

Risk factors for primary dysmenorrhea and the effect of complementary and alternative treatment methods: Sample from Corum, Turkey

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ABSTRACT

Objective: Dysmenorrhea is defined as menstrual pain that develops due to uterine menstrual contractions. When the literature is examined, there are a limited number of studies about the frequency of primary dysmenorrhea (PD), influencing factors, and complementary and alternative treatment methods (CAMs) in Turkey. In this study, the aim was to determine the risk factors for PD and the effect of CAM use on PD in female university students.

Methods: The sample for this descriptive study consisted of 180 female students who met the inclusion criteria and agreed to participate in the study. Data were collected using a questionnaire. Data were evaluated using SPSS v.21 and are presented as frequency, percentage, mean, and standard deviation with Chi-square and Kruskal–Wallis analyses performed.

Results: The prevalence of PD was found to be high in students (83.3%). When the distribution of students is examined according to risk factors affecting dysmenorrhea, the relationships between the history of early menstruation, history of menorrhagia, family history of dysmenorrhea, and the occurrence of dysmenorrhea were found to be statistically significant ($P < 0.05$). In addition, the relationships between smoking, regular consumption of caffeinated beverages, regular physical activity, and emotional problems with the prevalence of dysmenorrhea were found to be statistically significant ($P < 0.05$). The mean VAS score of the students was 5.99 ± 2.06 . When the distribution of VAS mean scores according to CAM used by the students is examined, the most effective CAM in reducing PD was mind–body techniques (4.20 ± 1.56) ($P < 0.05$). According to the students' VAS score averages, the most effective mind–body techniques used to reduce PD were applying heat to the abdomen (4.33 ± 1.98) and taking a hot shower (4.61 ± 2.13); the most effective nutritional supplement and healthy lifestyle behavior was omega 3 supplementation (4.20 ± 1.56); and the most effective herbal drink was ginger (4.88 ± 1.61) ($P < 0.05$).

Conclusion: Risk factors for PD included early menarche, menorrhagia, family history of PD, smoking, regular consumption of caffeinated beverages, and emotional problems. The most effective methods to reduce pain in PD were applying heat to the abdomen, taking a hot shower, omega 3 supplements, and ginger.

Keywords: Dysmenorrhea, pain, risk factors, Turkey

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Introduction

Dysmenorrhea is defined as menstrual pain that develops due to uterine menstrual contractions. While the prevalence of dysmenorrhea varies between 41.7% and 89.1% around the world,^[1,2] this rate varies between 55.5% and 95.6% in Turkey.^[3,4] Clinically, dysmenorrhea is seen in two forms as primary dysmenorrhea (PD) and secondary dysmenorrhea

(SD).^[2,5] PD is pelvic pain that occurs approximately 6 months after first menarche as a result of natural production of prostaglandins, usually unrelated to pelvic pathology.^[6] SD is pelvic pain that develops due to pelvic pathologies such as endometriosis and fibroids in women who have not had dysmenorrhea before.^[2,5] PD is among the most common gynecological problems.^[2,5,7] In women with PD, pain is most severe at 1.2 days of menstruation and usually lasts between 8 h and 72 h.^[5] Pelvic pain in dysmenorrhea is usually

accompanied by low back pain, nausea, vomiting, diarrhea, dizziness, migraine, insomnia, fatigue, and rarely syncope and hyperthermia.^[8] The symptoms continue to recur with each menstrual period. Risk factors for PD are generally being below 20 years of age (symptoms are more prominent in adolescence), history of dysmenorrhea in primary/secondary family members, early menarche, history of menorrhagia and nulliparity, low or high body mass index (BMI<18.5 and BMI>25), low omega 3 intake, tobacco and alcohol use, excessive caffeine consumption, and emotional problems such as stress, anxiety, and depression.^[4,9,10] It was reported that emotional problems such as sleep problems, stress, and anxiety disorders are frequently seen in women with PD.^[2,4,11] In dysmenorrhea, difficulties in performing daily life activities and a decrease in the quality of life occur in women depending on the severity of the pain.^[2,4,11] When the studies on the subject are examined, women with PD commonly resort to complementary and alternative treatment methods (CAMs), apart from conventional treatments, for the elimination of PD.^[12,13] CAM is a group of diverse medical and health-care systems, practices, and products that are not presently considered to be part of conventional medicine.^[14] The main CAMs used by women for the treatment of dysmenorrhea are hot application, massage, phytotherapy, use of vitamin-mineral supplements, and mind-body techniques.^[1,3,9,15] In terms of traditional practices, it is very important to apply these methods according to the results of scientific studies and to conduct studies in different regions.^[4,10,12,13] When the literature is examined, there are a limited number of studies about the frequency of PD, influencing factors and CAM utilized in Turkey. In this study, the aim was to determine the risk factors for PD and the effect of CAM used for PD by female university students.

