
Effect of Local Heat Application on Relieving Primary Dysmenorrhea among Nursing Students

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Abstract:

Aim: evaluate the effect of local heat application on relieving primary dysmenorrhea among nursing students. **Setting:** the study was conducted at the Faculty of Nursing at Benha University. **Research design:** A quasi-experimental design. **Sampling:** A systematic random sample of 150 students suffered from primary dysmenorrhea was divided into two equal groups; study group who applied local heat application and control group who used their usual self-care measures. **Tools of data collection:** three main tools were used; modified dysmenorrhea identification sheet, structured interviewing questionnaire and visual analog scale. **Results:** before local heat application, there was no statistically significant difference between the study and control groups regarding the severity of primary dysmenorrhea. After local heat application, there was a highly statistically significant difference between the study and control group ($p \leq 0.001$), pain decreased in the study group more than control group. **Conclusion:** local heat application by using small heated pillow filled with uncooked rice was effective in reducing the severity of primary dysmenorrhea, and decreasing days of absenteeism in the study group than the control group. **Recommendation:** Encouraging the use of local heat application before the onset of menstruation as a prophylactic relieving measure.

Keywords: Local heat application, Nursing students, Primary dysmenorrhea.

Introduction

Dysmenorrhea is the most common gynecologic complaint and the leading cause of recurrent short-term school or work absenteeism among female adolescents and young adults (*Bano et al., 2013*). There are two types of dysmenorrhea: primary and secondary. Primary dysmenorrhea is menstrual pain that is not associated with a physical abnormality of a pathologic process. Secondary dysmenorrhea is menstrual pain caused by specific organic conditions, such as endometriosis, uterine fibroids, adenomyosis, pelvic adhesions, intra-uterine devices, or pelvic inflammatory disease (*Pooler, 2010*).

Primary dysmenorrhea is typically characterized by a menstrual cramp that begins between several hours before and a few hours after onset of menstrual bleeding. Primary dysmenorrhea may be associated with vomiting, fatigue, back pain, headaches, dizziness, and diarrhea. Ninety percent of young women report that the duration of their menstrual cramps is 48 hours or less. Symptoms are relatively repeated from one menstrual period to the next. The pain is characteristically colicky and located in the midline of the lower abdomen (*Liau et al., 2012*).

Primary dysmenorrhea may be associated with increased production of endometrial prostaglandin, resulting in a high concentration of prostaglandins in blood. The pain related bio-molecular induction of cyclooxygenase and prostaglandin is strongly associated with the severity of primary dysmenorrhea. Excessive prostaglandin causes uterine contractions, ischemia, cramping, and pelvic pain (*Ke et al., 2012*).

Treatment approach for primary dysmenorrhea includes pharmacological as well as non-pharmacological. Pharmacological approaches may not be entirely effective and has side effect for about 15% of women with primary dysmenorrhea. In addition, Egyptian young women/girls are not preferring to use medication for dysmenorrhea as they believe that it may affect fertility or cause some types of dependence (*Rizk, 2013*).

Complementary and alternative medicine (CAM) and traditional medicine are important social phenomena. National and regional studies in the developed world

have shown high usage of CAM. In the developing world, traditional medicines can be the mainstay of health care delivery (*WHO, 2013*). Complementary and alternative medicine treatments for dysmenorrhea include transcutaneous electrical nerve stimulation, behavioral interventions, relaxation, herbal and dietary therapies (*Rakhshae, 2011*). Moreover, the use of heat in different forms has traditionally been used to ease menstrual pain in many cultures. Although the use of heat is one of the oldest treatment methods for dysmenorrhea, it has been abandoned due to the increased possibility of acute inflammation. Heat increases the blood flow in the area of an application via vasodilatation, leading to relaxation of smooth muscle and decrease in the perception of pain (*Potur and Komurcu, 2014*).

Nurses have the important role of educating females about non pharmacological interventions for alleviating dysmenorrhea; nurses should provide health education about physiological effects of local heat application on reducing dysmenorrhea, procedure, location, duration, interval of heat therapy. Instruct the female regarding pain assessment prior to, during, and after application of heat therapy, specific safety features during application, advice female to use a heating device for no longer than 30 minutes at a time and reassess skin during heat application (*Burton and Luwig, 2015*).

Significance of the study:

The prevalence of dysmenorrhea is difficult to determine because of different definitions of the condition, the estimates varying from 45% to 95%. A recent systematic review of the world literature on chronic pelvic pain reports prevalence of dysmenorrhea ranging between 17% and 80% (*Kural et al., 2015*). Dysmenorrhea was significantly associated with school absenteeism, decreased academic performance, decreased sports participation, and socialization with peers (*Awed et al., 2013*). Heat therapy has traditionally been used to relieve pain in many cultures; its utilization is currently limited because of the lack of interest among adolescences about traditional remedies. Local heat applied to the upper abdomen increases gastrointestinal motility and has a relaxing effect on the uterus (*Rigi et al., 2012*).

