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2734 17 Avenue SW,
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Canada
+15878858911
editorial-office@sciformat.ca

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VITAMIN D SUPPLEMENTATION IN PRIMARY DYSMENORRHEA. A NARRATIVE REVIEW

Anna Kołodziej (Corresponding Author, Email: annakolodziej002@gmail.com)
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0001-0969-5211

Aleksander Bogusz
University Clinical Hospital F. Chopin in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0005-4852-0851

Izabella Kula
John Paul II Municipal Hospital in Rzeszów, Rycerska 4, 35-241 Rzeszów, Poland
ORCID ID: 0009-0002-7379-5062

Jakub Klecha
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0003-8909-9181

Radosław Kołodziej
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0009-1767-5956

Kacper Szpanelewski
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0006-2517-4535

Szymon Lulek
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0000-3827-2907

Emilia Kucab
University Clinical Hospital F. Chopin in Rzeszów, Rzeszów, Poland
ORCID ID: 0000-0003-4320-6327

Damian Daniłczuk
John Paul II Municipal Hospital in Rzeszów, Rycerska 4, 35-241 Rzeszów, Poland
ORCID ID: 0009-0005-5755-1115

Joanna Ciemięga
University of Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0009-0041-1671

Szczepan Półchłopek
John Paul II Municipal Hospital in Rzeszów, Rycerska 4, 35-241 Rzeszów, Poland
ORCID ID: 0000-0003-1188-2830

Katarzyna Dżiki
University Clinical Hospital F. Chopin in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0003-9380-1244

Wiktor Adamiec
John Paul II Municipal Hospital in Rzeszów, Rycerska 4, 35-241 Rzeszów, Poland
ORCID ID: 0009-0002-3322-5479

ABSTRACT

Primary dysmenorrhea (PD) is a frequent gynecological disorder that leads to repeated episodes of severe, cramping pain in the lower abdomen without any detectable pelvic pathology. It significantly reduces the quality of life and limits daily functioning in menstruating women. The main cause of PD is the excessive production of uterine prostaglandins, which results in stronger myometrial contractions, decreased blood flow to the uterus, and pain. Some recent studies have shown that vitamin D may be involved in regulating these processes due to its anti-inflammatory properties and ability to modulate prostaglandin synthesis.

The objective of this review is to investigate the effect of vitamin D supplementation on the pain associated with primary dysmenorrhea. A literature search was conducted in PubMed and Google Scholar, focusing on clinical trials published within the last 15 years. The reviewed studies included randomized controlled trials of both high-dose and weekly vitamin D supplementation regimens.

The results show that vitamin D supplementation can have a significant effect on reducing the pain intensity, duration of symptoms, and the consumption of analgesics, particularly in women with vitamin D deficiency. Alleviation of systemic symptoms such as headache, nausea/vomiting, fatigue, and diarrhea was also reported. Interestingly, the level of clinical improvement was not always directly proportional to the increase in serum vitamin D levels. Both short-term and long-term supplementation, as well as combination therapies with other agents such as vitamin E and ginger were effective.

To sum up, vitamin D supplementation is possibly a new adjuvant therapy in the treatment of primary dysmenorrhea. However, more studies involving a larger number of participants are needed to determine the correct dosing and to verify its effectiveness in diverse populations.

KEYWORDS

Vitamin D, Primary Dysmenorrhea, Pain, Vitamin D Deficiency, Prostaglandins

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Introduction

The term "primary dysmenorrhea" (PD) refers to colic pain in the suprapubic area that radiates to the lumbar and thighs and occurs either before or during menstruation without the presence of pelvic illness. [1] The degree of dysmenorrhea varies among women and typically improves after childbirth. [2] The pain typically lasts from 8 to 72 hours and is usually relieved within this time frame. The onset of symptoms is most severe on the first and second days of menstruation due to the hormonal imbalance. During this period, increased release of prostaglandins was observed, which affects mood, sleep patterns, and quality of life. Ailments that may occur during menstruation include back pain, migraines, nausea, vomiting, diarrhea, dizziness, exhaustion, insomnia, and in rare cases fainting and hyperthermia. [1,4] At least half of women who menstruate experience primary painful menstruation, which often causes disruption to work and school schedules and ultimately raises concerns about education and finances. [3] Given the numerous challenges experienced by women with primary dysmenorrhea, several attempts have been made to elucidate the underlying causes of severe pain in certain patients. Among the potential contributing factors, vitamin D deficiency has been considered a possible determinant. This review aims to evaluate the impact of vitamin D supplementation on the alleviation of pain associated with primary dysmenorrhea.

