

Review Article

Getting Rid of “Bomb Pushing the Womb”: Dysmenorrhea Management-Mini Review

Abdul Kader Mohiuddin*

Assistant Professor Department of Pharmacy, World University of Bangladesh 151/8, Green Road, Dhanmondi, Dhaka – 1205, Bangladesh

***Corresponding Author**

Abdul Kader Mohiuddin

Article History

Received: 27.07.2019

Accepted: 16.08.2019

Published: 30.09.2019

Abstract: According to the American Academy of Family Physicians, up to 20% of women suffer from menstrual cramping severe enough to interfere with daily activities. If prostaglandins levels are higher, more pain is often associated with the cramps. Cycle length, blood loss, period-related symptoms, fluid color, and consistency are all highly variable, even for just one person. However, severe menstrual pain is likely to be caused by a health issue such as PMS, fibroids, or endometriosis and requires medical support. When researchers analyzed frequency and duration of exercise and compared it to reports of period pain, they found exercise did little to reduce discomfort, and in fact this persisted even when a range of other factors—including weight, ethnicity, smoking and use of the birth control pill—were taken into consideration. Some women may also prefer not to use hormonal contraceptives, as they can bring unwanted side-effects such as fluctuations in weight and mood. Some methods can also slightly raise the risk of certain cancers, including breast cancer (although they reduce the risk of others, including womb cancer).

Keywords: dysmenorrhea, premenstrual syndrome; irregular menstruation; pelvic pain; yoga; aromatherapy; menstrual disorders.

INTRODUCTION

There are various types of menstrual disorders, including dysmenorrhea, premenstrual symptoms, menorrhagia, polymenorrhea, abnormal vaginal bleeding, amenorrhea, oligomenorrhea, and irregular menstruation [1]. The major abnormalities are dysmenorrhea, premenstrual syndrome (PMS), and menstrual irregularities [2]. The prevalence of dysmenorrhea varies from 50% to 90% globally. Nakame *et al.* [4] reported a range of more than 50% to 85% in Europe and America for the same and 60% to 85% in Asia [4]. Approximately 75% of people experience PMS, as reported by Wilbur *et al.* [5], which includes emotional and physical symptoms that occur between one and two weeks before menstruation [5]. Total annual health care costs were approximately 2–3 times higher in patients with dysmenorrhea compared to women without the condition [6]. Endometriosis, one of the main causes of secondary dysmenorrhea, induces non-menstrual pelvic pain, dyspareunia and infertility, resulting in marked reduction of quality of life during reproductive age [7, 8]. In the Western populations, endometriosis is estimated to occur in 5% to 10% of the population; however, the prevalence of endometriosis is suspected to be higher in Asian women, affecting approximately 15% of women [9]. The estimated health care expenditures for endometriosis at nearly \$70 billion per year in the United States, \$7.4 billion in Australia, approximately 380 billion JPY Japan [10-12]. Heavy menstrual bleeding (HMB) is the second highest-ranked reason for a hospital referral and accounts for 12% of all gynecologic referrals [13]. According to Kwak *et al.* [14] prevalence of irregular menstruation varies from 5% to 35.6% depending on age, occupation, and the country of residence Rad *et al.* [14] reported that dysmenorrhea is more common in women and girls with the following characteristics: low age, early menarche, positive familial history, smoking, stress, heavy exercise, shift work, in older women, more natural births, marriage in low age and light sports [15]. According to Rafique *et al.* 2018 the most prevalent menstrual problems (dysmenorrhea and premenstrual symptoms) in the target population were strongly associated with stress [1]. Bajalan *et al.* [16] recommended psychological assessment before the choice of therapeutic methods as there is a significant relationship between depression, anxiety, stress, alcohol abuse, somatic disorders and dysmenorrhea [16]. Payne *et al.* stated that primary dysmenorrhea (PDM) is associated with enhanced pain sensitivity and temporal summation in adult women, which may reflect the presence of central pain processes [17]. Also, Yang *et al.* [18] concluded that women with PDM had