Thus, this study was conducted to evaluate the effectiveness of local heat application on relieving primary dysmenorrhea.

Aim:

This study aimed to evaluate the effect of local heat application on relieving primary dysmenorrhea among nursing students.

Research hypothesis:

The group who used local heat application will report lower pain scores than the other group.

Subjects and Methods

Research Design:

A quasi-experimental design was used to fulfill the aim of the study.

Setting of the study:

The study was conducted at the Faculty of Nursing - Benha University.

Sample:

Type of sample: Systematic random sample.

Size and technique:

- Among the 893 students who completed the Modified dysmenorrhea identification sheet (Tool I) 450 students met the inclusion criteria.
- All the students who met the inclusion criteria (450 students) were listed in a sampling frame and one-third of them were selected by systematic random sample which the first number was selected at random and then picked every 3rd until reached the sample size (150 students).
- Finally, the total sample was divided randomly into two equal groups:
 - Every odd number was recruited as control group: 75 female students used their usual self-care methods to relieve dysmenorrhea.
 - Every even number was recruited as study group: 75 female students apply local heat application using "heated small cotton pillow filled with uncooked rice" to relieve dysmenorrhea.

Inclusion criteria:

Unmarried, have primary dysmenorrhea, age ranging from 17-22 years, medically free from chronic diseases, not having menorrhagia, and without rash or other skin condition that could be made worse by heat.

Tools of data collection:

Three tools were used to collect data:

Tool (I). Modified dysmenorrhea identification sheet:

This sheet was prepared by the researcher after reviewing of literature **Chaudhuri et al., (2013)** to identify the study sample, included student name, academic year, presence or absence of dysmenorrhea. The following criteria were used to define students with primary dysmenorrhea recurrent, spasmodic menstrual cramps, that begin only a few hours before or with the onset of menstrual flow and lasting maximum for 2-3 days, suprapubic in location with radiation to both lower quadrants, the lumbar area, and into the inner aspects of the thighs and frequently associated with symptoms like nausea and vomiting, fatigue, headache, dizziness that are more or less reproducible from one menstrual period to the other.

Tool (II). Structured interviewing Questionnaire:

This tool was developed by the researcher after reviewing of literature. It was designed in an Arabic language. It composed of three parts:

Part 1. Socio-demographic characteristics of female as age, telephone number, residence, anthropometric measurements.

Part 2. Menstrual history of female included age at menarche, interval, duration of menstruation, a rhythm of menstruation, the amount of blood according to the number of pads/day.

Part 3. Characteristics of menstrual pain included the first time of dysmenorrhea, timing of pain occurrence, severity, and site of pain.

Tool (III). Visual Analog Scale (VAS):

Visual Analog Scale was adopted from *Khosravu and Moghadam, (2012)* to assess the severity of pain. VAS consisted of a blank line anchored at each end by adjectives that describe the extremes of pain for ease of measurement. A 10cm

vertical horizontal line was used. The classification of pain was done according to the scores of pain (no pain: 0, mild: 1-3, moderate: 4-7, severe: 8-10).

Ethical considerations:

Each female was informed about the purpose and benefits of the study at the beginning of interview and time throughout the study. An oral consent was obtained from each woman before starting the data collection. Confidentiality was ensured throughout the study process, where personal data were not disclosed, and the females were assured that all data was used only for research purpose. There is no harm for the participants. Also, each participant female has the freedom to withdrawal from participation at any time.

Pilot study:

The pilot study was conducted on 10% of the total sample (15 students), to test the applicability and clarity of the tools. This pilot study was conducted one month before collection of the data. Necessary modifications as some question was omitted and other was added were done based on the pilot study findings as well as to estimate the time needed for each female to fill in questions. A pilot study was excluded from the main study sample.

Field work:

- An official permission was obtained from the dean of the Faculty of Nursing at Benha University explaining the aim of the study and time of data collection.
- The current study was carried out from the end of February 2015 and completed at the end of June 2015 covered four months. The study setting was visited four days per week from 1 Pm to 3 Pm. The explanation was done for (15-20) students each time. The researcher greeted the females and the aim of the study was explained, assurance of confidentiality and oral consent was obtained.
- The students were divided randomly into equal groups. The study was started after the control group to avoid contamination of the sample.
- The students in both groups filled the interviewing questionnaire that took 10-15 minutes, the researcher assessed the anthropometric measurements. The

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- participants were asked to record pain severity on a visual analog scale by putting a dot or sign on the pain line against the hour at which the pain intensity was reported.
- The control group was instructed to continue using the usual self-care measures defined as all medical and non-medical treatment exception using of local heat application during the study period and reported if used to exclude from the study.
 - Instructed the students in the study group how to make small heated rice pillow, in addition to all the females in the study group was provided with CDs contained a recorded video about how to make a rice pillow, then how to prepare for using.
 - Once the pillow is ready to use, put the pillow in the microwave for three minutes or in the oven after completely wrap with aluminum foil (preheat the oven to 180°C for 10 minutes. Before applying the heated pillow, press it against your wrist to test its temperature and to make certain it is not too hot, usually around 42°C to 50°C. Apply the heated pillow medially inferior to navel region and superior to the upper edge of the pubic hair and supported by a long belt tied around the abdomen which allows the female to continue her daily routine while obtaining relief without using drugs. The students used the heated pillow for 20 to 30 minutes every four hours during daytime for first two days of menstruation for two consecutive cycles.
 - The study group was instructed not to use other methods than local heat application and if, occurred reported to exclude from the study.
 - The both groups recorded the degree of pain at the onset of menstruation before and after 4, 8 and 12 hours of using the relieving method for the first two days of menstruation for two consecutive cycles. The researcher collected the data after every cycle.

