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AYAK TABANINA UYGULANAN KURU ISI UYGULAMASININ MENSTRÜASYON BELİRTİLERİ VE AĞRI ÜZERİNE ETKİSİ: RANDOMİZE KONTROLLÜ BİR ÇALIŞMA

Kıvan ÇEVİK KAYA
Assoc.Prof, PhD, RN, Manisa Celal Bayar University, Faculty of Health Sciences, Fundamentals of Nursing Department, kivancevikk@gmail.com, Manisa/Türkiye, 0000-0002-0556-8012

Dilay AÇIL
Asst.Prof, PhD, RN, Manisa Celal Bayar University, Faculty of Health Sciences, Public Health Nursing Department, dilayacil@yahoo.com, Manisa/Türkiye, 0000-0001-6654-4666

Öz

Isı uygulaması premenstrüel semptomlar üzerinde etkili bir yöntem olabilir. Bu çalışmada ayak tabanına uygulanan kuru sıcak uygulamanın menstrüel semptomlar ve ağrı üzerine etkisinin belirlenmesi amaçlanmıştır. Bu randomize kontrollü çalışmada öğrencilerin ayak tabanına yapılan sıcak uygulamanın etkinliği değerlendirilmiştir. Veriler sosyodemografik form, Görsel Analog Skala (VAS) ve Menstruasyon Semptom Ölçeği (MSS) ile toplanmıştır. Ağrının daha yoğun olduğu menstrüasyon döneminin ilk üç gününde katılımcılar ağrı hissettiklerinde kuru sıcak uygulama yapmış; günde iki kez ağrı VAS ile değerlendirilmiş ve menstrüasyonun son gününde MSS doldurulmuştur. Her iki grupta da üç günlük VAS arasında istatistiksel olarak anlamlı bir fark bulunmuştur. Ancak, müdahale ve kontrol gruplarının Menstruasyon Semptom Ölçeği alt ölçek ve toplam puan ortalamaları arasında fark bulunmamıştır. Ayağa kuru sıcak uygulama yapmak, ağrıyı azaltmak için etkili bir yöntem olarak ifade edilebilir. Premenstrüel sendrom karmaşık bir süreç olduğundan, her iki grupta da menstrüel siklusun ilerleyen günlerinde ağrının azalması psikolojik olabileceği gibi fizyolojik nedenlerle de açıklanabilir.
Anahtar Kelimeler: Menstruasyon, kuru sıcak uygulama, ağrı, hemşirelik.

EFFECTS OF DRY HEAT APPLICATION ON MENSTRUAL SYMPTOMS AND PAIN: A RANDOMIZED CONTROLLED TRIAL

Abstract

Heat application can be effective method on premenstrual symptoms. This study was to determine the effect of dry heat applied on foot base menstrual symptoms and pain. In this randomized controlled trial, the effectiveness of the hot application to the foot base of the students was evaluated in 2019. Data were collected via sociodemografic form, Visual Analog Scale (VAS) and Menstruation Symptom Questionnaire [MSQ]. In the first three days of the menstrual period which the pain is more intense, the participants should have dry hot application when they feel pain; two times in a day pain was assessed with VAS and in the last day of the menstruation MSQ was filled. A statistically significant difference was found between the three-day VAS in both groups. However, there was no difference between Menstruation Symptom Scale subscale and total score avg of the intervention and control groups. Applying hot pack to the foot can be expressed as an effective method to reduce pain. Due to premenstrual syndrome is a complex process, the reduction of pain in the later days of the menstrual cycle in both groups can be psychological or be explained for physiological reasons. Clinical Trial Registration:NCT05664048.
Keywords: Menstruation; hot pack application; pain, nursing.