Copyright @ 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

structural and functional abnormalities in the amygdala, which associated with stress hormone levels, pain intensity and negative mood, may reflect disturbed emotional and pain modulation in women with PDM [18]. Dysmenorrhea was considerably higher in girls who were consistently eating fast food. Because junk foods are rich in saturated fatty acids, and these acids affect the metabolism of progesterone in the menstrual cycle [2]. Junk foods also lack micronutrients, which might be responsible for triggering dysmenorrhea, premenstrual symptoms, and menstrual irregularities [19]. Mohiuddin, 2019 stated that diet limitation and skipping breakfast lead obesity and gynecological problems [20], specifically the hormonal changes which cause menstrual disorders in most of the females [21]. An android body fat distribution is associated with the least amount of menstrual bleeding. In addition, obesity can increase the production of estrogen, which in turn is related to body weight and its fat content. Adipose tissue stores various lipids which are able to metabolize steroids such as androgens [22]. Kafaeei-Atrian *et al.* [23] stated that menstrual bleeding was found to be higher in obese women. Moreover, it has been reported that excessive weight is an important factor for uterine cramps during menstruation and increases the likelihood of prolonged pain [23]. Menstrual disorders have a wide range of manifestations. However, some of them can lead to significant problems and can even be considered as important causes of infertility [23]. Another 2 reviews by Mohiuddin [8] reported that during puberty, alteration of the sebaceous lipid profile, dysmenorrhea, stress, irritation, cosmetics and potential dietary factors lead to inflammation and formation of different types of acne lesions [25, 26]. Sharghi *et al.* [27] pointed to both used of NSAIDs and steroids in dysmenorrhea pain management. Their long-term use has been associated with common complications like headache, dizziness, drowsiness, loss of appetite, nausea, vomiting, gastrointestinal bleeding, increased acute asthma, dysuria, and acne [27]. Comparable pain intensity of dysmenorrhea and renal colic has been reported by Akiyama *et al.* and Iacovides *et al.* [28,29]. Chen *et al.* 2018 reported that dysmenorrhea is also associated with other pain conditions such as migraines, fibromyalgia (FM), and IBS [30]. Galvani *et al.* also reported that FM is frequently diagnosed in women with a history of headache, dysmenorrhea, IBS, temporomandibular joint disorders or other regional pain syndromes [31]. Terzi *et al.* also reported an increased frequency of premenstrual syndrome and dysmenorrhea in FM patients [32]. Other studies also revealed that, decrements in health utilities for dysmenorrhea were similar to those associated with chronic migraine [33, 34]. The prevalence of menstrual migraine is 3% in the general population, but it afflicts 35%–70% of female migraineurs [35]. The pain is due to increased level of prostaglandins causing uterine contraction, uterine ischemia, and increased sensitivity to pain fibers and ultimately causes pelvic pain [36-38]. In some studies, there is also a link between levels of hormones such as progesterone, estrogen, vasopressin and sex-bound hormones (SHBG) [15, 39-41]. Dehnavi *et al.* reported that sports activity decreases the level of serum aldosterone by reducing the level of renin and increasing estrogen and progesterone and thus decreases and improves physical symptoms [42]. Although, Chinese Olympic medalist Fu Yuanhui acknowledged that menstrual pain affected her Olympic swimming performance [43]. Armour *et al.* also reported absenteeism from work or school, reduced participation in sport and social activities, altered pain perception and sleeping problems [44]. Lack of satisfactory pain relief and effective medical interventions in primary dysmenorrhea leads to an uptake of self-care strategies by women [45]. Non-pharmacological self-care techniques or lifestyle interventions, either physical or psychological, that can be practiced by women themselves such as exercise (including yoga and Pilates), heat, meditation, aromatherapy, self-massage or acupressure may fulfil these criteria, allowing women to potentially reduce their menstrual pain and need for analgesics, and improve their HRQoL [46]. McGovern *et al.* improvement method for women with primary dysmenorrhea [47-50]. The application of local heat can reduce muscle tension and relax abdominal muscles to reduce pain caused by muscle spasms. Jo *et al.* also reported that heat can also increase pelvic blood circulation to eliminate local blood and body fluid retention and diminish congestion and swelling, thereby enabling a reduction in pain caused by nerve compression [51]. Aromatherapy, the use of essential oils for a therapeutic purpose, is a popular type of CAM in the UK, USA, Australia and Canada [52-54]. Essential oils can be absorbed via olfaction, through the external skin, internal skin, and ingestion and the applications are divided into inhalation, topical use, and oral use. Song *et al.* [52], Lee *et al.* [56] and Fernández-Martínez *et al.* [3] reported that aromatherapy massage was an effective intervention for reducing dysmenorrhea [3, 52, 56]. Chinese herbal medicines (CHM) are well-accepted in the treatment of primary dysmenorrhea in East Asia, such as China, Korea, and Japan. Reviews from Gao *et al.* [57] showed a significant advantage compared with other treatments Sharghi *et al.* [57]. demonstrated that medicinal plants, drugs, and acupressure seem to suppress pain by reducing the level of prostaglandins, mediating nitric oxide, increasing beta-endorphin levels, blocking the calcium channel, and enhancing circulatory flow through the uterine pathway [27]. Traditional Chinese medicine (TCM) or Korean medicine identified blood stagnation as the main factor causing abdominal pain during menstruation [58]. Mirabi *et al.*, 2014 revealed advantage of several plant parts or plant derived medicines like *Foeniculum vulgare*, *Zingiber officinale*, Menastil® (calendula oil and mint essential oil), *Cuminum cyminum*, Menstrugol® (saffron, celery and aniseed), *Matricaria chamomilla*, *Valeriana officinalis*, *Cinnamomum zeylanicum*, *Stachys lavandulifolia*, *Zataria multiflora*, *Mentha piperita*, *Vitex agnus-castus*, *Echinophora platyloba*, *Achillea williamsii* etc Kartal *et al.* [59] recommended diet therapy including balanced nutrition, low-fat diet, some herbal teas, reducing salt intake in the diet, fish oil, magnesium, zinc, Vitamins B and E and protein intake that were found to be effective in pain reduction in earlier studies [60].