Limitation of the study:

There was difficulty in gathering the students at the same time because of different times for lectures and clinical work.

Statistical Design:

Data was verified prior to computerized entry. The statistical package for social sciences (SPSS version 20) was used for that purpose, followed by a data tabulation and analysis. Descriptive statistics were applied (e.g., mean, standard deviation, frequency, and percentages). Test of significance (Independent t-test, chi-square, and Fisher exact test), Pearson correlation coefficients were used. A significant level value was considered when $P \leq 0.05$, and a highly significant level value was considered when $P < 0.001$.

Results

Table (1) shows the distribution of the studied samples according to socio-demographic characteristics. As regards age, more than three quarters of students 84% and 80% were more than 19 years old with mean age 20.61 ± 1.04 and 20.65 ± 1.13 years in the study and control group respectively. As far as a residence, 81.3% and 70.7% in the study and control group respectively were living in rural area. Regarding academic year, 30.7% and 33.3% of the study and control groups respectively were in the third year. There is no statistically significant difference between both groups regarding socio-demographic characteristics and body mass index ($P > 0.05$).

Table (2) presents the menstrual characteristics of the studied samples. In relation to age at menarche, 46.7% and 53.3% in the study and control group respectively had menarche from 11 to less than 13 years. More than two-thirds of students 78.7% and 66.7% in the study and control group respectively had an interval of menstruation between 21- 28 days. According to the duration of menstruation, 78.7% and 82.7% of the students in the study and control group respectively had menstrual duration 4-6 days. Regarding the menstrual flow, the majority of the students 97.3% and 94.7% had a moderate amount of menstrual flow in the study and control group respectively. 73.3% and 69.3% in the study and control group respectively had regular menstruation. There is no statistically significant difference between the study and control group regarding menstrual characteristics ($P > 0.05$).

Table (3) clarifies that 48% and 38.7% of the students in the study and control group respectively had dysmenorrhea with menarche, 92% and 88% of the students in the study and control group respectively had dysmenorrhea usually occurred with menstrual beginning and continues for 48 hours. According to the severity of dysmenorrhea, more than half of the students in the study and control group had severe dysmenorrhea. More than three quarters of the students 76% and 77.3% in the study and control group respectively had menstrual pain in the lower back and abdomen. There is no statistically significant difference between the study and control group regarding characteristics of menstrual pain $P > 0.05$.

Figure (1) shows that the most common self-care measures used by the control group in the first month were hot drinks, taking analgesics and bed rest 48%, 44%, and 44% respectively. While the most common self-care measures used by the same group in the second month were hot drinks, bed rest and taking analgesics 49.3%, 46.7% and 42.7% respectively.

Table (4) indicates comparisons of the severity of dysmenorrhea pain between study group who used local heat application and control group who used their usual self-care measures during two months. Before intervention, there was no statistically significant difference between both groups regarding the severity of pain. After 4, 8 and 12 hours of intervention, there were highly statistically significant differences between both groups, pain decreased in the study group from 6.76 ± 2.15 to 1.28 ± 1.49 more than the control group who reported that pain severity decreased from 6.81 ± 2.25 to 4.19 ± 3.11 . At the second month before using the relieving methods, there was no statistically significant between both groups. At the end of the second month of intervention there were highly statistically significant differences between both groups, pain decreased in the study group from 6.0 ± 2.74 to 0.93 ± 1.44 compared to the control group from 6.61 ± 2.24 to 4.04 ± 2.17 ($P \leq 0.001$).

Table (5) illustrates that highly significant positive correlation between severity of pain score and absenteeism from faculty before intervention and at the first and second month of intervention.

Table (6) reveals that there was no significant positive correlation between total pain score of study group at the first and second month and age of menarche and body mass index.