1. INTRODUCTION

Premenstrual syndrome (PMS) is identified as emotional and physical symptoms that develop 7-10 days before the menstrual cycle such as change in emotions, anxiety,thoughts of unworthiness, decrease of energy, irritability, depressive mooddifficulty of gathering attention, changes in appetite, breast swelling, and joint pain and frequently appears in the in the luteal phase in young/ middle-aged women. PMS refers to all of these symptoms (1-5). Although its etiology remains unknown, neurohormones and neurotransmitters might be effective (2-3). In the literature, it is stated that no laboratory or hormone tests are available for the diagnosis of PMS (6-7) and it is not possible to establish a final diagnosis with clinical evaluation because every woman develop different symptoms (4). Thus, some diagnostic criteria have been determined and the related studies use scales with proven validity and reliability (8). The American College of Obstetricians and Gynecologists states that a woman' symptoms must appear in the 5 days before her period and end within 4 days after her period in order to establish the diagnosis of PMS. Women suffer from some disorders that cause premenstrual syndrome during their period (9-10). The prevalence of premenstrual syndrome in adolescents has reached to 96% (11). Premenstrual syndrome negatively affects life quality of millions of women (12). PMS and dysmenorrhea are common among university students and should be taken into consideration (13-14). Menstrual distress affects the clinical learning and performance of female students in clinical practice process, is one of the important components of nursing education (15). Given that PMS starts in the 7-10 days before the menstrual cycle, it affects life quality of women for 10 to 15 days in every menstrual cycle (1,16). Also, women suffering from PMS have a poor sleep quality than those without PMS (17). It has a major adverse effect on women's labor productivity and life quality (18-21). Pain is the most frequently experienced complaint during period (22,23). Young women aged 17 to 24 years experience pain at the rate of 67-90% (11,18).

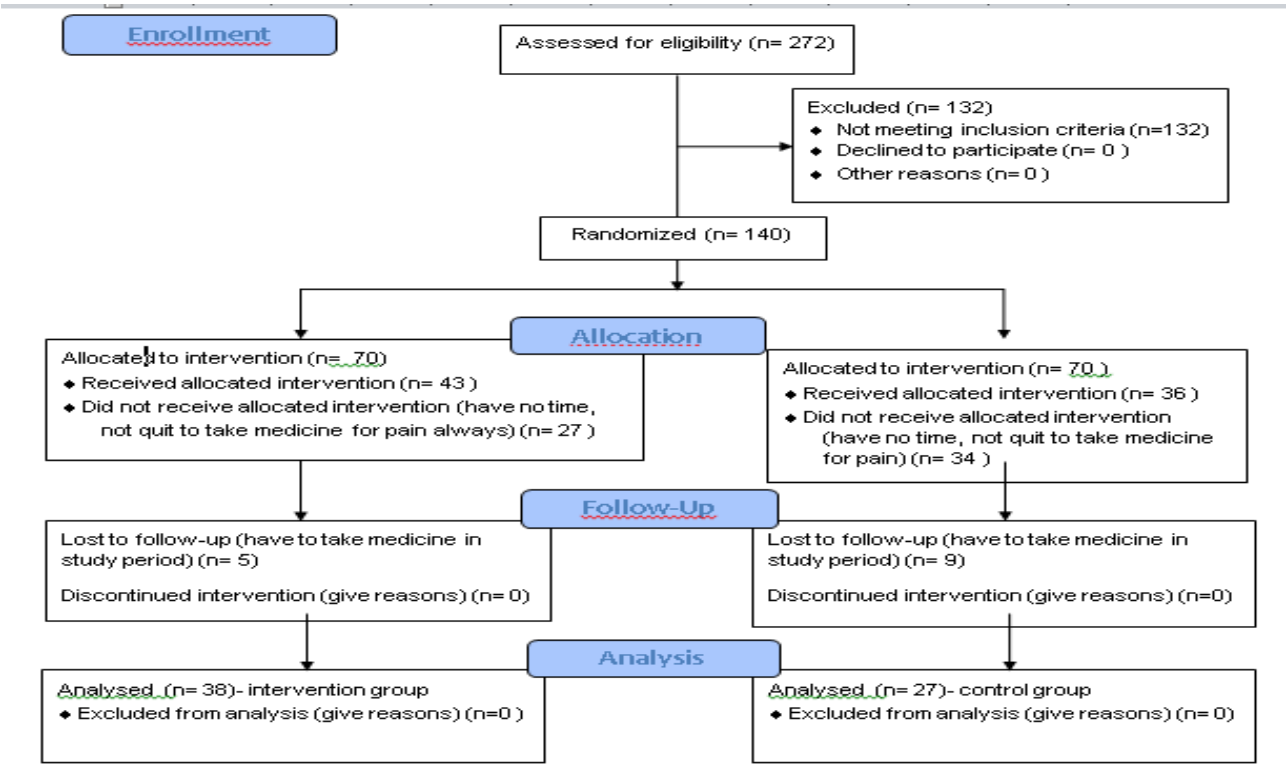
Pain also prevents students from going to school and doing many activities such as problem solving skill, concentration and participation in the classroom, and socialization (24). Dysmenorrhea prevents women from going to work or school and is likely to impose a negative effect on national economy, women's life quality and productivity; therefore, its treatment becomes important (25-27). The rate of seeking medical advice increases with increasing level of pain and many women suffering from dysmenorrhea take over-the-counter analgesics and use non-pharmaceutical methods to relieve their pain (25). One of the oldest methods used by women in Turkey to alleviate their menstrual symptoms and pain restricting the activities of daily living every month is heat application. Heat application helps to alleviate pain due to its physiological effects such as muscle relaxing and vasodilatation. Heat application can be used for therapeutic purpose in various disorders such as edema or hemorrhoid and to relieve kidney, gall bladder, intestinal, premenstrual syndrome and dysmenorrhea pain (28-30). Although thermophore, one of dry heat methods we planned to employ in the study, is used frequently in society, we have not found any scientific study assessing the issue in terms of regions, where women can use the application, in Turkey. The present descriptive studies have focused on determining the methods women use to cope with premenstrual syndrome. Additionally, a meta-analysis which included randomized controlled trials evaluating the effectiveness of heat application on primary dysmenorrhea indicated that heat application was effective on dysmenorrhea; however, there is a need for further studies (31). In this context, it is thought that this randomized controlled trial would contribute to the literature and raise awareness in society.