Materials and Methods

Study participants

The sample for this descriptive cross-sectional study consisted of 180 female students aged 18 and over who voluntarily accepted participation in the study and studied at Hitit University Faculty of Health Sciences in Çorum during the academic year 2020–2021. The power analysis (95% power) method was used to calculate the sample size (G-Power 3.1.9.2 package program). Individuals with a history of chronic psychotic disease (obsessive compulsive disorder, schizophrenia, paranoid disorder, bipolar disorder, etc.) and/or a history of chronic systemic disease (cardiovascular disease, hypertension, kidney disease, diabetes mellitus, etc.) and antipsychotic drug use were not included in the study.

Data collection

The data collection form and CAM evaluation form prepared by the researchers based on the literature were used to collect the data. The data collection form questioned the

sociodemographic characteristics of female students (age, department, class, parent education and employment status, and BMI) and consisted of eight questions. The CAM evaluation form consisted of 14 questions including risk factors such as history of menarche, history of dysmenorrhea, smoking, alcohol use, caffeine consumption, physical activity, and use of CAM. In addition, the visual analog scale (VAS) was used to determine the severity of PD.

The VAS, developed by Freyd,^[16] is a visual scale created to evaluate the severity of pain. The Cronbach alpha coefficient of the scale is 0.916.^[16] The Turkish adaptation and validity and reliability study for the scale were carried out by Yaray *et al.*^[17] It was reported that the Cronbach's alpha coefficient of the VAS was 0.965 and it was a scale with high reliability. One end of the 100 mm line on the VAS represents the pain severity as "I have no pain," while the other end indicates "I have very severe pain." The individual is asked to mark the current state of her pain on this line.^[17] The length of the distance from the point where there is no pain to the point marked by the individual indicates the severity of pain.^[18]

Procedure

In the study, female students were asked to mark the VAS according to the severity of pain, considering pain they often experienced during PD. Before completing the questionnaire, students were informed about the scoring system of the VAS. Then, they were asked about CAM they use to relieve PD, and they were again allowed to mark the severity of the pain they felt after use on the VAS. In this way, the aim was to evaluate the changes in pain scores after use of different CAMs.

Ethical issues

The study began after receiving approval from Hitit University Non-Interventional Research Ethics Committee on June 25, 2021. Written informed consent to participate in the study was obtained from the students.

Analysis of data

Data were evaluated using frequency, percentage, mean, and standard deviation with Chi-square analysis. Kolmogorov–Smirnov test, histogram and branch-leaf graphs, and skewness-kurtosis coefficients were examined for normal distribution. The Kruskal–Wallis test was used to compare more than three groups of non-parametric data. Data were evaluated with SPSS 21 (SPSS Inc., Chicago, Ill, USA) program. $P < 0.05$ was considered to be statistically significant. The obtained results were evaluated in the 95% confidence interval.

Results

The mean age of 48.9% of the female students was 21–23 years of age and 47.2% were 18–20 years of age. The average age of the students was 20.74 ± 1.89 years. About 83.3% of the

students studied in the nursing department and 16.7% in the child development department. The fathers of 67.2% of the students were primary school graduates. The mothers of 81.7% of the students were primary school graduates. The fathers of 67.8% of the students and the mothers of 80.6% of the students were unemployed [Table 1].

Menarche age of 68.9% of the students was below 10 years old. All of the students had regular menstrual cycles and 68.9% of them had a menstrual cycle longer than 7 days. The rate of dysmenorrhea in students was 88.3%. Dysmenorrhea began before menstruation in 66.7% of students and lasted longer than 36 h in 36.1%. About 77.2% of the students had normal BMI, while 13.2% had high BMI [Table 2].