Fig-1: A symbolic figure of woman with depression, Menstruation can exacerbate incapacitating physical or mental health problems including endometriosis and depression; it can also be distressing or problematic for people with gender dysphoria (Source: Davis N. 'We don't need to bleed': why many women are giving up on periods. *The Guardian*, 18 July 2019).

Acknowledgement

I'm thankful to Dr. Mike Armour Postdoctoral Research Fellow - Women's Health, NICM Health Research Institute, Western Sydney University, and Sydney, Australia for his valuable time to audit my paper and for his thoughtful suggestions. I'm also grateful to seminar library of Faculty of Pharmacy, University of Dhaka and BANSDOC Library, Bangladesh for providing me books, journal and newsletters.

Abbreviations

Premenstrual Syndrome (PMS); Heavy menstrual bleeding (HMB); Premenstrual Syndrome (PMS); Primary dysmenorrhea (PDM); irritable bowel syndrome (IBS); Chinese Herbal Medicines (CHM); Complementary And Alternative Medicine (CAM); Traditional Chinese medicine (TCM); fibromyalgia (FM); sex-bound hormones (SHBG); Health-Related Quality Of Life (HRQoL); Primary Dysmenorrhea (PDM); Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

REFERENCES

1. Rafique, N., & Al-Sheikh, M. H. (2018). Prevalence of menstrual problems and their association with psychological stress in young female students studying health sciences. *Saudi medical journal*, 39(1), 67.
2. Negi, P., Mishra, A., & Lakhera, P. (2018). Menstrual abnormalities and their association with lifestyle pattern in adolescent girls of Garhwal, India. *Journal of family medicine and primary care*, 7(4), 804.
3. Fernández-Martínez, E., Onieva-Zafra, M. D., & Parra-Fernández, M. L. (2019). The Impact of Dysmenorrhea on Quality of Life among Spanish Female University Students. *International journal of environmental research and public health*, 16(5), 713.
4. Nakame, R. M., Kiwanuka, F., & Robert, A. (2019). Dysmenorrhoea among students aged 18–45 years attending University in Uganda: A cross-sectional multicenter study of three Universities in Uganda. *Nursing open*, 6(2), 268-275.
5. Wilbur, J., Torondel, B., Hameed, S., Mahon, T., & Kuper, H. (2019). Systematic review of menstrual hygiene management requirements, its barriers and strategies for disabled people. *PloS one*, 14(2), e0210974.
6. Akiyama, S., Tanaka, E., Cristeau, O., Onishi, Y., & Osuga, Y. (2017). Evaluation of the treatment patterns and economic burden of dysmenorrhea in Japanese women, using a claims database. *ClinicoEconomics and outcomes research: CEOR*, 9, 295.
7. Harada, T. (2013). Dysmenorrhea and endometriosis in young women. *Yonago acta medica*, 56(4), 81.
8. Mohiuddin, A. K. (2018). Managing Rational Use of Drugs in Bangladesh. *PharmaTutor*, 6(11), 30-35.
9. Yen, C. F., Kim, M. R., & Lee, C. L. (2019). Epidemiologic factors associated with endometriosis in East Asia. *Gynecology and minimally invasive therapy*, 8(1), 4.
10. Arakawa, I., Momoeda, M., Osuga, Y., Ota, I., & Koga, K. (2018). Cost-effectiveness of the recommended medical intervention for the treatment of dysmenorrhea and endometriosis in Japan. *Cost Effectiveness and Resource Allocation*, 16(1), 12.
11. Aubusson, P., Skamp, K., Burke, P. F., Pressick-Kilborn, K., Ng, W., Palmer, T. A., ... & Ferguson, J. (2019). Primary Connections: Linking science with literacy Stage 6 research evaluation final report.
12. Eisenberg, V. H., Weil, C., Chodick, G., & Shalev, V. (2018). Epidemiology of endometriosis: a large population-based database study from a healthcare provider with 2 million members. *BJOG: An International Journal of Obstetrics & Gynaecology*, 125(1), 55-62.
13. Ding, C., Wang, J., Cao, Y., Pan, Y., Lu, X., Wang, W., ... & Zhan, S. (2019). Heavy menstrual bleeding among women aged 18–50 years living in Beijing, China: prevalence, risk factors, and impact on daily life. *BMC women's health*, 19(1), 27.
14. Kwak, Y., Kim, Y., & Baek, K. A. (2019). Prevalence of irregular menstruation according to socioeconomic status: A population-based nationwide cross-sectional study. *PloS one*, 14(3), e0214071.