The purpose of this study is to determine the effect of applied dry heat on soles for pain and menstrual symptoms.

2. MATERIAL AND METHODS

The randomized controlled trial was conducted with 65 students including 38 in the intervention group and 27 in the control, between 30 September -29 November in 2019. The population consisted of female nursing students (N=452) from health sciences faculty. The students (n=75) who were absent in the school, took analgesics during the study, and did not agree to participate in the study, were excluded from the study. The students, who had no diagnosis of psychiatric disorder and history of endometriosis, stated that they menstruated regularly (between 22-35 days), did not use complementary and alternative treatments such as analgesics or massage throughout the study, had no diabetes or neuropathic problem causing nerve injury, did not take oral contraceptives, were over 18 years, and agreed to participate in the study, were included in the study. Sample selection was not made, but some students did not meet the inclusion criteria and some of them refused to heat application. A post-doc power analysis was performed by G. Power-3.1.9.2" to justify the sample size of this study at p=0.05 and a 95% confidence level; effect size = 0.64; and power of sample =0.81. To determnine having PMS symptoms, the PMS Scale was used for all participants and then the randomization was presented according to the CONSORT diagram for the sample group (Figure I). The data were collected by "Student Information Form", "Visual Analog Scale", "Menstrual Symptom Questionnaire", and the "Premenstrual Syndrome Scale (PMSS)" to assess premenstrual syndrome.

Figure 1. Flowchart of the study



Student Information Form: Being prepared in accordance with the related literature; the form includes a total of 23 questions (1,14,32,33). The students' age, residence place they stayed longest, present residence place, monthly income, and perception of monthly income were assessed as well as their menstrual characteristics such as age of menarche, duration of cycle and duration of menstruation.

Visual Analog Scale (VAS): This scale is a simple method, a score between 0 and 10 points; used for measurement and follow up of level of pain.

