/m². The participants were excluded if they had a history of pelvic pathology as inflammatory disease, tumors, pelvic

infection, ovarian cysts, any gynecological disease, or any problem in the acupressure point (e.g. fracture, inflammation, ulcer, varicose vein and skin disease). Also, they didn't receive analgesics, NSAIDs and oral contraceptives, any anti-inflammatory or anti-spasmodic drugs during the study period.

Interventions: Group (A) included 15 females who received hot packs on lower abdomen and lower back for 2 successive menstrual cycles, while group (B) included 15 females who received the same hot packs in addition to acupressure at SP 6 point for 2 successive menstrual cycles.

Hot Packs: All females in both groups (A & B) received hot packs for 2 successive menstrual cycles. The hot packs were applied on lower abdomen and lower back for 30 minutes, starting two days before menstruation till the first day of menstruation for 2 successive menstrual cycles.

Acupressure: All females in group (B) received acupressure at SP6 points on both lower limbs. Sp6 points were located approximately four fingers above the inner ankle behind the posterior edge of tibia on each lower limb. Each female was placed in a sitting position with crossed legs for easy access of SP6. Participants were received acupressure, alternating between each leg, at SP6 point. Acupressure was started two days before menstruation till the first day of menstruation for 2 successive menstrual cycles. Two complete 5-minute cycles of pressure were performed on each leg for a total of 20 minutes. For each pressure cycle on each leg, pressure applied on SP6 with a thumb for 6 seconds and then released for 2 seconds (without pressure). This was continued for 5 minutes on each leg and repeated four times to bring the total treatment time to 20 minutes [13].

Outcome Measures

Plasma Cortisol Level (Primary Outcome Measure): A blood sample was taken from each female in both groups (A & B) before and after the treatment to measure the serum cortisol levels, which could reflect the pain intensity with decreased cortisol levels indicating decreased pain intensity. The cortisol level was assessed in the first day of the menstrual cycle preceding the treatment program and the first day of the successive two menstrual cycles after treatment. Participants were asked to lie in half lying position, with well supported back and arms. The anticubital area was cleaned with alcohol.

Blood sample of about 5 cm was drawn from the antecubital vein from all participants by disposable sterile syringe by vein puncture to determine plasma cortisol level. All blood samples were taken at 8-9 am.

The short form of McGill pain questionnaire (secondary outcome measure):

It was used to assess the pain intensity for all females in both groups (A and B) at the first day of the menstrual cycle preceding the treatment program and the first day of the successive two menstrual cycles after treatment. It is considered a valid, reliable, easy use and rapid method in evaluating pain intensity in clinical research. It consisted of 15 descriptors (11 sensory; 4 affective) which were rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate or 3 = severe. The intensity values for the 15 descriptors were summated to provide the pain rating index. The SF-MPQ also included the Present Pain Intensity (PPI) index of the standard MPQ and a visual analogue scale (VAS) [14].

Statistical Analysis: Prior to final analysis, data were screened for normality assumption, homogeneity of variance and presence of extreme scores. This exploration was done as a pre-requisite for parametric calculations of the analysis of difference. Descriptive analysis using histograms with the normal distribution curve showed that the plasma cortisol level, VAS, present pain intensity and pain rating index was normally distributed and not violates the parametric assumption for the measured dependent variables. Additionally, testing for the homogeneity of covariance revealed that there was no

significant difference with p values of > 0.05. The box and whiskers plots of the tested variable were done to detect outliers and showed no outliers. Normality test of data using Shapiro-Wilk test was used, that reflect the data was normally distributed (p>0.05). Accordingly, 2×3 mixed design MANOVA was used to compare the cortisol level, VAS, present pain intensity and pain rating index at different measuring periods at both groups. The alpha level was set at 0.05.

RESULTS

Both groups were similar in age, weight, height and BMI (Tables 1)

Within group (A), Multiple pairwise comparisons (Post hoc tests) revealed non-significant differences in plasma cortisol level at different measuring periods (p>0.05). However, McGill pain questionnaire results revealed significant reductions at both post 1 month and post 2 months when compared to pre-treatment (p<0.05), while they showed non-significant differences between post 1 month and post 2 months within group (A)(p>0.05) (Table 2).