When the distribution of students according to the risk factors affecting dysmenorrhea was examined, the rate of dysmenorrhea in students with a history of early menarche and menorrhagia (64.8%) was higher than in students without

a history of early menarche and menorrhagia (35.2%). In addition, the prevalence of dysmenorrhea in students with a family history of dysmenorrhea (94.3%) was found to be higher than in students without a family history of dysmenorrhea (5.7%). In the analysis, the relationships between the history of early menstruation, history of menorrhagia, family history of dysmenorrhea, and the occurrence of dysmenorrhea were found to be statistically significant ($P < 0.05$). In addition, the rate of dysmenorrhea in students who smoked was higher (87.4%) than students who did not smoke (12.6%), and the rate of dysmenorrhea in students who had emotional problems (94.3%) was higher than students who did not have any emotional problems (5.7%). In addition, the prevalence of dysmenorrhea (86.8%) was found to be higher in those who regularly consumed high amounts of caffeinated beverages compared to those who did not consume these drinks (13.2%). In addition, the rate of dysmenorrhea in students who did regular physical activity (39.0%) was lower than those who did not do regular physical activity (61.0%). In the analysis,

Table 1: Distribution of students by some demographic characteristics

| Characteristics | n | % |
|--------------------------|-----|-------|
| Age (years) | | |
| 18–20 | 85 | 47.3 |
| 21–23 | 88 | 48.9 |
| 24–26 | 7 | 3.8 |
| Department | | |
| Nursing | 150 | 83.3 |
| Child development | 30 | 16.7 |
| Class | | |
| 1 | 55 | 30.6 |
| 2 | 48 | 26.7 |
| 3 | 54 | 30.0 |
| 4 | 23 | 12.8 |
| Father's education level | | |
| Primary education | 121 | 67.2 |
| High school | 31 | 17.2 |
| College and above | 28 | 15.6 |
| Father's working status | | |
| Working | 122 | 67.8 |
| Not working | 23 | 12.8 |
| Retired | 35 | 19.4 |
| Mother's education level | | |
| Primary education | 147 | 81.6 |
| High school | 21 | 11.6 |
| College and above | 12 | 6.8 |
| Mother's working status | | |
| Working | 29 | 16.1 |
| Not working | 145 | 80.6 |
| Retired | 6 | 3.3 |
| Total | 180 | 100.0 |

Table 2: Distribution of students by menarche history, dysmenorrhea history, and body mass index

| Characteristics | n | % |
|--------------------------------|--------|-------|
| Age of menarche | n=180 | |
| Under 10 years old | 124 | 68.9 |
| 11–13 years | 56 | 31.1 |
| Over 14 years old | 0 | 0.0 |
| Menstruation length | n=180 | |
| 3–6 days | 56 | 31.1 |
| 7 days and longer | 124 | 68.9 |
| Menstruation feature | | |
| Regular | 180 | 100.0 |
| Irregular | 0 | 0.0 |
| Presence of dysmenorrhea | N=180 | |
| Presence | 159 | 88.3 |
| Not presence | 21 | 11.7 |
| Dysmenorrhea onset time | n=159* | |
| Before menstruation | 106 | 66.7 |
| Simultaneous with menstruation | 31 | 19.5 |
| One day after menstruation | 22 | 13.8 |
| Dysmenorrhea length (hours) | n=159* | |
| 6–8 | 31 | 17.2 |
| 12–24 | 63 | 35.0 |
| 24–36 | 0 | 0.0 |
| 36–48 | 48 | 26.7 |
| 72 and above | 17 | 9.4 |
| BMI | n=180 | |
| Low BMI** | 16 | 8.9 |
| Normal BMI*** | 139 | 77.2 |
| High BMI**** | 25 | 13.9 |

*This group consisted of students with dysmenorrhea. **This group consists of students with BMI<18.5. ***This group consisted of students between 18.5 and 25.9. ****This group consists of students with BMI>25

the relationships between smoking, regular consumption of caffeinated beverages, regular physical activity, and emotional problems with the prevalence of dysmenorrhea were found to be statistically significant ($P < 0.05$). In addition, dysmenorrhea was observed in 86.8% of students with normal BMI, while 42.8% of students with high BMI did not have dysmenorrhea. In the analysis, the relationship between smoking BMI and the prevalence of dysmenorrhea was found to be statistically insignificant ($P > 0.05$) [Table 3].