Table (1): Distribution of the studied samples according to socio-demographic characteristics (n= 150)

Socio-demographic characteristics	Study group n=75		Control group n=75		χ^2	p-value	
	No	%	No	%			
Age (years)							
≤ 19	12	16.0	15	20.0	0.407	0.524	
> 19	63	84.0	60	80.0			
<i>Mean ± SD</i>	20.61±1.04		20.65±1.13		t=0.225	0.822	
Residence							
Rural	61	81.3	53	70.7	2.34	0.13	
Urban	14	18.7	22	29.3			
Academic year							
First	16	21.3	12	16.0	0.755	0.86	
Second	17	22.7	17	22.7			
Third	23	30.7	25	33.3			
Fourth	19	25.3	21	28.0			
Body mass index (kg/m²)							
<i>Mean ± SD</i>	23.85 ± 3.22		24.0 ± 3.17		t=0.276	0.783	

t= indepent t test

Table (2): Distribution of the studied samples according to their menstrual characteristics (n= 150)

Menstrual characteristics	Study group n=75		Control group n=75		χ^2	p-value
	No	%	No	%		
Age of menarche (years):						
11 < 13	35	46.7	40	53.3	0.667	0.717
13 <15	32	42.7	28	37.3		
15 17	8	10.6	7	9.3		
Mean ± SD	12.67±1.18		12.53±1.11		t=0.714	0.476
Interval of menstruation (days):						
< 21	4	5.3	4	5.3	FET	0.155
21 – 28	59	78.7	50	66.7		
30 – 35	11	14.7	21	28.0		
> 35	1	1.3	0	0.0		
Mean ± SD	24.92±5.1		25.99±5.62		1.22	0.225
Duration of menstruation (days):						
1 – 3	10	13.3	10	13.3	FET	0.669
4 – 6	59	78.7	62	82.7		
> 6	6	8.0	3	4.0		
Mean ± SD	4.63±1.18		4.69± 1.09		t=0.359	0.720
Amount of menstrual flow according to number of pads / day:						
Mild (1 pad)	2	2.7	4	5.3	FET	0.41
Moderate (2-3 pads)	73	97.3	71	94.7		
Rhythm of menstrual cycle:						
Regular	55	73.3	52	69.3	0.293	0.588
Irregular	20	26.7	23	30.7		

t= indepent t test

FET=Fisher Exact Test

Table (3): Distribution of the studied samples according to characteristics of menstrual pain (n= 150)

Characteristics of menstrual pain	Study group n=75		Control group n=75		χ^2	p-value	
	No	%	No	%			
Start of dysmenorrhea:							
Starting with menarche	36	48.0	29	38.7	3.72	0.294	
After 1 st menses 6 month	22	29.3	22	29.3			
After 1 st menses 1 year	7	9.3	15	20.0			
After 1 st menses 2 year	10	13.4	9	12.0			
Time of pain occurrence:							
With menstrual beginning and continues for 24 hour	2	2.7	4	5.3	FET	0.656	
With menstrual beginning and continues for 48 hour	69	92.0	66	88.0			
With menstrual beginning and continues for 72 hour	4	5.3	5	6.7			
Severity of menstrual pain:							
Moderate	37	49.3	35	46.7	0.11	0.744	
Severe	38	50.7	40	53.3			
*Site of menstrual pain:							
Lower back	4	5.3	2	2.7	FET	0.762	
Lower abdomen	12	16.0	14	18.7			
In extremities	2	2.7	1	1.3			
Lower back and abdomen	57	76.0	58	77.3			

*responses are not mutually

FET= Fisher Exact Test

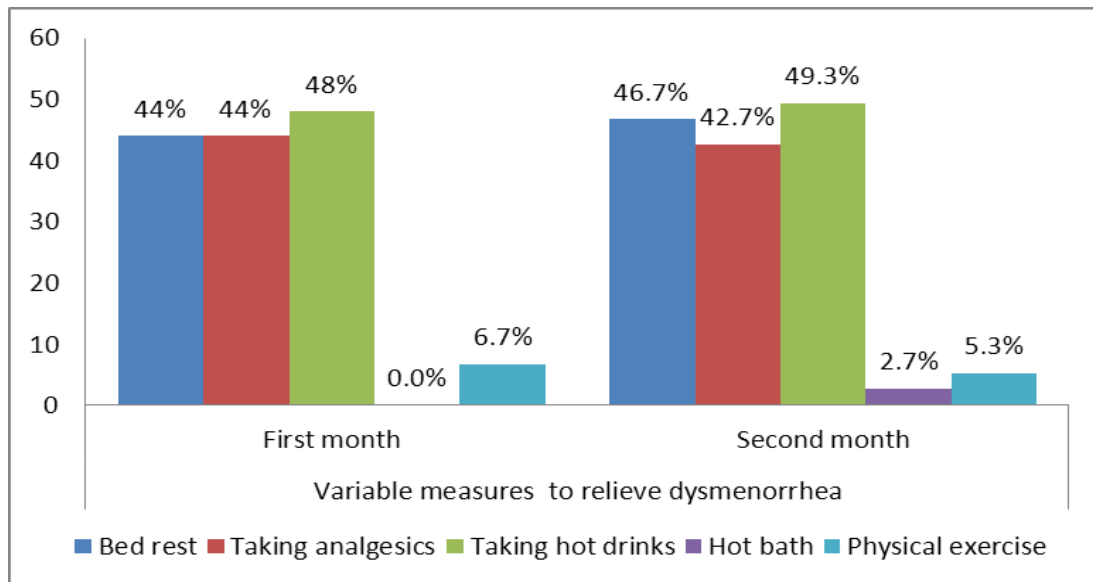


Figure (1): Distribution of the control group according to variable measures to relieve menstrual pain (n= 75)