Within group (B), Multiple pairwise comparisons (Post hoc tests) revealed non-significant differences in plasma cortisol level at different measuring periods (p>0.05). However, McGill pain questionnaire results revealed significant reductions at both post 1 month and post 2 months when compared to pre-treatment (p<0.05), while they showed non-significant differences between post 1 month and post 2 months within group (B) (p>0.05) (Table 3).

Table 1: Physical characteristics of participants in both groups (A&B)

Items	Group A Mean ± SD	Group B Mean ± SD	Comparison		
			t-value	P-value	S
Age (years)	24±2.55	22.93±2.95	1.088	0.285	NS
Body mass (Kg)	67.31±5.54	64.5±7.38	1.218	0.233	NS
Height (cm)	165.37±2.52	164.06±3.67	1.177	0.249	NS
BMI (kg/m ²)	24.09±1.95	23.51±1.85	0.863	0.395	NS

*SD: standard deviation, P: probability, S: significance, NS: non-significant.

Table 2: Descriptive statistics and 2×3 mixed design MANOVA for all outcome measures at different measuring periods within group (A)

	Pre-treatment (Mean ±SD)	Post 1 month (Mean ±SD)	Post 2 months (Mean ±SD)
Plasma cortisol level (µg/dl)	10.95±2.33	10.81±2.29	10.91±2.39
VAS	7.85±1.46	6.28±1.38	5.42±1.81
Present pain intensity	3.42±0.53	2.57±0.53	2.42±0.78
Pain rating index	21.42±4.07	17.42±3.95	14.57±4.54

Multiple pairwise comparisons (Post hoc tests) among different measuring periods for all outcome measures within group (B)

p-value	Pre-treatment Vs. Post 1 month	Pre-treatment Vs. Post 2 months	Post 1 month Vs. Post 2 months
Plasma cortisol level (µg/dl)	0.99	0.99	0.717
VAS	0.006*	0.004*	0.099
Present pain intensity	0.034*	0.001*	0.999
Pain rating index	0.01*	0.006*	0.033*

*Significant at alpha level <0.05.

Table 3: Descriptive statistics and 2×3 mixed design MANOVA for all outcome measures at different measuring periods within group (B).

	Pre-treatment (Mean ±SD)	Post 1 month (Mean ±SD)	Post 2 months (Mean ±SD)
Plasma cortisol level (µg/dl)	11.51 ±3.71	10.26±2.56	10.16±2.48
VAS	7.37 ±1.4	5.62±0.51	4.75±1.03
Present pain intensity	3.25 ±0.70	2.12±0.35	1.62±0.51
Pain rating index	21.25 ±4.59	15.12±2.9	13.75±3.61

Multiple pairwise comparisons (Post hoc tests) among different measuring periods for all outcome measures within group (B)			
p-value	Pre-treatment Vs. Post 1 month	Pre-treatment Vs. Post 2 months	Post 1 month Vs. Post 2 months
Plasma cortisol level (µg/dl)	0.481	0.409	0.645
VAS	0.002*	0.001*	0.065
Present pain intensity	0.004*	0.0001*	0.22
Pain rating index	0.0001*	0.002*	0.455

*Significant at alpha level <0.05.

Table 4: Multiple pairwise comparison tests (Post hoc tests) for all outcome measures between both groups at different measuring periods

Group (A) Vs. group (B)	Pre-treatment	Post 1 month	Post 2 months
Plasma cortisol level (µg/dl)	0.737	0.671	0.564
VAS	0.527	0.229	0.381
Present pain intensity	0.595	0.075	0.034*
Pain rating index	0.938	0.216	0.703

*Significant at alpha level <0.05

Comparing both groups revealed that there non-significant differences in plasma cortisol level and McGill pain questionnaire results at different measuring periods ($p > 0.05$), except for present pain intensity scores that showed a significant reduction at post 2 months of treatment in favour of group (B) ($p < 0.05$) (Table 4).

DISCUSSION

Primary dysmenorrhea is a common gynecological disorder which, while not life-threatening, severely affects the quality of life of women [15]. Most females with primary dysmenorrhea suffer from psychological stress, which can disrupt the endocrine system leading to production of prostaglandins, myometrial contraction and dysmenorrhea [16]. Therefore, this study conducted to determine the effect of acupressure on plasma cortisol, a stress related hormone, in primary dysmenorrhea.