Epidemiology and risk factors

Primary dysmenorrhea is the most common gynecological condition in menstruating women. Unlike secondary dysmenorrhea, its prevalence is lower with age and is more frequent in the second and third decades of life. [1] The 16–25 age range has the highest prevalence of primary dysmenorrhea, although this condition is substantially underreported since many women view pain as a typical aspect of the menstrual cycle and choose not to seek medical attention despite experiencing significant symptoms. [7,8] However, due to growing public health awareness, the number of reported cases has increased in recent years. [3] Dysmenorrhea affects between 70 and 90% in menstruating adolescent girls and women; severe pain is reported in 2 to 29% of cases. [16] The intensity of dysmenorrheic pain may lessen with age and after childbirth. [8] Risk factors for primary dysmenorrhea are: age younger than 30 years, BMI <20, smoking, menarche at younger than 12 years, longer menstrual cycles or duration of bleeding, irregular or heavy menstrual flow, poor sleep quality, staying up late, short sleep duration (< 8 hours per day), skipping breakfast, dietary bias, lack of physical exercise, high stress, a history of sexual assault, and a family history of dysmenorrhea. [3,6,8]

Diagnosis

Primary dysmenorrhea is diagnosed when any organic pathology of gynecological origin is excluded [7]. Obtaining detailed medical, psychosocial, and gynecologic (menstrual and sexual) history may be sufficient to diagnose PD. [17] Pain associated with primary dysmenorrhea usually starts right before menstruation, or at the onset of menstruation, and begins within a few months or up to 2 years of menarche. Pain (episodic and crampy in nature) is located in the lower abdomen and can radiate to the back and inner thighs. It usually lasts up to 72 h and is similar to previous menstrual cycles. Additional symptoms may include nausea and vomiting, fatigue, headaches, dizziness, and sleep disturbances. Women with the mentioned symptoms are candidates for empiric therapy (nonsteroidal antiinflammatory drugs are considered first-line treatment). [6]

Patients whose symptoms do not respond to empiric therapy or are presenting with dysmenorrhea for the first time should receive pelvic examination and radiologic testing due to the significantly higher probability of secondary causes. The recommended technique for assessing the pelvic organs is transvaginal ultrasonography. In non-sexually active adolescents and young women, transabdominal pelvic ultrasonography is preferred. [6,17]

Pathophysiology

The overproduction of uterine prostaglandins (PGs) is the most commonly recognized pathophysiological explanation for primary dysmenorrhea. The increased release of PGs from cells that are disintegrating during endometrial sloughing is thought to induce myometrial hypercontractility, which in turn causes uterine muscle ischemia, hypoxia, and pain (hypoxia leads to the accumulation of anaerobic metabolites that stimulate pain receptors). [1,8] Prostaglandins are synthesized from long-chain polyunsaturated fatty acids such as arachidonic acid, a common component of cell membrane phospholipids. Phospholipase A₂, a lysosomal enzyme, converts phospholipids into arachidonic acid. [1] The stability of lysosomes is regulated by several factors, one of which is progesterone levels. At the end of the luteal phase, the level of progesterone decreases, lysosomes release phospholipase A₂, which starts the cyclooxygenase pathway and prostanoid production. [6]

There are nine kinds of prostaglandins; prostaglandin F_{2α} (PGF_{2α}) and prostaglandin E₂ (PGE₂) are the ones linked to the pathophysiology of primary dysmenorrhea. Due to its ability to promote myometrial contraction and uterine vasoconstriction, prostaglandin F_{2α} is more significant in cases of dysmenorrhea. Prostaglandins affect the body's temperature, regulate sleep patterns, and are also responsible for causing pain and inflammation. Menstrual pain and related symptoms are more severe when prostaglandin levels are higher. Prostaglandin F_{2α} also lowers the threshold for pain perception by sensitizing nerve receptors. [1,6] Compared to women who are eumenorrheic, women with primary dysmenorrhea have higher quantities of PGF_{2α} in their menstrual fluid. Furthermore, there seems to be a correlation between the level of PGF_{2α} and the severity of the pain. [6,8]