Menstrual Symptom Questionnaire (MSQ): It was developed by Chesney and Tasto in English in 1975, for the purpose of assessing menstrual pain and symptoms (34). The scale is commonly used in the United States and many countries. Its factor structure and usability on adolescents were reviewed and revised by Negriff et al., in 2009 (35). Its validity and reliability study in Turkey was conducted by Guvenc et al., (2014) (36). The scale items are renumerated according to factors for ease of use. Items 1-13 belong to the "Negative affect/somatic complaints" subscale; items 14-19 to the "Menstrual pain symptoms" subscale; and items 20-22 to the "Coping methods" subscale. MSQ score is calculated based on total mean score of items in the scale. It is a five-point likert scale with 22 items. Participants are asked to rate their menstrual symptoms from 1 (never) to 5 (always) points. A high mean score indicates that severity of menstrual symptoms increases. The scale has three subscales. Score obtained from the subscales is calculated based on total mean score of items in the subscales. A high mean score for the subscales indicates that severity of menstrual symptoms in that subscale increases. The Cronbach's Alpha value of the scale was found to be 0.86 (36). In this study, the Cronbach's Alpha value of MSQ was determined to be 0.93. Permission was obtained from the authors, who conducted validity-reliability study of the scales, via e-mail.

Premenstrual Syndrome Scale (PMSS): To measure severity of premenstrual symptoms, the Premenstrual Syndrome Scale (PMSS) is a five-point likert scale (never, seldom, sometimes, often, always) with 44 items was developed by Gencdogan. It was suggested that results of PMS Scale are assessed reveal whether or not PMS is present according to the state of total and subscale scores to exceed 50% of the highest score. Higher score means that severity of premenstrual syndrome symptoms is greater. Gencdogan indicates that psychometric features of this scale are high and can be used in measuring premenstrual symptoms (37). This scale was used only for determining the sample group.

The nursing students were asked to complete the "Student Information Form", "Visual Analog Scale" every day in the first three days of the period and the "Menstrual Symptom Questionnaire" on the last day of the period. It is stated that heat application should not be preferred due to acute inflammation however the number of comprehensive studies regarding how to perform the application is limited in the literatüre (38) . In the literature, it is also stated that neither hot nor cold application should be used as a result of abdominal pain (39). Thus, in this study, it was chosen to apply heat on sole, where nerves are more intense, rather than directly on the abdomen in the first days of the period when pain is more. First Stage: In the first assessment, they completed the "Premenstrual Syndrome Scale (PMSS)" to evaluate premenstrual syndrome. In line with the data acquired from the Premenstrual Syndrome Scale, the study was continued with the students who were determined to have PMS symptoms. The randomization was presented according to the CONSORT (Figure I). When the relevant literature is examined, it is thought that there is a need for evidence-based randomized controlled trial; therefore, there was a need for control group in the study in order to determine the effectiveness of thermophore. The intervention and control group sets were created using the "Research Randomizer" computer program to include 70 students in each group among 272 students who were evaluated in terms of eligibility for the study. Second Stage: The students who were previously trained on heat application were trained once again by the researcher as a reminder and then their written consents were obtained through the informed consent form. The thermophores, liquid thermometers and gloves were delivered to the students in intervention group. They were asked to complete the "Student Information Form", "Visual Analog Scale" in the first three days of the menstrual period at 12-hour intervals, and the Menstrual Symptom Questionnaire (MSQ) to assess premenstrual syndrome on the last day of the menstrual period. The students in the control group were also asked to complete only the forms without performing any application on the same days and periods. No intervention was applied to the students in control group.

The data of the study were conducted using the Statistical Package for Social Science (SPSS) 23.0 packaged software. The students' socio-demographic characteristics and scale-related assessments were performed with the normality analysis, homogeneity test, descriptive analyses, t-test, variance, and correlation analyses ($p<0.05$).

In order to conduct the study, approval from the clinical trials ethics committee of a university (26.12.2018/ 59632) and written permission from the faculty of health sciences were obtained. The study had been carried out in accordance with Declaration of Helsinki, The Code of Ethics of the World Medical Association for experiments involving humans. Also, after the students who would participate in the study were informed about purpose of the study and procedures, their written consents were obtained. It was also registered at clinicaltrials.gov (Clinical Trial Registration Number: NCT05664048).