When the distribution of the students was examined regarding the use of CAM for relief of PD, all of them resorted to CAMs during dysmenorrhea. The CAM used by the students for

dysmenorrhea included nutritional supplements and healthy lifestyle behaviors (76.1%), mind–body techniques (71.7%), and herbal beverage consumption (57.1%). The most used mind–body techniques by the students were massage (69.2%), applying heat to the abdomen (66.7%), abdominal massage (65.4%), listening to music (54.1%), taking a hot shower (47.8%), and praying (44.0%). When the distribution of nutritional supplements and healthy lifestyle behaviors of students was examined, the methods they used most included increasing fluid intake (72.3%) and caffeine restriction (22.6%). In addition, the herbal drinks that students consumed most during dysmenorrhea were green tea (52.2%), linden (31.4%), black tea (25.8%), and chamomile tea (20.1%). When the satisfaction levels of the students regarding the CAM they used during dysmenorrhea were examined, 86.1% of the students stated that they were moderately satisfied with the effect of the CAM in reducing pain [Table 4].

Table 3: Distribution of students in dysmenorrhea according to some risk factors

| Risk factors | Dysmenorrhea | | |
|---|----------------|-------------------|-----------------------------|
| | Having, n: 159 | Not having, n: 21 | |
| History of early menarche ^a | n (%) | n (%) | |
| Having | 103 (64.8) | 11 (52.4) | $X^2=9.503$ $P=0.009^*$ |
| Not having | 56 (35.2) | 10 (47.6) | |
| Menorrhagia history ^b | | | |
| Having | 103 (64.8) | 11 (52.4) | $X^2=9.503$ $P=0.009^*$ |
| Not having | 56 (35.2) | 10 (47.6) | |
| Family history of dysmenorrhea | | | |
| Having | 150 (94.3) | 13 (61.9) | $X^2=12.101$ $P=0.000^*$ |
| Not having | 9 (5.7) | 8 (38.1) | |
| Smoking status | | | |
| Smoking | 139 (87.4) | 20 (95.2) | $X^2=10.234$ $P=0.000^*$ |
| Not smoking | 20 (12.6) | 1 (4.8) | |
| Regular alcohol use ^c | | | |
| Using | 14 (8.8) | 2 (9.5) | $X^2=0.876$ $P=0.676$ |
| Not using | 145 (91.2) | 19 (90.5) | |
| Regular consumption of caffeinated ^d | | | |
| Consumption | 21 (13.2) | 17 (80.9) | $X^2=10.345$ $P=0.000^*$ |
| Not consumption | 138 (86.8) | 4 (19.1) | |
| Regular physical activity ^e | | | |
| Doing | 62 (39.0) | 14 (66.6) | $X^2=9.234$ $P=0.000^*$ |
| Not doing | 97 (61.0) | 7 (33.4) | |
| Having emotional problems ^f | | | |
| Having | 150 (94.3) | 13 (61.9) | $X^2=12.101$ $P=0.000^*$ |
| Not having | 9 (5.7) | 8 (38.1) | |
| BMI | | | |
| Low BMI | 8 (5.0) | 8 (38.1) | $X^2=0.616$ $P=0.775$ |
| Normal BMI | 135 (86.8) | 4 (19.1) | |
| High BMI | 13 (8.2) | 12 (42.8) | |

^aThis group consists of students whose mean age is under 10. ^bThis group consists of students whose menarche length is more than 7 days. ^cThis group consists of students who drink 2–4 doubles of alcohol 1–2 times a week. ^dThis group consists of students who consume 1–3 glasses of caffeinated beverages a day. ^eThis group consists of students who do regular physical activities such as walking, swimming, and cycling for at least 30 min a day. ^fThis group of anxiety disorder and depression. It consists of students diagnosed with obsessive compulsive disorder. * $P < 0.05$. BMI: Body mass index