The role of prostanoids such as thromboxane A₂, prostacyclins, and leukotrienes remains unclear. Prostacyclins are uterine relaxants and vasodilators that are assumed to be reduced in dysmenorrhea. Certain types of dysmenorrhea resistant to nonsteroidal anti-inflammatory drug therapy may be caused by leukotrienes. The menstrual fluid of women suffering from dysmenorrhea has a higher quantity of leukotrienes, particularly LTC₄ and LTD₄. It is also believed that leukotrienes play a role in uterine hypercontractility, since LTC₄ has

specific binding sites on myometrial cells. [1] The role of vasopressin in the pathophysiology of dysmenorrhea is likewise debatable. Some studies suggest that high levels of circulation may produce dysrhythmic uterine contractions. [1,6,8]

Contractions of the uterus are associated with a brief lack of perfusion, which leads to ischemia and consequently pain. It is suggested that increased basal tone of contractions and uncoordinated contractions further reduce uterine perfusion. [6,8]

There is some evidence that women with dysmenorrhea may develop hypersensitivity to pain, but it still remains unclear. It is believed that there is variation in the processing of pain in these cases. The amplification of peripheral nociceptive information produced by the sexual organs during menstruation leads to an increase in the excitability of the somatovisceral convergent neurons in the spinal cord, which in turn causes an increase in the perception of pain. [1]

The role of vitamin D in the female reproductive system

Given the diverse physiological roles of vitamin D in the human body, its potential applications in medicine have attracted increasing scientific interest. As a steroid hormone, vitamin D is primarily (80–90%) produced in the skin by exposure to sunlight; the remaining portion is obtained through diet and supplements. [9] Vitamin D plays a significant role in the female reproductive system, since its receptors are found in ovarian and endometrial tissue, as well as in epithelial cells of the fallopian tubes, decidua, and placenta. [2] By interfering with the endometrium's receptors, vitamin D metabolites (such as 25[OH]D and 1,25[OH]₂D) inhibit the endometrium's biological activity by lowering the levels of inflammatory cytokines and related contractile factors (prostaglandin). [10] Vit. D can lower PG production in uterine tissue through a number of different mechanisms. Firstly, vit. D reduces the expression of PG receptors, which is followed by the inhibition of PG-mediated functional response. Secondly, vit. D by raising the activity of the enzyme 15-(dehydrogenase) accelerates breakdown of PG. Thirdly, vitamin D has the ability to reduce the expression of cyclooxygenase-2 (COX-2), similar to NSAIDs. [5] Recent research has demonstrated that during the luteal phase of the menstrual cycle, serum levels of vitamin D decrease. [10] It has been stated that Vitamin D deficiency and severe to extremely severe dysmenorrhea are correlated. Vitamin D's ability to control prostaglandin levels, which has anti-inflammatory qualities, most likely explains this phenomenon. [2]

Methodology

A literature review was conducted using the PubMed and Google Scholar databases. The search strategy included specific keywords such as “primary dysmenorrhea,” “vitamins,” “supplementation,” and “vitamin D.” The analysis was limited to data from double-blind or single-blind placebo-controlled clinical trials published within the last 15 years, with earlier studies excluded from consideration.

Results

Several studies have investigated the impact of vitamin D supplementation on symptoms of primary dysmenorrhea, with findings indicating potentially beneficial effects. The studies differed in terms of the dosing regimens of vitamin D, duration, and purposes of observation. The first study investigating the effect of a single high dose of vitamin D in primary dysmenorrhea was conducted in Italy by Lasco et al. A single dose of 300,000 IU of vitamin D was administered five days prior to the estimated menstruation over two consecutive cycles in women with primary dysmenorrhea and serum vitamin D levels below 45 ng/mL, resulting in a reduction in symptom severity and NSAID use. [18] Similarly, Zangene et al. demonstrated that administration of a single 300,000 IU dose five days before menstruation across three consecutive cycles was both effective and safe in women with primary dysmenorrhea. [19] In 2023, another double-blind, randomized, placebo-controlled trial was published, which also examined the effects of a single high dose of vitamin D, but differed in the method of supplementation. Participants with vitamin D deficiency received 300,000 IU of vitamin D in the form of 50,000 IU [2 tablets] every 8 hours 5 days before their expected menstrual period. The observation period lasted for 3 menstrual cycles, including the cycle preceding vitamin D administration. Questionnaires based on the visual analog scale (VAS), the verbal multidimensional scoring system (VMS), and the pictorial blood assessment card (PBLAC) were used. The findings indicated that, at one and two months following the initiation of vitamin D supplementation, the mean score and severity of primary dysmenorrhea, as well as mefenamic acid consumption, were significantly lower in the experimental group compared to the control group. However, the intervention did not produce a statistically significant effect on

menstrual blood loss. [14] Based on these three studies, it can be concluded that high doses of vitamin D may have a positive effect on alleviating pain associated with primary dysmenorrhea. [14,18,19]