Table (4): Comparison of the severity of pain between study and control groups during first and second months (n=150)

Pain score at various interval	Study group n= 75	Control group n= 75	<i>t-test</i>	<i>P-value</i>
	<i>Mean± SD</i>	<i>Mean± SD</i>		
At first month				
Before intervention	6.76±2.15	6.81±2.25	0.148	0.882
After 4 hours of intervention	3.59±2.73	4.11±2.57	1.202	0.03*
After 8 hours of intervention	3.2±2.61	6.74±2.12	9.803	0.001**
After 12 hours of intervention	1.28±1.49	4.19±3.11	7.30	0.001**
At second month				
Before intervention	6.0±2.74	6.61±2.24	1.5	0.135
After 4 hours of intervention	1.81±2.28	3.89±3.1	4.18	0.001**
After 8 hours of intervention	1.33±1.79	5.87±3.21	8.3	0.001**
After 12 hours of intervention	0.93±1.44	4.04±2.17	8.45	0.001**

*A statistically significant at ($P \leq 0.05$) **A highly statistically significant at ($P \leq 0.001$)

Table (5): Correlation coefficient between total pain score at 1st and 2nd month of the studied samples and their days of absenteeism from Faculty (n=150)

Total pain score	Absenteeism from faculty	
	r	P- value
Before intervention	0.606	0.001**
First month of intervention	0.727	0.001**
Second month of intervention	0.855	0.001**

**A highly statistically significant at ($P \leq 0.001$)

Table (6): Correlation coefficient between total pain score at 1st and 2nd month of the studied samples and age at menarche and body mass index (n=150)

Variables	Total pain score	
	r	P- value
Age at menarche	0.102	0.212
Body mass index	0.147	0.072

Discussion

This study aimed to evaluate the effect of local heat application on relieving primary dysmenorrhea among nursing students. The finding of the present study showed that more than three quarters of students were more than 19 years old with mean age 20.61 ± 1.04 and 20.65 ± 1.13 years in the study and control group respectively. This finding is agree with *Rakhshae* (2011) mentioned that the mean age of the students was ranged between 20.86 and 20.45 years for the experimental and control groups respectively. Also, *Abedian et al.,* (2011) reported that the mean

age of students with primary dysmenorrhea was ranged between 21-23 years. Moreover, *Younesy et al., (2014)* mentioned that the mean age of the students were 19.86 ± 1.52 and 20 ± 1.56 years in the interventional group and the placebo group respectively. On the other hand, *Mirbagher et al., (2011)* revealed that the mean age of the participants with primary dysmenorrhea was 22 ± 1.6 and 22 ± 2.64 years.

The findings of the present study demonstrated that more than two-thirds of the students in both groups were living in rural area. This is in congruence with *Zegeye et al., (2009)* who found that more than two-thirds of the students were living in rural areas. Also supported by *Mohamed et al., (2015)* who reported that the majority of the studied samples with primary dysmenorrhea were living in rural areas.

Moreover, the findings of the present study demonstrated that the mean age at menarche were 12.67 ± 1.18 and 12.53 ± 1.11 years in the study and control group respectively. This is in agreement with *Eswi et al., (2012) and Zannoni et al., (2014)* mentioned that majority of the studied subjects had their menarche at mean age 12.3 years. On the other hand, *Kural et al. (2015)* had reported that the majority of the student's menarche age with a mean of 13.8 ± 1.6 years. This may be attributed to the differences in socioeconomic status, environment and food habits in different countries.

In relation to the interval of the menstrual cycle, the findings of the present study showed that more than two-thirds of students in the study and control group had an interval of menstruation between 21- 28 days with mean interval with the a mean interval of a menstrual cycle. This finding is supported by *Azima et al., (2015)* reported that the mean interval of menstrual cycle of studied samples was 25.55 ± 4.26 , 25.5 ± 3.5 and 25.82 ± 3.45 days in the control and both studied groups respectively. On the other hand, *Nasehi et al., (2013)* found that the mean interval of the menstrual cycle among the study population was 28.1 ± 1.5 days.

Regarding duration of the menstrual cycle, the finding of the present study revealed that more than three-quarters of the students 78.7% and 82.7% in the study and control group respectively had a menstrual duration of menstrual cycle ranged 4-6 days with a mean duration of the menstrual cycle 4.63 ± 1.18 and 4.69 ± 1.09 days.

This result is similar to *Gagua et al., (2013)*. Also, *Santina et al., (2012)* mentioned the majority of the students among the three studied groups had a menstrual duration less than or equal 6 days. On the contrast *Zeraati et al., (2014)* revealed that the mean duration of the menstrual cycle between the studied samples was 6.24 ± 1.66 and 7.04 ± 1.27 days.