Regarding cortisol levels, the results of the present study revealed non-significant differences within both groups as well as between groups at all measuring periods, reflecting that neither hot packs nor acupressure has an effect on cortisol levels in primary dysmenorrhea.

The non-significant effect of hot packs on cortisol levels was in the line of Brenner, *et al.* [17] who found that passive heating did not alter the concentrations of cortisol hormone or other stress hormones significantly. In contrast, Grant [18] reported that thermotherapy using the Amethyst Bio Belt is beneficial in minimizing stress and cortisol levels. The controversy between researches could be attributed to the variations in the design of them, the applied method of heating and the duration of heating.

The non-significant effect of acupressure on cortisol levels could be supported by Chang, *et al.* [12] who proved that there is no effect of acupressure at SP-6 on cortisol levels at the time immediately after, 30 minutes after, one hour after and two hours after the intervention in college students having primary dysmenorrhea. Additionally, Asadi, *et al.* [19] reported no significant variations in serum cortisol levels between the group of real acupuncture at SP-6 and LI-4 acupoints and the group of sham acupuncture at the same points in women suffering from labor pain. Moreover, Mucuk, *et al.* [20] found a non-significant difference in cortisol levels in labor between electroacupuncture group and placebo group. On the other hand, Kwan, *et al.* [21] concluded that acupressure is effective in reducing salivary cortisol levels among agitated patients. In addition, Kuo, *et al.* [22] revealed the effectiveness of auricular acupressure in decreasing cortisol levels of women who underwent caesarean section at the fifth day postpartum (post-treatment) when compared to the first day postpartum (pre-treatment). The contrast among studies could be related to the differences in study design and studied sample, as well as in method and site of acupoint stimulation.

Regarding McGill pain questionnaire results, the findings of the present study revealed significant reductions at post 1 month and post 2 months when compared to pre-treatment, while they showed non-significant differences between post 1 month and post 2 months within both groups. Comparing both groups revealed that there were non-significant differences in McGill pain questionnaire results at all measuring periods,

except for present pain intensity scores that showed a significant reduction at post 2 months of treatment in favour of group (B), indicating the positive effects of both techniques on females with primary dysmenorrhea, with a superior effect of acupressure on reducing present pain intensity.

The analgesic effect of hot packs in primary dysmenorrhea could be confirmed by Lee, *et al.* [23] who reported a major improvement in the menstrual pain intensity in the third treatment cycle following use of heat belt. Also, Potur and Komurcu [24] showed that the heat patch had a more favorable effect on the severity of menstrual pain compared to analgesic medications (assessed by VAS and McGill questionnaire). Similarly, Jo and Lee [25] showed beneficial effects of heat therapy on menstrual pain compared to no treatment (assessed by VAS). This decrease in pain after heat application probably occurred because of heat reduction of muscle tension, which thus gives the sensation of pain reduction and it also acts on pain control by means of the gate theory, similarly to TENS, or cause changing in central pain thresholds or through a well-being sensation [26].

The pain-relieving effect of acupressure in primary dysmenorrhea could be supported by Kashefi, *et al.* [27] who investigated the successfulness of SP6 acupressure for 2 menstrual cycles on relieving pain in females with primary dysmenorrhea. In addition, Wong, *et al.* [28] reported that SP6 acupressure for 3 successive menstrual cycles in primary dysmenorrhea females has a significant analgesic effect in the third month (assessed by VAS and McGill questionnaire). Other researches have also revealed the effectiveness of acupressure in treatment of dysmenorrhea and relaxation [29, 30].

The better effect of acupressure on reducing the present pain intensity scores in females with primary dysmenorrhea could be coincided with Maryanti and Keb [31] who concluded that the most effective method in reducing dysmenorrhea pain intensity was acupressure compared to warm compress. The analgesic effect of acupressure could be related to release of endorphins that block pain gates [27]. Acupressure, in fact, means the touch technique aiming to balancing human body's energy flow or Qi [29]. This method leads to the release of various neurotransmitters, which cut the nervous signals transferred by the nervous system. It also inhibits secretion of prostaglandins so reduces stimulation of cerebral cortex and regulates secretion of endocrine hormones and relieves pain [32].

The current study limitation is the lack of exploring the mechanisms underlying the valuable effect

of acupressure on reducing scores of present pain intensity in primary dysmenorrhea. Thus, future research is needed to measure the blood levels of different pain and stress markers to explore the mechanisms underlying the pain-relieving effect of acupressure in dysmenorrheic females.