The promising results of a study conducted by Lasco et al. prompted other researchers to investigate the effects of vitamin D supplementation on primary dysmenorrhea. Further double-blind, randomized, placebo-controlled clinical trials were conducted to evaluate vitamin D supplementation at a dose of 50,000 IU per week. [9,10,11] The supplementation period lasted 8 weeks in three studies [9,10], while in one study it lasted up to 5 months. [11] Only women suffering from primary dysmenorrhea and vitamin D deficiency (<30 ng/ml) were eligible for the study. Women with a secondary cause of dysmenorrhea did not participate in the study. The study investigated the effect of vitamin D supplementation on the number of days with pain, the severity of systemic symptoms such as fatigue, headaches, nausea/vomiting, and diarrhea [10], the intensity of menstrual pain, and the use of pain medications such as NSAIDs. [9,10,11] This effect was consistently measured using validated assessment tools, such as the visual analog scale (VAS), verbal multidimensional scoring systems (VMS) [9,11], and Friedman's test. [10] In the intervention groups, there was a statistically significant reduction in pain intensity, a lower need for nonsteroidal anti-inflammatory drugs (NSAIDs) or other analgesics [9,10,11], a decrease in the duration of menstrual pain, and a reduction in the severity of systemic symptoms compared with the placebo-controlled groups. [10]

Considering the results of vitamin D supplementation in alleviating menstrual pain, it was also decided to conduct studies on the combined use of vitamins D and E [20], as well as to examine the individual effects of each of these supplements and others like ginger on painful periods. [15] The studies differed in terms of the duration of the observation period. The results of a single-blind trial showed vitamin D, vitamin E, and ginger significantly reduced the severity of dysmenorrhea, with ginger having the most significant effect, followed by vitamin D and vitamin E. [15] In the double-blind study with combined use of vitamin D and E, the intervention group exhibited a significant reduction in pain intensity compared to controls. Furthermore, premenstrual symptoms significantly improved, and baseline vitamin D inversely correlated with pain. [20]

Discussion

The available evidence suggests that vitamin D supplementation, especially in women with a deficiency, may help reduce the symptoms of primary dysmenorrhea. Randomized controlled trials indicate that high doses of vitamin D, regardless of the method of administration (50,000 IU once a week or a single dose of 300,000 IU taken 5 days before the expected menstrual period), show comparable treatment effects. Women experience relief from menstrual pain and a reduced need for pain medication after just 4 weeks of vitamin D supplementation. [9,10,11,14,18,19] In addition, systemic symptoms such as fatigue, nausea, vomiting, diarrhea, and headaches are alleviated [10], but no significant effect on reducing menstrual bleeding has been reported. [14] The observed positive effects of supplementation persist for up to a month after discontinuation. [9,11] However, we cannot determine whether this effect lasts longer due to a lack of research in this area.

Notably, since all patients participating in the studies had vitamin D deficiency, we cannot speculate on the effect of vitamin D supplementation on the treatment of primary dysmenorrhea in women with sufficient levels of this vitamin. It is therefore unknown whether vitamin D supplementation would reduce pain associated with primary dysmenorrhea in women with normal baseline serum vitamin D levels. [9,10,11,14] Furthermore, in two clinical trials, no significant difference in the intensity of pain after 8 weeks was found between individuals who achieved normal vitamin D levels (≥ 30 ng/ml) and those who did not reach normal levels after taking vitamin D supplements. This suggests that vitamin D may exert its effects through mechanisms beyond simple correction of deficiency, potentially involving modulation of inflammation and prostaglandin activity. [10]

In addition, observational data confirm the association that women suffering from painful periods often have lower levels of vitamin D and calcium and report higher levels of pain. [12,13] The role of vitamin D in regulating calcium metabolism and hormonal balance may influence the pathophysiology of menstrual pain.