15. Rad, M., Sabzevari, M. T., Rastaghi, S., & Dehnavi, Z. M. (2018). The relationship between anthropometric index and primary dysmenorrhea in female high school students. *Journal of education and health promotion*, 7.
16. Bajalan, Z., Moafi, F., MoradiBaglooei, M., & Alimoradi, Z. (2019). Mental health and primary dysmenorrhea: A systematic review. *Journal of Psychosomatic Obstetrics & Gynecology*, 40(3), 185-194.
17. Payne, L. A., Seidman, L. C., Sim, M. S., Rapkin, A. J., Naliboff, B. D., & Zeltzer, L. K. (2019). Experimental evaluation of central pain processes in young women with primary dysmenorrhea. *Pain*, 160(6), 1421-1430.
18. Yang, L., Dun, W., Li, K., Yang, J., Wang, K., Liu, H., ... & Zhang, M. (2019). Altered amygdalar volume and functional connectivity in primary dysmenorrhoea during the menstrual cycle. *European Journal of Pain*, 23(5), 994-1005.
19. Fujiwara, T., Sato, N., Awaji, H., Sakamoto, H., & Nakata, R. (2009). Skipping breakfast adversely affects menstrual disorders in young college students. *International journal of food sciences and nutrition*, 60(sup6), 23-31.
20. Mohiuddin, A. K. (2019). Skipping Breakfast Everyday Keeps Well-Being Away. *Research & Reviews: Journal of Dairy Science and Technology*, 7(3), 20-30.
21. Misra, A., & Shrivastava, U. (2013). Obesity and dyslipidemia in South Asians. *Nutrients*, 5(7), 2708-2733.
22. Carranza-Lira, S., Flores-Hernández, M. I., Sandoval-Barragán, M. P., Martínez-Chéquer, J. C., & Martínez-Rodríguez, O. A. (2013). Variability of the menstrual cycle in Mexican women according to the weight and the distribution of the adipose fabric. *Ginecología y obstetricia de Mexico*, 81(06), 321-328.
23. Kafaei-Atrian, M., Mohebbi-Dehnavi, Z., Sayadi, L., Asghari-Jafarabadi, M., Karimian-Taheri, Z., & Afshar, M. (2019). The relationship between the duration of menstrual bleeding and obesity-related anthropometric indices in students. *Journal of education and health promotion*, 8.
24. Rad, M., Sabzevari, M. T., & Dehnavi, Z. M. (2018). Association between menstrual disorders and obesity-related anthropometric indices in female high school students: A cross-sectional study. *International Journal of School Health*, 5(2).
25. Mohiuddin, A.K. (2019). A Comprehensive Review of Acne Vulgaris. *Clin Res Dermatol Open Access* 6(2): 1-34. DOI: <http://dx.doi.org/10.15226/2378-1726/6/2/00186>
26. Mohiuddin, A. K. (2019). Acne Vulgaris: Measures and Miseries.
27. Sharghi, M., Mansurkhani, S. M., Larky, D. A., Kooti, W., Niksefat, M., Firoozbakht, M., ... & Jouybari, L. (2019). An update and systematic review on the treatment of primary dysmenorrhea. *JBRA assisted reproduction*, 23(1), 51.
28. Akiyama, S., Goren, A., Basurto, E., Komori, T., & Harada, T. (2018). Treatment preferences among Japanese women with dysmenorrhea: Results from a discrete choice experiment study. *Patient preference and adherence*, 12, 1627.