The mean VAS score of students with dysmenorrhea was 5.99 ± 2.06 . According to the VAS score average of the students participating in the research, the severity of PD felt during dysmenorrhea is moderate. When the distribution of VAS score averages according to the CAM used by the students is examined, the most effective method in reducing PD was mind–body techniques (4.20 ± 1.56). This difference was found to be statistically significant ($P < 0.05$). When the distribution of the mean VAS scores according to the mind–body techniques used by the students was examined, the most effective mind–body techniques in reducing PD were applying heat to the abdomen (4.33 ± 1.98) and taking a hot shower (4.61 ± 2.13), respectively. In the analysis, the differences between applying heat to the abdomen and taking a hot shower and the mean VAS score were found to be statistically significant ($P < 0.05$). In addition, when the distribution of VAS score averages according to the use of nutritional supplements and healthy lifestyle techniques of students is examined, the most effective method in reducing PD was omega 3 supplementation (4.20 ± 1.56). This difference was found to be statistically significant ($P < 0.05$). When the mean VAS scores of the students were examined according to the herbal beverages they consumed, the most effective herbal beverage in reducing PD was ginger (4.88 ± 1.61). In the analysis, the difference between ginger consumption and VAS score averages was found to be statistically significant ($P < 0.05$) [Table 5].

Discussion

PD, especially affecting young nulliparous women, is among the most common gynecological problems.^[2-5] The rate of PD (88.3%) was found to be high in the student population with young average age in our study. The literature supports our findings.^[1,2,5,7,19] In our study, the severity of PD in dysmenorrhea was moderate according to the mean VAS score (5.99 ± 2.06). Similarly, other studies using VAS reported that the mean VAS scores in dysmenorrhea ranged from 1.71 to 6.88.^[3,9,18,20] When the studies on the subject are examined, in parallel with the

Table 4: Distribution of students according to complementary and alternative treatment methods (CAMs) used for dysmenorrhea

| | n | % |
|---|---------|-------|
| CAM | n: 159* | |
| Mind-body techniques | 114 | 71.7 |
| Nutritional supplements and wellness behavior | 121 | 76.1 |
| Herbal beverage consumption | 90 | 57.1 |
| Mind-body techniques | n: 159* | |
| Rest and sleep | 159 | 100.0 |
| Massage | 110 | 69.2 |
| Praying | 70 | 44.0 |
| Listening to music | 86 | 54.1 |
| Breathing exercises | 38 | 23.9 |
| Meditation | 36 | 22.6 |
| Application of heat to the abdomen | 106 | 66.7 |
| Take a hot shower | 76 | 47.8 |
| Massaging the abdomen | 104 | 65.4 |
| Nutritional supplements and wellness behavior | n: 159* | |
| Omega 3 | 15 | 9.4 |
| Vitamin E | 4 | 2.5 |
| Vitamin B | 10 | 6.3 |
| Caffeine restriction | 36 | 22.6 |
| Increasing fluid intake | 115 | 72.3 |
| Consumed herbal drinks | n: 159* | |
| Green tea | 83 | 52.2 |
| Rose tea | 6 | 3.8 |
| Chamomile tea | 32 | 20.1 |
| Black tea | 41 | 25.8 |
| Fennel tea | 18 | 11.3 |
| Ginger | 9 | 5.7 |
| Linden | 50 | 31.4 |
| Satisfaction with CAM | n: 159* | |
| Very satisfied | 15 | 8.3 |
| Moderately satisfied | 137 | 86.1 |
| Not satisfied | 7 | 3.9 |

*This group consisted of students with dysmenorrhea

findings of our study, the severity of dysmenorrhea in women was moderate in the studies by Aktaş,^[3] Potur *et al.*,^[18] Burnett and Lemyre,^[7] and Türkmen.^[4] Based on the present literature, the severity of pain in PD is often moderate. The findings from our study are parallel with these findings.

In women with PD, pain is most severe on day 1.2 of menstruation and usually PD lasts between 8 h and 72 h.^[7,8] When the studies on the subject are examined, the average duration of PD is 24–48 h. In our study, similar to the literature, dysmenorrhea started before menstruation in 66.7% of the students and lasted longer than 36 h in 36.1%. In the study by Seven *et al.*,^[21] it was reported that women experienced severe pain on the 1st day of menstruation and this pain continued for