Moreover, in most of the cited studies, post-treatment, serum vitamin D concentrations in the intervention groups rose from deficient to sufficient levels but did not reach high levels. [9,10,11] Across the included studies, an increase in serum vitamin D levels was associated with a significant reduction in pain intensity. This observation may indicate that higher vitamin D levels could contribute to greater pain reduction. However, current evidence does not clearly support a dose-response relationship. Further research is needed to confirm this.

The growing interest in non-pharmacological treatment methods has also prompted a closer look at combined and comparative supplementation strategies. Clinical research examining the effects of vitamin D

alongside other substances, including vitamin E and ginger, indicates potential additive or synergistic benefits. The joint supplementation of vitamins D and E showed a notable link to decreased pain intensity compared to a placebo. [20] In a head-to-head comparison of supplements, ginger was found to have the strongest effect, followed by vitamin D and vitamin E. [15] Nevertheless, the interpretation of these results is limited because participants in these studies were allowed to use analgesics, which might have affected the outcomes. Given the low risk associated with the use of these supplements, further controlled studies are needed to directly compare these interventions and to evaluate their effectiveness when used alone. [20]

Finally, the evidence that can be generalized from the available research is quite limited, because a significant number of studies were carried out in populations that were relatively homogeneous (young women, university students). To confirm the efficacy of vitamin D in the treatment of primary dysmenorrhea, further randomized, controlled clinical trials are needed involving a larger number of patients from diverse backgrounds and age groups, with longer treatment durations, varying doses of vitamin D used as maintenance doses, and longer follow-up periods.

Conclusions

Considering all of the aspects mentioned above, it may be concluded that vitamin D supplementation by itself or in association with the intake of other dietary supplements might help to relieve primary painful menstruation, particularly among individuals with confirmed deficiency. However, further rigorously designed studies are warranted to establish optimal dosing protocols and to more precisely define its therapeutic position in relation to other available treatment options.

REFERENCES

- Guimarães, I., & Póvoa, A. M. (2020). Primary dysmenorrhea: Assessment and treatment. *Revista Brasileira de Ginecologia e Obstetrícia*, 42(8), 501–507. <https://doi.org/10.1055/s-0040-1712131>
- Matsas, A., Sachinidis, A., Lamprinou, M., Stamoula, E., & Christopoulos, P. (2023). Vitamin effects in primary dysmenorrhea. *Life*, 13(6), Article 1308. <https://doi.org/10.3390/life13061308>
- Wang, L., Yan, Y., Qiu, H., Xu, D., Zhu, J., Liu, J., & Li, H. (2022). Prevalence and risk factors of primary dysmenorrhea in students: A meta-analysis. *Value in Health*, 25(10), 1678–1684. <https://doi.org/10.1016/j.jval.2022.03.023>
- Donayeva, A., Amanzholyzy, A., Abdelazim, I., Saparbayev, S., Nurgaliyeva, R., Kaldybayeva, A., Zhexenova, A., Gubasheva, G., Ayaganov, D., & Samaha, I. (2023). The effects of vitamin D and calcium on primary dysmenorrhea: A systematic review. *Journal of Medicine and Life*, 16(11), 1597–1605. <https://doi.org/10.25122/jml-2023-0248>
- Chen, Y. C., Chiang, Y. F., Lin, Y. J., Huang, K. C., Chen, H. Y., Hamdy, N. M., Huang, T. C., Chang, H. Y., Shieh, T. M., Huang, Y. J., & Hsia, S. M. (2023). Effect of vitamin D supplementation on primary dysmenorrhea: A systematic review and meta-analysis of randomized clinical trials. *Nutrients*, 15(13), Article 2830. <https://doi.org/10.3390/nu15132830>
- Ferries-Rowe, E., Corey, E., & Archer, J. S. (2020). Primary dysmenorrhea: Diagnosis and therapy. *Obstetrics & Gynecology*, 136(5), 1047–1058. <https://doi.org/10.1097/AOG.0000000000004096>
- López-Liria, R., Torres-Álamo, L., Vega-Ramírez, F. A., García-Luengo, A. V., Aguilar-Parra, J. M., Trigueros-Ramos, R., & Rocamora-Pérez, P. (2021). Efficacy of physiotherapy treatment in primary dysmenorrhea: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 18(15), Article 7832. <https://doi.org/10.3390/ijerph18157832>
- 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. <https://doi.org/10.1093/humupd/dmv039>
- Moini, A., Ebrahimi, T., Shirzad, N., Hosseini, R., Radfar, M., Bandarian, F., Jafari-Adli, S., Qorbani, M., & Hemmatabadi, M. (2016). The effect of vitamin D on primary dysmenorrhea with vitamin D deficiency: A randomized double-blind controlled clinical trial. *Gynecological Endocrinology*, 32(6), 502–505. <https://doi.org/10.3109/09513590.2015.1136617>
- Rahnemaei, F. A., Gholamrezaei, A., Afrakhteh, M., Zayeri, F., Vafa, M. R., Rashidi, A., & Ozgoli, G. (2021). Vitamin D supplementation for primary dysmenorrhea: A double-blind, randomized, placebo-controlled trial. *Obstetrics & Gynecology Science*, 64(4), 353–363. <https://doi.org/10.5468/ogs.20316>
- Donayeva, A., Amanzholyzy, A., Abdelazim, I., Kurmangazin, M., Khamidullina, Z., Kurmanalina, M., Sumanova, A., Shabanbayeva, Z., Baubekov, Z., Bissaliyev, B., Gubasheva, G., & Samaha, I. (2023). The effect of vitamin D on adolescents' primary dysmenorrhea. *Journal of Medicine and Life*, 16(11), 1658–1662. <https://doi.org/10.25122/jml-2023-0290>