3. RESULTS

It was found that age average was 21.08±2.70 and 20.82±1.12 in the intervention and control groups, respectively, and the score of pain in the last menstrual period was 5.91±2.37 and 5.00±2.38, respectively. Average age of menarche was 12.94±.97 in the intervention group and 12.96 ±.88 in the control group and the score of pain in the last menstrual period was 5.91±2.37 and 5.00±2.38, respectively (Table I.). Majority of the intervention group (89.2%) and the control group (78.6%) expressed that their menstrual cycle was regular. Neither of the groups had mostly dysmenorrhea history (67.6%; 75%, respectively). More than half of the participants stated that they took no medicine for the pain they experienced in the menstruation period (56.8%; 53.6%, respectively). Both groups mainly took analgesics as medicine (66.7%; 76.9%, respectively). The use of complementary treatment was not usually preferred by the both groups (70.2%; 71.4%, respectively). Most of those using complementary treatment in the two groups stated that they consumed herbal tea (81.8%; 50%, respectively). When assessing their state of applying to a healthcare organization due to pain, it was determined that majority of both groups (81.9%; 67.9%) did not prefer to go to a healthcare organization (Table I). While those in the intervention group (51.4%) were living with their family in district, those in the control group (46.4%). were living with their family in the city center. Current residence place of the participants was dormitory in both groups (54.1%; 67.9%, respectively). Majority of the students in both groups did not smoke (83.8%; 78.6%, respectively) or use alcohol (86.5%; 85.7%, respectively). More than half of the participants in both groups (54.1%; 60.7%, respectively) stated that they did not do exercise regularly. In the comparison of descriptive characteristics of the intervention and control groups, it was determined that they were homogeneously distributed ($p>0.05$) (Table I).

Table 1. Descriptive characteristics of the participants

Descriptive characteristics	**Intervention Group (n=37)**		**Control Group (n=28)**		**t**	**P**
	$\bar{X}$**±SS**		$\bar{X}$**±SS**			
Age	21.08±2.70		20.82±1.12		.47	.63
Age of menarche	12.94±.97		12.96 ±.88		.07	.93
VAS average in the last menstrual period	5.91±2.37		5.00±2.38		1.54	.12
	Intervention Group (n=37)		**Control Group (n=28)**		χ^2	**P**
	n	**%**	**n**	**%**		
Menstrual cycle						
Regular	33	89.2	22	78.6	1.38	.30*
Irregular	4	10.8	6	21.4		

Family history of dysmenorrhea						
Yes	12	32.4	7	25.0	.42	.58*
No	25	67.6	21	75.0		
Using medication for pain						
Yes	15	40.5	13	46.4	.06	.80*
No	22	59.5	15	53.6		
The medicine used						
Analgesic	10	66.7	10	76.9	3.07	.38
NSAI	3	20.0	2	15.4		
Other	2	13.3	1	7.7		
Use of CAM						
Yes	11	29.8	8	28.6	.39	.53
No	26	70.2	20	71.4		
Preferred CAM						
Herbal tea	9	81.8	4	50.0	2.62	.26
Hot application	2	9.2	3	37.5		
Other	-		1	12.5		
Applying to a health instution						
Yes	7	18.1	9	32.1	1.50	.25*
No	30	81.9	19	67.9		
Living with family						
Village	4	10.8	3	10.7	.524	.76
District	19	51.4	12	42.9		
Province	14	37.8	13	46.4		
Place of residence						
With family	11	29.7	4	14.2	2.17	.33
The residence	20	54.1	19	67.9		
At home with friends	6	16.2	5	17.9		
Alcohol status						
Uses	5	13.5	4	14.3	.008	.92
Not use	32	86.5	24	85.7		
Smoking status						
Uses	6	16.2	6	21.4	1.40	.49
Not use	31	83.8	22	78.6		
Regular exercise						
Yes	17	45.9	11	39.3	.28	.59
No	20	54.1	17	60.7		