Table 5: Distribution of students' visual analog scale mean scores (VAS) and VAS mean scores according to the complementary and alternative treatment methods (CAMs) using

| | GAÖ Puan ortalaması | |
|--|---------------------|-----------------------|
| | $\bar{X} \pm SS$ | P-value |
| WAS mean scores | 5.99±2.06 | |
| CAM | | |
| Mind-body techniques | 4.20±1.56 | KW=15.296 P=0.000* |
| Nutritional supplements and wellness behavior | 5.33±2.33 | |
| Herbal beverage consumption | 5.83±2.06 | |
| Mind-body techniques | | |
| Rest and sleep | 5.33±2.33 | KW=15.287 P=0.000* |
| Massage | 5.78±1.96 | |
| Praying | 5.92±1.92 | |
| Listening to music | 5.86±1.94 | |
| Breathing exercises | 6.21±2.06 | |
| Meditation | 5.83±2.06 | |
| Application of heat to the abdomen | 4.33±1.98 | |
| Take a hot shower | 4.61±2.13 | |
| Massaging the abdomen | 6.23±2.05 | |
| Nutritional supplements and healthy lifestyle behavior | | |
| Omega 3 | 4.20±1.56 | KW=13.984 P=0.007* |
| Vitamin E | 6.25±1.25 | |
| Vitamin B | 6.10±1.66 | |
| Caffeine restriction | 6.16±1.99 | |
| Increasing fluid intake | 6.13±1.98 | |
| Consumed herbal drinks | | |
| Green tea | 5.63±2.14 | KW=3.283 P=0.657 |
| Rose tea | 5.33±2.33 | |
| Chamomile tea | 6.00±2.19 | |
| Black tea | 6.21±2.10 | |
| Fennel tea | 5.94±2.33 | |
| Ginger | 4.88±1.61 | |
| Linden | 6.30 ± 1.90 | |

*P<0.05

3 days. Zhou and Zheng-Wei^[22] reported that PD started at the beginning of menstruation in 64.7% of adolescent girls.

According to the literature, being under 20 years of age, family history of dysmenorrhea, early menarche, menorrhagia, nulliparity, low (BMI<18.5) or high BMI (BMI>25), tobacco and alcohol use, excessive caffeine consumption, and emotional problems of stress, anxiety, and depression are associated with PD.^[1,2,5,7,19]

In our study, the rate of PD was found to be higher in students with a history of early menarche, history of menorrhagia, family history of dysmenorrhea, and diagnosed with emotional problems ($P < 0.05$). Supporting the results of our study,

Fernández-Martínez *et al.*,^[9] Hu *et al.*,^[2] and Vlachou *et al.*^[12] reported that the rate of PD in girls with family history of dysmenorrhea, early menarche, and menorrhagia was higher than those without family history of dysmenorrhea, early menarche, or menorrhagia. In the study by Ju *et al.*,^[23] there was a strong relationship between genetic factors and dysmenorrhea. In the study by Aktaş,^[3] history of menstrual complaints in a first-degree relative such as a mother or sister increased the probability of experiencing symptoms related to menstruation.

According to the literature, there is a strong and bidirectional relationship between experiencing emotional problems and PD.^[24,25] Studies about the subject show that individuals with emotional problems and diagnosed with mental disorders may experience more severe menstrual symptoms.^[24] On the other hand, women with PD experience different psychosocial effects depending on the severity of their pain and emotional problems such as stress, anxiety disorder, and depression were found to be more common among them.^[25,26] In parallel with the literature, the rate of PD in our study was also found to be higher in students diagnosed with emotional problems compared to other students ($P < 0.05$). Similar to the results of our study, Aktaş *et al.* reported that students with dysmenorrhea had lower relaxation subdimension mean scores than those who did not experience dysmenorrhea, and PD negatively affected psychosocial and emotional comfort.^[20] In the study by Faramarzi and Salmalian,^[26] the risk of PD was found to be approximately 3.3 times higher in women with alexithymia and 2.5 times higher in women with neurotic character.