Moreover, the finding of the present study indicated that the majority of the students in both groups had a moderate amount of menstrual flow daily. This result is in congruence with *Marzouk et al., (2013)* who found that more than half of students in the studied groups had average menstrual flow 2-3 pads/ day. Also, *Ortiz et al., (2009)* illustrated that more than three quarters of the studied samples had moderate amount of the menstrual flow.

Concerning rhythm of the menstrual cycle, the result of the present study showed that less than three quarters of the students in the study and control group had regular menstruation. This is in congruence with *Tavallae et al., (2011)* who stated that highest percentage of studied samples had always regular menstruation. Also, *Al-Kindi and Al-Bulushi, (2011)* reported that the menstruation was regular in more than half of the students. Such result may be due to the facts that the selected sample in both studies was at younger age, with no gynecological problems.

As regards beginning of dysmenorrhea, the findings of the present study showed that more than one-third of the students in the study and control group had dysmenorrhea with menarche. This result is supported by *Shaban (2011)* reported that dysmenorrhea started with menarche for almost two-fifths of the students in Faculty of Nursing at Tanta University. On the other hand, *Abadian et al., (2016)* mentioned that dysmenorrhea occurred after two years of menarche in students at Shahid Beheshti University in Tehran, Iran. This disagreement might be related to geographic and climatic differences.

Regarding time of menstrual pain occurrence, the finding of the present study showed that the most of the students in both groups had their dysmenorrhea began with the beginning of menstruation and continues for 48 hours. This result in congruence with *Gulsen et al., (2010)* who reported that more than half of the female

adolescents had experienced dysmenorrhea during the last one to two days. In the same line *Al Yousef et al. (2013)* who stated that the pain in primary dysmenorrhea started with the beginning of the menstrual cycle and lasts 48 hours. This result is disagreed with *Wang et al., (2009)* who reported that the more than half of the participants their menstrual pain duration lasted for up to 12 hours per cycle. This difference might be related to that the students in the current study were living in developing countries and might have anemia.

The finding of the present study showed that more than half of the studied samples in both groups had severe menstrual pain. This result is in agreement with *Mohamed (2012)* who proved that more than one-third of the students described menstrual pain as severe. In the same line *Rahnama et al., (2012)* mentioned that more than two-thirds of the participants had severe pain. Also, **Asadi and Abdul-Qadir, (2013)** reported that more than one-third of the participants had severe dysmenorrhea. These differences in pain severity may be related to the ethnic and cultural differences in pain perception.

Regarding the most common sites of menstrual pain, the finding of the present study revealed that more than three-quarters of the students in the study and control group had menstrual pain in the lower back and abdomen. This is agreed with *Eryilmaz et al., (2010)* who reported that both lower back and abdomen was the commonest site of pain during menstruation for students in his study. Also, *Abdel-Hameed et al., (2011)* who mentioned that more than half of the students had lower abdominal pain during menstruation.

Concerning severity of dysmenorrhea, the findings of the present study revealed that the mean pain score between the study group who used local heat application and control group who used usual self-care measures, there was no statistically significant difference between both groups before intervention. Meanwhile, there was statistically significant change after 4, 8, and 12 hours of intervention on the first and second day. This difference became more manifested at the end of the second month of intervention, the severity of pain decreased in the study group than the control group. This improvement in the pain intensity may be

due to the instructions given to the study group about the technique of heat application.

This finding is supported by *Kim (2013)* found that heated red bean pillows had the effect on reducing pain as painkillers had during the menstrual period. In the same line, *Potur and Komurcu (2014)* found that there is no significant difference between groups in terms of the initial pain levels. The pain reduction methods were applied to the groups following the baseline pain measurement. There was a significant difference between the three groups (the control group did not use any treatments to relieve dysmenorrheal pain, self-medication group used analgesic medication, and the heat patch group applied a heat patch on the lower abdomen) in the mid time and at the end of intervention, the pain severity of heat patch group decreased significantly at the end of the intervention than the other groups.

In addition, *Chaudhuri et al., (2013)* concluded that both exercise and hot water bottle led to a significant improvement in the severity of pain and menstrual distress in the study groups. Subjects in both groups showed a clear shift from moderate and severe grades towards a mild grade. Although the shift was evident after 1st month of intervention, it becomes more prominent at the end of the third month in both groups. In exercise group, 28.3% of dysmenorrhea girls become pain free at the end of the 3rd month of intervention compared to 37.33% in hot water bottle group. Also, *Hosono et al., (2010)* reported that fifty-four percent of the subjects experienced the relief of symptoms of dysmenorrhea on heat and steam generating sheet application compared to the control group.

As regards correlation coefficient between total pain score of both groups and student's number of absenteeism, it was found that there was a highly significant positive correlation. The majority of the students have two days absence from the faculty before local heat application while the students reported decreased in days of absenteeism gradually until reached 96% of students have no absent after the second month of intervention. This result is in agreement with *Joshi et al., (2015)* who had mentioned that there was a highly significant association between dysmenorrhea and school absenteeism. Additionally, *Chauhan and Kodnani (2016)* and *Al-Jefout et*

al., (2015) found that there was a significant association between dysmenorrhea and school absenteeism.