VAS mean pain score was found to be 5.45±.2.58 on the first day, 3.85±2.38 on the second day, and 2.52±2.46 on the third day in the intervention group and 4.53±.2.34 on the first day, 3.67±2.43 on the second day, and 1.82±1.72 on the third day in the control group. A statistically significant difference was found between the three-day VAS mean pain scores of the intervention (F=28.672) and control (F=27.455) groups (p=0.00<0.05). Analyses performed for paired comparison of mean pain scores for each day revealed no statistically significant difference between the intervention and control groups (t=1.48, p=.14; t=.28, p=.77; t=1.29, p=.20, respectively). No statistically significant difference was determined between VAS total mean pain scores of the intervention and control groups (t=1.152; p=.25>0.05). However, it was thought that the decrease in mean pain scores of the intervention group was clinically significant and was higher than the decrease in the control group (Table II).

Table 2. The Pain Status of Nursing Students According to the Visual Comparison Scale in the Intervention and Control Groups

	VAS 1.day $\bar{X}$±SS	VAS 2.day $\bar{X}$±SS	VAS 3.day $\bar{X}$±SS	F	p
Intervention	5.45±.2.58	3.85±2.38	2.52±2.46	28.672	.000
Control	4.53±.2.34	3.67±2.43	1.82±1.72	27.455	.000
t	1.48	.28	1.29		
p	.14	.77	.20		
Dual comparison	Intervention	1>2;2>3;1>3			
	Control	1>2;2>3;1>3			
	VAS Total			**t**	**p**
Intervention	3.94±2.23			1.152	.25
Control	3.34±1.86				

In the analyses, socio-demographic characteristics such as family history of dysmenorrhea, residence place, smoking, and doing exercise did not cause a statistically significant difference between the intervention and control groups in terms of their pain scores (p>0.05). No difference was determined between the intervention and control groups in terms of MSQ subscale and total mean scores (p>0.05). Mean score of its negative affect/somatic complaints subscale was 43.59±10.33 in the intervention group and 38.82±10.38 in the control group. There was no statistically significant difference between both groups in terms of mean score of that subscale (t=1.844; p=.07>.05) (Table III). It was found that mean score of MSQ menstrual pain symptoms subscale was 21.97±5.91 in the intervention group and 21.03±5.98 in the control group. Also, mean score of MSQ coping methods subscale was 8.86±3.40 in the intervention group and 8.39±3.44 in the control group. MSQ total mean score was 74.43±17.76 in the intervention group and 68.25±17.60 in the control group. There was no statistically significant difference between the groups in terms of the MSQ total score and subscales (p>.05) (Table III). The analyses revealed that socio-demographic characteristics such as family history of dysmenorrhea, residence place, smoking and doing exercise did not cause a statistically significant difference between the intervention and control groups in terms of their MSQ mean scores (p>0.05). The correlation coefficient between VAS and MSQ was .703 and there was a positively moderate and significant correlation between the two measurements (p=0.00).

Table 3. Menstruation Symptom Scale Scores of Nursing Students in the Intervention and Control Groups

Mean of score	Intervention Group (n=37)	Control Group (n=28)	t	P
	$\bar{X}$±SS	$\bar{X}$±SS		
Negative affect/somatic complaints subscale	43.59±10.33	38.82±10.38	1.844	.07
Menstrual pain symptoms subscale	21.97±5.91	21.03±5.98	.63	.53
Coping methods subscale	8.86±3.40	8.39±3.44	.55	.58
Menstruation Symptom Scale Total Score	74.43±17.76	68.25±17.60	1.39	.16

4.DISCUSSION

In this study, VAS mean score was found to be 3.94±2.23 in the intervention group and 3.34±1.86 in the control group. On the other hand, previous studies reported that the VAS mean score ranged from 5.02 to 6.59 (23,40). 46.8% of the participants in the study by Alsaleem (2018) and 47% of the participants in the study by Grandi et al., (2012) stated that they experienced moderate pain during the menstrual period (23,33). In another study, 82.27% of the nursing students experienced back pain during the menstrual period (20).