CONCLUSION

Acupressure for 2 successive menstrual cycles is considered as a simple, convenient, cost-free, noninvasive and efficient method for reducing scores of present pain intensity in females having primary dysmenorrhea, without affecting their cortisol levels.

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Conflict of Interest: The authors have no conflict of interest to declare

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REFERENCES

1. Osayande, A.S. and S. Mehulic, 2014. Diagnosis and initial management of dysmenorrhea. *American Family Physician*, 89(5): 341-346.
2. Bernardi, M., L. Lazzeri, F. Perelli, F.M. Reis and F. Petraglia, 2017. Dysmenorrhea and related disorders. *F1000 Research*, 6: 1645.
3. Lindh, I., A.A. Ellström and I. Milsom, 2012. The effect of combined oral contraceptives and age on dysmenorrhoea: An epidemiological study. *Hum Reprod*, 27(3): 676-682.
4. Subasinghe, A.K., L. Hapoo, Y.L. Jayasinghe, S.M. Garland, A. Gorelik and J.D. Wark, 2016. Prevalence and severity of dysmenorrhoea and management options reported by young Australian women. *Aust Fam Physician*, 45(11): 829-834.
5. Zannoni, L., M. Giorgi and E. Spagnolo, 2014. Dysmenorrhea, absenteeism from school and symptoms suspicious for endometriosis in adolescents. *J. Pediatr Adolesc Gynecol.*, 27(5): 258-265.