As regards correlation between pain severity and body mass index, the results of the current study revealed there was no significant correlation between body mass index and severity of dysmenorrhea. This result is agreed with *Haidari et al., (2011)* and *Shaban (2011)* concluded that there was no significant relationship between the severity of dysmenorrhea and body mass index. The results disagree with *Unsal et al., (2010)* who reported that dysmenorrhea was significantly associated with low body mass index. Also, *Madhubala and Jyoti (2012)* concluded that there was a significant relation between dysmenorrhea and body mass index was found to be significant ($P < 0.001$) and dysmenorrhea increased in a low body mass index group. These findings were not consistent with the present study results may be due to differences in body mass index grading.

As regards correlation between dysmenorrhea severity and age at menarche, the results of the current study revealed there was no significant relationship between age at menarche and severity of dysmenorrhea. This result is in agreement with *Al-Kindi and Al-Bulushi, (2011)* who study the prevalence and impact of dysmenorrhea among High School students and showed that there was no significant association between dysmenorrhea and age at menarche. Moreover, the present study finding supported by *Kural et al., (2015)* found that no significant relation between age at menarche and dysmenorrhea. This result is disagree with *Khodakarami et al., (2015)* who concluded that dysmenorrhea had a significant relationship with age at menarche.

Conclusion

Local heat application by using small heated pillow filled with uncooked rice was effective in reducing the severity of primary dysmenorrhea as well as improving daily activities of female students and decreasing days of absenteeism in the study group than the control group. Therefore, study hypothesis was supported.

Recommendations

Based on the results of the present study, the following recommendations can be suggested:

- Encouraging the use of local heat application before the onset of menstruation as a prophylactic relieving measure.
- Raising the awareness of student females about heat therapy for relieving primary dysmenorrhea.

Further studies:

- Further studies may be needed to replicate the beneficial findings of local heat application using a wider geographic scope and a larger sample size.

References

- Abadian, K., Keshavarz, Z., Mojab, F., Alavi Majd, H., and Abbasi, N. M. (2016):** Comparison the effect of Mefenamic acid and Teucrium polium on the severity and systemic symptoms of dysmenorrhea. *Complementary Therapies in Clinical Practice*, 22(1), 12–15.
- Abd El-Hameed, N., Mohamed, M., Ahmed, N., and Ahmed, E. (2011):** Assessment of dysmenorrhea and menstrual hygiene practices among adolescent girls in some nursing Schools at EL-Minia Governorate, Egypt. *Journal of American Science*, 7(9), 216–223.
- Abedian, Z., Kabirian, M., Mazlom, S., and Mahram, B. (2011):** The effects of peer education on health behaviors in girls with dysmenorrhea. *Journal of American Science*, 7(1), 431–438.
- Al-Jefout, M., Seham, A. F., Ameal, H., J., Randa, A. Q., Ola, A. M., and Oday, A. M., (2015):** Dysmenorrhea: Prevalence and impact on quality of life among young adult Jordanian females. *Journal of Pediatric and Adolescent Gynecology*, 28(3), 173–185.
- Al-Kindi, R., and Al-Bulushi, A. (2011):** Prevalence and impact of dysmenorrhea among Omani High school students. *SQU Medical Journal*, 11(4), 485–491.

-
- AlYousef, S. A., El-Hay, S. A. A., Mohamed, N. S., and Baker, R. M. A. (2013):** Effect of transcutaneous electrical nerve stimulation on the relief of dysmenorrheal pain among students of applied medical science college at Hafer Al-Batin. *Journal of American Science*, 9(11), 225–234.
- Asadi, J., and Abdoul-Qadir, R. (2013):** Dysmenorrhea and its impact on daily activities among secondary school in Basra, Iraq. *J Fac Med Baghdad*, 55(4), 339–344.
- Awed, H., EL Saied, T., and Amoro, T., (2013):** The use of fresh ginger herbs as a home remedy to relieve primary dysmenorrhea, *J.Res.Nur.*, 2(8),104-113.
- Azima, S., Bakhshayesh, H. R., Kaviani, M., Abbasnia, K., and Sayadi, M. (2015):** Comparison of the effect of massage therapy and isometric exercises on primary dysmenorrhea: A randomized controlled clinical trial. *Journal of Pediatric and Adolescent Gynecology*, 28(6), 486–491.
- Bano, R., Alshammari, E., Khalid, H., and Aldeabani, S. (2013):** Study of the prevalence and severity of dysmenorrhea among the university students of Hail city. *International Journal of Health Sciences and Research*, 3(10), 15–22.
- Burton, M., and Ludwig, L., (2015):** *Fundamental of nursing care: concepts, connections and skills*, 2nded., Mosby, USA., p 346.
- Chaudhuri, A., Singh, A., and Dhaliwal, L. (2013):** A randomized controlled trial of exercise and hot water bottle in the management of dysmenorrhoea in school girls of Chandigarh, India. *Indian Journal of Physiology and Pharmacology*, 57(2), 114–122.
- Chauhan, G., and Kodnani, A. (2016):** A study of prevalence and impact of dysmenorrhea and its associated symptoms among adolescent girls residing in slum areas of Vadodara city, Gujarat. *International Journal of Medical Science and Public Health*, 5(5):1-6
- Eryilmaz, G., Ozdemir, F., and Pasinlioglu, T. (2010):** Dysmenorrhea prevalence among adolescents in eastern turkey: Its effects on school performance and relationships with family and friends. *Journal of Pediatric and Adolescent Gynecology*, 23(5), 267–272.