In the present study, it was determined that there was a statistically significant difference between the three-day mean pain scores of the intervention and control groups (Table II; $p<0.05$). On the other hand, no significant difference was observed between the groups (Table II; $p>0.05$). It was thought that the decrease in mean pain scores of the intervention group was clinically significant and was higher than the decrease in the control group. The studies in the literature have indicated that heat application reduces pain scores (30,38,41-43). The frequency of performing the application in the past was 9.2% in the intervention group and 37.5% in the control group ($p>0.05$). Premenstrual syndrome is a somatic and physiological complex process (44). In the systematic review conducted by Kwan & Onwude with 132 studies in 2014, they stressed that conducting randomized controlled trials was difficult due to the complexity of the natural course of premenstrual syndrome (45). In this study, the students in the intervention and control groups were able to establish communication with nurse academicians about a process affecting their daily life negatively. Heat method applied to sole is effective on reducing pain; however, it is thought that the decrease of pain in later days of the menstrual cycle in both groups can be explained with physiological reasons (23,38) and psychological reasons depending on this interaction as in the literature.

In this study, family history of dysmenorrhea was 32.4% and 25% in the intervention and control groups, respectively, which is lower than those reported in the studies in the literature (52.9-66.8%) (46-48). In this case, other factors causing premenstrual syndrome become remarkable besides genetic predisposition.

Taking drugs for pain was at nearly half rates in the intervention and control groups (43.2%; 46.4%). Also in the literature the rate of using analgesics (51.7-66%) is similar (23,33,46). The type of medicine was mainly analgesics in both groups. This result is compatible with other studies (33,46). In the study conducted by Gun et al., in 2014 they determined that CAM methods were used at the rate of 80.9%, the most frequently used method was heat application on the abdomen (67.2%) and 28.4% of the participants chose to drink herbal tea. In the study by Alsaleem (2018) it was found that 69.1% of the students used herbal therapy (33). Even though the use of CAM was preferred at lower rates in this study compared to the literature (24.3%; 17.9%), the most frequently preferred method was consumption of herbal tea (81.8%; 50.0%). In addition, the rate of applying to a healthcare organization was lower in the intervention group compared to the control group (18.9 %; 32.1%, respectively). This suggests that students are able to decide especially on consuming medicine on their own, thus being likely to result in negative outcomes.

Smoking has a risk of dysmenorrhea depending on vasoconstriction caused by nicotine (49). In their study, Dorn et al., (2010) determined that smokers had higher mean scores of premenstrual pain and back pain during the menstrual period (50). However in this study it was found that smoking had no effect on pain scores in the intervention and control groups and the rates of smoking (16.2%; 21.4%) and alcohol consumption (13.5%; 14.3%) were lower compared to the literature (23,50). This suggested that nursing education prevented individuals from applying to ineffective coping methods in pain management.

In the study conducted by Grandi et al., in 2012, they found that doing exercise was not effective on pain (23). Also in this study it was observed that doing exercise did not cause any

difference between the pain scores of intervention and control groups, which is compatible with the literature.