12. Zarei, S., Mohammad-Alizadeh-Charandabi, S., Mirghafourvand, M., Javadzadeh, Y., & Effati-Daryani, F. (2017). Effects of calcium–vitamin D and calcium alone on pain intensity and menstrual blood loss in women with primary dysmenorrhea: A randomized controlled trial. *Pain Medicine*, 18(1), 3–13. <https://doi.org/10.1093/pm/pnw121>
13. Karacin, O., Mutlu, I., Kose, M., Celik, F., Kanat-Pektas, M., & Yilmazer, M. (2018). Serum vitamin D concentrations in young Turkish women with primary dysmenorrhea: A randomized controlled study. *Taiwanese Journal of Obstetrics & Gynecology*, 57(1), 58–63. <https://doi.org/10.1016/j.tjog.2017.12.009>
14. Amzajerdi, A., Keshavarz, M., Ghorbali, E., Pezaro, S., & Sarvi, F. (2023). The effect of vitamin D on the severity of dysmenorrhea and menstrual blood loss: A randomized clinical trial. *BMC Women's Health*, 23(1), Article 138. <https://doi.org/10.1186/s12905-023-02284-5>
15. Pakniat, H., Chegini, V., Ranjkesh, F., & Hosseini, M. A. (2019). Comparison of the effect of vitamin E, vitamin D, and ginger on the severity of primary dysmenorrhea: A single-blind clinical trial. *Obstetrics & Gynecology Science*, 62(6), 462–468. <https://doi.org/10.5468/ogs.2019.62.6.462>
16. Barbosa-Silva, J., Avila, M. A., de Oliveira, R. F., Dedicação, A. C., Godoy, A. G., Rodrigues, J. C., & Driusso, P. (2024). Prevalence, pain intensity, and symptoms associated with primary dysmenorrhea: A cross-sectional study. *BMC Women's Health*, 24(1), Article 92. <https://doi.org/10.1186/s12905-023-02878-z>
17. Kho, K. A., & Shields, J. K. (2020). Diagnosis and management of primary dysmenorrhea. *JAMA*, 323(3), 268–269. <https://doi.org/10.1001/jama.2019.16921>
18. Lasco, A., Catalano, A., & Benvenga, S. (2012). Improvement of primary dysmenorrhea caused by a single oral dose of vitamin D: Results of a randomized, double-blind, placebo-controlled study. *Archives of Internal Medicine*, 172(4), 366–367. <https://doi.org/10.1001/archinternmed.2011.715>
19. Zangene, M., Veisi, F., Nankali, A., Rezaei, M., & Ataee, M. (2014). Evaluation of the effects of oral vitamin D for pelvic pain reduction in primary dysmenorrhea. *Iranian Journal of Obstetrics, Gynecology and Infertility*, 16(88), Pe14–Pe20.
20. Hosseini, M. S., Talayeh, M., Haghbin Toutounchi, A., Hosseini, A., Moradi, N., Iranshahi, S., & Abdollahi Aliabadi, F. (2025). Effect of vitamin D and E supplementation on pain relief and premenstrual symptoms in primary dysmenorrhea: A randomized controlled trial. *BMC Women's Health*, 25(1), Article 455. <https://doi.org/10.1186/s12905-025-04007-4>