6. Wang, L., X. Wang, W. Wang, C. Chen, A.G. Ronnennberg, W. Guang, A. Huang, Z. Fang, T. Zang, L. Wang and X.Xu, 2004. Stress and dysmenorrhoea: a population based prospective study. *Occupational and Environmental Medicine*, 61(12): 1021-1026.
7. Ou, M., T. Hsu, A. Lai, Y. Lin and C. Lin, 2012. Pain relief assessment by aromatic essential oil massage on outpatients with primary dysmenorrhoea: A randomised, double-blind clinical trial. *Journal of Obstetrics and Gynaecology Research*, 38: 817-822.
8. Robert, S.C., C. Hodgkiss, A. Di Benedetto and E. Lee, 2012. Managing dysmenorrhea in young women. *Nurse Practitioner*, 37: 47-52.
9. Mirbagher, N., M. Adib and F. Mosaebi, 2011. The effects of acupressure on primary dysmenorrhea: A randomized controlled trial. *Complementary Therapies in Clinical Practice*, 17: 33-36.
10. Luo, D., X. Wang and J. He, 2013. A comparison between acute pressure block of the sciatic nerve and acupressure: Methodology, analgesia and mechanism involved. *J. Pain Res.*, 6: 589-593.
11. Mike, A., A.S. Caroline, A.S. Kylie and M. Freya, 2019. The effectiveness of self-care and lifestyle interventions in primary dysmenorrhea: A systematic review and meta-analysis. *BMC Complement Altern Med.*, 19: 22.
12. Chang, S.B. and E.M. Jun, 2003. Effects of SP-6 acupressure on dysmenorrhea, cortisol, epinephrine and norepinephrine in the college students. *Taehan Kanho Hakhoe Chi*, 33(7): 1038-1046.
13. Sakineh, M.A., S.N. Maryam, K. Sedigheh and M. Ramin, 2011. The effect of acupressure at the Sanyinjiao point (SP6) on primary dysmenorrhea in students resident in dormitories of Tabriz. *Iranian Journal of Nursing and Midwifery Research*, 16(4): 309-317.
14. Melzack, R., 1987. The short-form McGill pain questionnaire. *Pain*, 30(2): 191-197.
15. Fang, L., C. Gu, X. Liu, J. Xie, Z. Hou, M. Tian, J. Yin, A. Li and Y. Li, 2017. Metabolomics study on primary dysmenorrhea patients during the luteal regression stage based on ultra performance liquid chromatography coupled with quadrupole-time-of-flight mass spectrometry. *Molecular Medicine Reports*, 15(3): 1043-1050.
16. Ertiana, D., M. Akhyar and U.R. Budihastuti, 2016. Path analysis of factors which correlated with dysmenorrhea. *Journal of Medicine*, 1(2): 136-145.
17. Brenner, I.K., J. Zamecnik, P.N. Shek and R.J. Shephard, 1997. The impact of heat exposure and repeated exercise on circulating stress hormones. *Eur. J. Appl. Physiol. Occup Physiol.*, 76: 445-454.
18. Grant, G., 2016. Evaluating thermotherapy using the amethyst bio belt and the infra red negative ion amethyst bio mat in 12 subjects to reduce fat, pain and stress over 3 months-case report. *Journal of Anesthesiology and critical care medicine (AACM). Canada: Enliven Academy of Wellness*, 1: 1-4.
19. Asadi, N., N. Maharlouei, A. Khalili, D. Yalda, D. Sarah, R.S. Hadi, J.H. Mohammad, J. Azam, V. Homeria and K. Maryam, 2015. Effects of LI-4 and SP-6 Acupuncture on Labor Pain, Cortisol Level and Duration of Labor. *Journal of Acupuncture and Meridian Studies*, 8: 249-254.
20. Mucuk, S., M. Baser and T. Ozkan, 2013. Effects of noninvasive electroacupuncture on labor pain, adrenocorticotrophic hormone and cortisol. *Alternative Therapies in Health & Medicine*, 19: 26-30.
21. Kwan, R., M. Leung and C. Lai, 2017. A Randomized Controlled Trial Examining the Effect of Acupressure on Agitation and Salivary Cortisol in Nursing Home Residents with Dementia. *Dementia and Geriatric Cognitive Disorders*, 44: 92-104.
22. Kuo, S.Y., S.H. Tsai, S.L. Chen and Y.L. Tzeng, 2016. Auricular acupressure relieves anxiety and fatigue and reduces cortisol levels in post-caesarean section women: A single-blind, randomised controlled study. *International Journal of Nursing Studies*, 53: 17-26.
23. Lee, C.H., J.W. Roh, C.Y. Lim, J.H. Hong, J.K. Lee and E.G. Min, 2011. A multicenter, randomized, double-blind, placebo-controlled trial evaluating the efficacy and safety of a far infrared-emitting sericite belt in patients with primary dysmenorrhea. *Complementary Therapies in Medicine*, 19: 187-193.
24. Potur, D.C. and N. Komurcu, 2014. The effects of local low-dose heat application on dysmenorrhea. *J. PediatrAdolesc Gynecol.*, 27(4): 216-221.
25. Jo, J. and S.H. Lee, 2018. Heat therapy for primary dysmenorrhea: A systematic review and meta-analysis of its effects on pain relief and quality of life. *Sci. Rep.*, 8(1): 16252.
26. Navvabi, R.S., K. Fatihe, N. Ali, S. Leila, S. Ameneh, K. Somaye, S. Shahla and S. Tahmineh, 2012. Comparing the analgesic effect of heat patch containing iron chip and ibuprofen for primary dysmenorrhea: A randomized controlled trial. *BMC Womens Health*, 12: 25

27. Kashefi, F., S. Ziyadlou, M. Khajehei, A.R. Ashraf, F.A. Reza and P. Jafari, 2010. Effect of acupressure at the Sanyinjiao point on primary dysmenorrhea: A randomized controlled trial, *Complement. Ther. Clin. Pract*, 16(4): 198-202.
28. Wong, C.L., K.Y. Lai and H.M. Tse, 2010. Effects of SP6 acupressure on pain and menstrual distress in young women with dysmenorrhea. *Complement Ther Clin Pract*, 16(2): 64-69.
29. Gharloghi, S., S. Torkzahrani, A.R. Akbarzadeh and R. Heshmat, 2012. The effects of acupressure on severity of primary dysmenorrhea. *Patient Prefer Adherence*, 6: 137-142.
30. Chen, H.M. and C.H. Chen, 2004. Effects of acupressure at the Sanyinjiao point on primary dysmenorrhoea. *J. Adv. Nurs.*, 48: 380-387.
31. Maryanti, S.A. and M. Keb, 2017. The Effectiveness of Acupressure in Reducing the Pain Intensity of Dysmenorrhea. *IOSR Journal of Nursing and Health Science*, 6(3): 77-83.
32. Iacovides, S., I. Avidon, A. Bentley and F.C. Baker, 2009. Diclofenac potassium restores objective and subjective measures of sleep quality in women with primary dysmenorrhea. *Sleep*, 32: 1019-1026.