When the literature is examined, different study results are found on behavioral and vital risk factors associated with PD. While some studies did not find a relationship between unhealthy lifestyle behaviors such as smoking, alcohol use, excessive caffeine consumption, low BMI (<18.5), and high BMI (>25),^[2,9,12,23] some studies reported strong positive associations.^[2,4,27] According to the literature, a healthy lifestyle including proper nutrition, regular physical activity, exercise, not smoking, low alcohol consumption, and low caffeinated beverage consumption alleviates the symptoms of dysmenorrhea.^[7,27] In our study, a positive correlation was found between consumption of beverages with high caffeine content in the diet and smoking with PD, and a negative correlation was present between regular physical activity and PD ($P < 0.05$). In other words, the prevalence of PD in women who smoke and consume caffeinated beverages is higher than in women who do not smoke or consume caffeinated beverages, while the prevalence of PD is lower in women who do regular physical activity.

Uterine perfusion decreases and uterine ischemia occurs due to sclerotic changes in the uterine arteries and sudden vasoconstriction in women who smoke.^[26] Therefore, the risk of PD increases during menstrual contractions. In the meta-analysis study by Qin *et al.*,^[28] in which 24 studies including

27,091 participants were included, the probability of PD was 1.45 times higher in smokers compared to non-smokers, the probability of PD in current smokers was 1.50 times higher compared to those who have never smoked, and the probability of dysmenorrhea in former smokers was reported to increase 1.31 times. The findings from our study are in parallel with these findings.

Caffeine is regularly consumed all around the world.^[29] Caffeine may cause uterine ischemia and an increase in the severity of pelvic pain due to its vasoconstrictor effect. Studies on the subject show that there is a strong relationship between caffeine consumption and the development of pain such as pelvic pain.^[26] Similar to the results of our study, in the study by Faramarzi and Salmalian, the prevalence of PD was found to be twice as high in women with high dietary caffeine intake.^[26]

Physical exercise is a crucial component in maintaining a healthy life.^[30] Regular physical activity helps to increase the circulation rate and alleviates PD symptoms by increasing uterine perfusion.^[31,32] Some studies reported that physical exercise reduces the symptoms of dysmenorrhea.^[31,32] It was reported that there is a general benefit of exercise, especially in women younger than 25 years of age who exercise for 45–60 min at least 3 times a week.^[32] Mahvash *et al.* examined the effect of 8-week physical activity on PD, and physical activity significantly reduced the severity of PD, the duration of dysmenorrhea, and the consumption of drugs used during PD.^[31] In addition, in our study too, the prevalence of PD was found to be lower in students who did regular physical activity for 30 min every day compared to those who did not ($P < 0.05$).

Depending on the severity of the pain, women have difficulty in performing their daily life activities and many psychosocial problems may arise due to dysmenorrhea. In some studies, it was reported that women with PD frequently resort to CAMs to reduce pain, apart from traditional treatments.^[12,13] The main CAMs used by women for the treatment of PD were reported to be mind–body techniques such as sleep and rest, hot application, taking a hot shower and massage, nutritional supplements and healthy lifestyle behaviors, and phytotherapy.^[12,13] The rates of CAM use in PD vary between 50% and 95.1%.^[16,20] These findings show that CAM is widely used for pain relief in PD. Similarly, in our study, all of the students used CAM during PD and almost all (94.4%) were satisfied with these methods at moderate or high level. The most commonly used CAMs during PD in the study were taking nutritional supplements and wellness behaviors (76.1%), mind–body techniques (71.7%), and herbal beverage consumption (57.1%). These findings are in parallel with the results of the studies in the literature.^[16,20]

In our study, the mind–body techniques most commonly used by students during PD were rest (100.0%), massage (69.2%), applying heat to the abdomen (66.7%), and abdominal massage (65.4%). In addition, the most frequently applied methods and healthy lifestyle behaviors regarding nutritional supplements

were increased fluid intake (72.3%) and caffeine restriction (22.6%), respectively. In addition, Aktaş *et al.* reported that the most commonly used pain management methods among participants with dysmenorrhea were rest, heat application, and massage.^[20] Süt *et al.* found that the most common CAM applied by female students for PD was applying heat to the abdomen and massaging.^[32] Seven *et al.* discovered that students preferred heat treatment, herbal tea, and rest during PD.^[21] In another study, mind–body techniques, nutritional supplements, and healthy lifestyle behaviors were revealed to be effective in the management of PD.^[31] Furthermore, when the most commonly used phytotherapy applications were examined, green tea and linden were the herbal beverages that young women consumed most during dysmenorrhea.^[32] Similarly, in our study, green tea (52.2%) and linden (31.4%) were the herbal beverages most commonly consumed by students for PD.