In the present study, no difference was determined between the intervention and control groups in terms of MSQ subscale and total mean scores (Table III; p>0.05). There was no statistically significant difference between the intervention and control groups in terms of mean score of the negative affect/somatic complaints subscale (t=1.844; p=.07>.05). Mean score of MSQ negative affect/somatic complaints subscale was 43.59±10.33 in the intervention group and 38.82±10.38 in the control group. Mean score of the negative affect/somatic complaints subscale was reported to be 40.45±10.63 in the study by Derya et al., (2019), 37.69±9.57 in the study by Sonmez et al., (2019), and 2.91±0.82/ 37.83±10.66 in the study by Oksuz and Guvenc (2018) (51-53). It was determined in the present study that there was no statistically significant difference between the intervention and control groups in terms of mean score of the menstrual pain symptoms subscale (t=.63; p=.53>.05). Mean score of MSQ menstrual pain symptoms subscale was 21.97±5.91 in the intervention group and 21.03±5.98 in the control group. Mean score of the menstrual pain symptoms subscale was reported to be 21.22±6.07 in the study by Derya et al., (2019), 20.91±5.70 in the study by Sonmez et al., (2019), and 3.14±1.02/18.84±6.12 in the study by Oksuz and Guvenc (2018) (51-53). There was no statistically significant difference between the intervention and control groups in terms of mean score of the coping methods subscale (t=.55; p=.58>.05). Mean score of MSQ coping methods subscale was 8.86±3.40 in the intervention group and 8.39±3.44 in the control group. Mean score of the coping methods subscale was reported to be 7.67±4.08 in the study by Derya et al., (2019), 6.74±3.51 in the study by Sonmez et al., (2019), and 2.51±1.13/ 7.53± 3.39 in the study by Oksuz and Guvenc (2018) (51-53). No statistically significant difference was found between the intervention and control groups in terms of MSQ total score (t=1.39; p=.16>.05). MSQ total mean score was 74.43±17.76 in the intervention group and 68.25±17.60 in the control group. In an experimental study assessing the effect of aerobic exercise and yoga on menstrual symptoms, MSQ total score was 56.20±11.21 in the aerobic exercise group and 57.26±9.46 in the yoga group (40). It was reported to be 69.36±17.59 in the study by Derya et al., (2019), 65.34±15.65 in the study by Sonmez et al., (2019) and 2.92±0.81/64.24±17.82 in the study by Oksuz and Guvenc (2018) (51-53). In randomized controlled trial, the decrease in the dysmenorrhea pain after the heat treatment in each of the three menstrual cycles [54]. The results of the present study are compatible with the literature.

In the study, no statistically significant difference was determined between the residence place and PMS sypmtoms. In addition, as students in the control group stayed in dormitories, they had more interaction with their friends and thus it was thought that they experienced the effects of social interaction more in terms of the decrease of PMS symptoms in all subscales. Similar results were obtained in the study conducted by Asci et al., in 2016.

The rate of smoking was found to be significantly higher in students with PMS than those without PMS (14). The studies conducted with adolescents and midwifery students have reported that menstrual symptoms are encountered more frequently in smokers (50,53). As a result of the study conducted by Cheng et al., in 2013 they reported that smoking had no effect on PMS symptoms. The result of the present study is compatible with the results of the study by Cheng et al., in 2013 (55).

It was observed that the rate of doing exercise regularly in the past was higher in the intervention group than the control group. In a study assessing the impacts of aerobic exercise and yoga on premenstrual syndrome, VAS and MSQ scores decreased after both applications and it was stressed that exercise increased many neurotransmitters such as natural endorphins, oestrogen, and dopamine and faciliated blood flow from the uterus (40). In the study conducted by Ghanghoriya et al., in 2018 they determined that prevalence of dysmenorrhea was higher in individuals not doing exercise (20). Students in the intervention group did not perceive doing exercise as a different

intervention and it was thought that they might have benefited from positive effects of exercise more. In the study conducted by Asci et al., in 2016, they reported that regular exercise was not effective on the development of PMS symptoms, which supports the results of the present study (14).

The correlation coefficient between scales was calculated to be .703 and there was a positively moderate and significant correlation (p=0.00). In this study, it was observed that as the level of pain increased, menstrual symptoms increased.

5. CONCLUSION

The studies in the literature are mainly descriptive and therefore this study is important because it assesses the effectiveness of heat applied to sole, a common application, with an experimental design. In this study, the students in the intervention and control groups established communication with nurse academicians about a process affecting their daily life negatively. It can be asserted that heat applied to sole is an effective method for reducing pain. However, the decrease of pain in following days of the menstrual cycle in both groups can be explained by both physiological and psychological reasons related to this interaction. Both groups were similar in terms of experiencing menstrual symptoms at a moderate level. In addition, as the participants' pain level increased, menstrual symptoms increased. Due to complex processof PMS, the difficulty of conducting randomized controlled trials was revealed once again. On the other hand, it was determined that socio-demographic characteristics did not affect pain and menstrual symptoms during the menstrual cycle. Based on the results of this study, it is recommended to conduct cohort studies, presenting multiple interventions together by a multidisciplinary team and with a higher sample size, for individuals with PMS, rather than interventions aiming only to relieve pain.

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