29. Iacovides, S., Avidon, I., & Baker, F. C. (2015). What we know about primary dysmenorrhea today: a critical review. *Human reproduction update*, 21(6), 762-778.
30. Chen, C. X., Draucker, C. B., & Carpenter, J. S. (2018). What women say about their dysmenorrhea: a qualitative thematic analysis. *BMC women's health*, 18(1), 47.
31. Galvani, C., Caramaschi, P., Mura, P., Paladini, A., Piroli, A., Arnaudo, E., ... & Finco, G. (2019). Postural counseling represents a novel option in pain management of fibromyalgia patients. *Journal of pain research*, 12, 327.
32. Terzi, R., Terzi, H., & Kale, A. (2015). Evaluating the relation of premenstrual syndrome and primary dysmenorrhea in women diagnosed with fibromyalgia. *Revista brasileira de reumatologia*, 55(4), 334-339.
33. Rencz, F., Gulácsi, L., Varga, A. N., Sziklai, O. R., Péntek, M., & Brodszky, V. (2015). Time trade-off utility values in mild and severe primary dysmenorrhea. *Value in Health*, 18(7), A738-A739.
34. Spierings, E. L., & Padamsee, A. (2015). Menstrual-cycle and menstruation disorders in episodic vs chronic migraine: an exploratory study. *Pain Medicine*, 16(7), 1426-1432.
35. Martin, V. T., Ballard, J., Diamond, M. P., Mannix, L. K., Derosier, F. J., Lener, S. E., ... & McDonald, S. A. (2014). Relief of menstrual symptoms and migraine with a single-tablet formulation of sumatriptan and naproxen sodium. *Journal of Women's Health*, 23(5), 389-396.
36. Fang, L., Gu, C., Liu, X., Xie, J., Hou, Z., Tian, M., ... & Li, Y. (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.
37. Yang, L., Cao, Z., Yu, B., & Chai, C. (2015). An in vivo mouse model of primary dysmenorrhea. *Experimental animals*, 14-0111.
38. Dmitrovic, R., Kunselman, A. R., & Legro, R. S. (2012). Continuous compared with cyclic oral contraceptives for the treatment of primary dysmenorrhea: a randomized controlled trial. *Obstetrics and gynecology*, 119(6), 1143.
39. Liedman, R., Hansson, S. R., Howe, D., Iqbal, S., McLeod, A., Russell, R. J., & Åkerlund, M. (2008). Reproductive hormones in plasma over the menstrual cycle in primary dysmenorrhea compared with healthy subjects. *Gynecological Endocrinology*, 24(9), 508-513.
40. Reed, B.G, Carr B. R. (2000). The Normal Menstrual Cycle and the Control of Ovulation. 2018 Aug 5. In: Feingold KR, Anawalt B, Boyce A, editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK279054/>
41. Oladosu, F. A., Tu, F. F., & Hellman, K. M. (2018). Nonsteroidal antiinflammatory drug resistance in dysmenorrhea: epidemiology, causes, and treatment. *American journal of obstetrics and gynecology*, 218(4), 390-400.
42. Dehnavi, Z. M., Jafarnejad, F., & Kamali, Z. (2018). The Effect of aerobic exercise on primary dysmenorrhea: A clinical trial study. *Journal of education and health promotion*, 7.