In our study, according to the mean VAS scores of the students, the most effective mind–body techniques in reducing pain in PD were found to be applying heat to the abdomen (4.33 ± 1.98) and taking a hot shower (4.61 ± 2.13) ($P < 0.05$). The first non-pharmacological CAM option in PD is heat therapy. Heat inhibits sympathetic nerve activities and increases uterine perfusion and oxygenation. In this way, uterine ischemia decreases, and the levels of hormones that cause pain such as prostaglandin and leukotriene decrease. This creates a relaxing effect on the uterus and reduces the severity of cramps. Supporting the results of our study, it was reported that topical heat therapy applied before the onset of menstruation is effective in relieving dysmenorrhea symptoms, provides analgesic effects comparable to ibuprofen, and increases the effectiveness of analgesics.^[4,20] Potur *et al.*^[18] and Aktaş *et al.*^[20] reported that women who used heat application to alleviate PD had lower pain levels and higher overall comfort, convenience, relaxation, and superiority than those who did not. The findings of our study are in parallel with these findings.

In our study, the most effective nutritional supplements and healthy lifestyle behaviors in reducing pain in PD, according to the VAS score averages of the students, were omega 3 supplementation (4.20 ± 1.56) ($P < 0.05$). According to the literature, omega-3 polyunsaturated fatty acids help reduce inflammatory pain by suppressing the production of inflammatory cytokines and eicosanoids. Supporting the result of our study, studies on the subject associated omega-3 intake in the diet with less severe menstrual symptoms and lower PD. It was also reported that increasing the omega-3/omega-6 ratio is beneficial in reducing the symptoms of dysmenorrhea.^[33,34] Similar to the results of our study, Moghadamnia *et al.*^[33] and Hidayati *et al.*^[35] found that consumption of omega-3 fatty acids was associated with a decrease in the prevalence of dysmenorrhea, while a randomized controlled study conducted by Davaneghi *et al.*^[34] who found weakness due to dysmenorrhea in women taking omega-3 supplements. The symptoms of diarrhea, dizziness, and chills were reported to be

significantly reduced, but there was no significant effect on pain symptoms. It is thought that these differences in the results of the study may be due to the fact that the studies were performed with different ethnicities, demographic characteristics, and different sizes of samples.

Ginger is a plant with anti-inflammatory and anti-carcinogenic properties.^[36] Ginger is known to help alleviate the severity of menstrual contractions and ischemic pain by inhibiting prostaglandin synthesis.^[37,38] In studies on the subject, ginger consumed 2 days before the start of menstruation was as effective as NSAIDs in reducing the severity of PD.^[39] Similar to the literature, in our study, the most effective herbal beverage in reducing pain in PD was ginger (4.88 ± 1.61) according to the students' VAS score averages ($P < 0.05$).

Limitations

The perceived effectiveness of CAM use in PD management was determined using the yes and no responses to the question given in the questionnaire. The lack of randomized controlled studies to evaluate the long-term effects of CAM use in PD is one of the limitations of the study. Another limitation of our study is that the VAS scale was used randomly, rather than at the time of occurrence of PD, reflecting pain perceived in the past.

Conclusion

In the study, the prevalence of PD was high in those with a history of early menarche and menorrhagia, family history of dysmenorrhea, who smoked, drank highly caffeinated drinks, and with emotional problems, while it was observed to be low among students with regular physical activity. The most effective methods to reduce pain in PD were applying heat to the abdomen, taking a hot shower, omega 3 supplements, and ginger.

In line with these results, it is recommended to perform randomized controlled studies on the subject in the future with larger sample sizes to provide evidence-based information about the use of CAMs in coping with PD.

Authors' Declaration Statements

Ethics approval and consent to participate

The study was started after getting the approval of Hitit University Non-Interventional Research Ethics Committee on June 25, 2021. Written informed consent to participate in the study was obtained from the students.

Availability of data and material

The data used in this study are available and will be provided by the corresponding author on a reasonable request.

Competing interest

There are no conflicts of interest.

Funding statement

No funding was received for this study.

Authors' Contributions

According to the corresponding author, all authors whose names were mentioned in the study contributed sufficiently to the data collection, design, review, and analysis. The final paper was approved by all authors.

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