43. Feng, E. (2016). Uninhibited Chinese swimmer, discussing her period, shatters another barrier. *New York Times*. Available at: <http://www.nytimes.com/2016/08/17/world/asia/china-fuyuanhui-period-olympics.html>.
44. Armour, M., Smith, C. A., Steel, K. A., & Macmillan, F. (2019). The effectiveness of self-care and lifestyle interventions in primary dysmenorrhea: a systematic review and meta-analysis. *BMC complementary and alternative medicine*, 19(1), 22.
45. MacKichan, F., Paterson, C., Henley, W. E., & Britten, N. (2011). Self-care in people with long term health problems: a community based survey. *BMC family practice*, 12(1), 53.
46. Pattanittum, P., Kunyanone, N., Brown, J., Sangkomkarnhang, U. S., Barnes, J., Seyfoddin, V., & Marjoribanks, J. (2016). Dietary supplements for dysmenorrhoea. *Cochrane Database of Systematic Reviews*, (3).
47. McGovern, C. E., & Cheung, C. (2018). Yoga and Quality of Life in Women with Primary Dysmenorrhea: A Systematic Review. *Journal of midwifery & women's health*, 63(4), 470-482.
48. Yonglithipagon, P., Muansiangsai, S., Wongkhumngern, W., Donpunha, W., Chanavirut, R., Siritaratiwat, W., ... & Janyacharoen, T. (2017). Effect of yoga on the menstrual pain, physical fitness, and quality of life of young women with primary dysmenorrhea. *Journal of bodywork and movement therapies*, 21(4), 840-846.
49. Yang, N. Y., & Kim, S. D. (2016). Effects of a yoga program on menstrual cramps and menstrual distress in undergraduate students with primary dysmenorrhea: a single-blind, randomized controlled trial. *The Journal of Alternative and Complementary Medicine*, 22(9), 732-738.
50. Hyun-Nam, K., Sam-Sun, L., & Sang-Dol, K. (2016). Effects of Yoga on Dysmenorrhea: A Systematic Review of Randomized Controlled Trials. *Altern Integr Med*, 5(226), 2.
51. Jo, J., & Lee, S. H. (2018). Heat therapy for primary dysmenorrhea: A systematic review and meta-analysis of its effects on pain relief and quality of life. *Scientific reports*, 8(1), 16252.
52. Song, J. A., Lee, M. K., Min, E., Kim, M. E., Fike, G., & Hur, M. H. (2018). Effects of aromatherapy on dysmenorrhea: A systematic review and meta-analysis. *International journal of nursing studies*, 84, 1-11.
53. Koo, M. (2017). A bibliometric analysis of two decades of aromatherapy research. *BMC research notes*, 10(1), 46.
54. Reid, R., Steel, A., Wardle, J., Trubody, A., & Adams, J. (2016). Complementary medicine use by the Australian population: a critical mixed studies systematic review of utilisation, perceptions and factors associated with use. *BMC complementary and alternative medicine*, 16(1), 176.
55. Berger, L., Tavares, M., & Berger, B. (2013). A Canadian experience of integrating complementary therapy in a hospital palliative care unit. *Journal of palliative medicine*, 16(10), 1294-1298.
56. Lee, M., Lee, H., Khalil, M., Lim, H., & Lim, H. J. (2018). Aromatherapy for managing pain in primary dysmenorrhea: a systematic review of randomized placebo-controlled trials. *Journal of clinical medicine*, 7(11), 434.
57. Gao, L., Xiao, Z., Jia, C., Wang, W. (2019). A comparison of the efficacy of Chinese herbal medicines in the treatment of primary dysmenorrhea: A network meta-analysis protocol. *Medicine (Baltimore)*. Apr;98(14):e15100.
58. Leem, J., Jo, J., Kwon, C. Y., Lee, H., Park, K. S., & Lee, J. M. (2019). Herbal medicine (Hyeolbuchukeo-tang or Xuefu Zhuyu decoction) for treating primary dysmenorrhea: a systematic review and meta-analysis of randomized controlled trials. *Medicine*, 98(5).
59. Mirabi, P., Alamolhoda, S. H., Esmailzadeh, S., & Mojab, F. (2014). Effect of medicinal herbs on primary dysmenorrhoea-a systematic review. *Iranian journal of pharmaceutical research: IJPR*, 13(3), 757.
60. Kartal, Y. A., & Akyuz, E. Y. (2018). The effect of diet on primary dysmenorrhea in university students: A randomized controlled clinical trial. *Pakistan journal of medical sciences*, 34(6), 1478.