-
- Eswi, A., Helal, H., and Elarousy, W. (2012):** Menstrual attitude and knowledge among Egyptian female adolescents. *Journal of American Science*, 8(6), 555–565.
- Gagua, T., Tkeshelashvili, B., Gagua, D., and Mchedlishvili, N. (2013):** Assessment of anxiety and depression in adolescents with primary dysmenorrhea: A case-control study. *Journal of Pediatric and Adolescent Gynecology*, 26(6), 350–354.
- Gulsen, E., Funda, O., and Turkan, P. (2010):** Original study dysmenorrhea prevalence among adolescents in Eastern Turkey: Its effects on school performance and relationships with family and friends. *Journal of Pediatr. Adolesc. Gynecol.*, 23, 267–272.
- Haidari, F., Akrami, A., and Mohammad, S. (2011):** Prevalence and severity of primary dysmenorrhea and its relation to anthropometric parameters. *Journal of Faculty of Nursing and Midwifery*, 17(1), 70–78.
- Hosono, T., Takashima, Y., Morita, Y., Nishimura, Y., Sugita, Y., Isami, C., Suzuki, A. (2010):** Effects of a heat and steam generating sheet on relieving symptoms of primary dysmenorrhea in young women. *The Journal of Obstetrics and Gynaecology Research*, 36(4), 818–824.
- Joshi, T., Kural, M., Agrawal, D., Noor, N., and Patil, A. (2015):** Primary dysmenorrhea and its effect on quality of life in young girls. *International Journal of Medical Science and Public Health*, 4(3): 1-5
- Ke, Y. M., Ou, M. C., Ho, C. K., Lin, Y. S., Liu, H. Y., and Chang, W. A. (2012):** Effects of somathermal far-infrared ray on primary dysmenorrhea: A pilot study. *Evidence-Based Complementary and Alternative Medicine*, <http://doi.org/10.1155/2012/240314>
- Khodakarami, B., Masoumi, S. Z., Faradmal, J., Saadati, M., Sharifi, F., and Shakhbabaie, M. (2015):** The severity of dysmenorrhea and its relationship with body mass index among female adolescents in hamadan , Iran.
- Khosravu, A. and Moghadam, D. (2012):** Comparison of verbal multidimensional scoring system (VMS) with visual analogue score(VAS) for evaluating of shirazi

thymus vulgaris on menstrual pain. *Journal of Pharmaceutical and Biomedical Sciences*, 23(19), 1–5.

Kim, J. I. (2013): Effect of heated red bean pillow application for college women with dysmenorrhea. *Korean J Women Health Nurs.*, 19(2), 67–74.

Kural, M., Noor, N. N., Pandit, D., Joshi, T., and Patil, A. (2015): Menstrual characteristics and prevalence of dysmenorrhea in college going girls. *Journal of Family Medicine and Primary Care*, 4(3), 426–31.

Liau, B.-Y., Leung, T.-K., Ou, M.-C., Ho, C.-K., Yang, A., and Lin, Y.-S. (2012): Inhibitory Effects of Far-Infrared Ray-Emitting Belts on Primary Dysmenorrhea. *International Journal of Photoenergy*, 2012, 1–6.

Madhubala, C., and Jyoti, K. (2012): Relation between dysmenorrhea and body mass index in adolescents with rural versus urban variation. *Journal of Obstetrics and Gynecology of India*, 62(4), 442–445.

Marzouk, T. M. F., El-Nemer, A. M. R., and Baraka, H. N. (2013): The effect of aromatherapy abdominal massage on alleviating menstrual pain in nursing students: A prospective randomized cross-over study. *Evidence-Based Complementary and Alternative Medicine*,. <http://doi.org/10.1155/2013/742421>

Mirbagher-Ajorpaz, N., Adib-Hajbaghery, M., and Mosaebi, F. (2011): The effects of acupressure on primary dysmenorrhea: A randomized controlled trial. *Complementary Therapies in Clinical Practice*, 17(1), 33–36.

Mohamed, E. M. (2012): Epidemiology of dysmenorrhea among adolescent students in Assuit city, Egypt. *Life Science Journal*, 9(1), 348–353.

Mohamed, H. E., Salem, S., and Al-Agamy, Z. (2015): Effect of using Femi-band acupressure on primary dysmenorrhea : Randomized controlled trial. *Journal of Nursing Education and Practice*, 5(12), 49–57.

Nasehi, M., Sehhatie, F., Zamanzadeh, V., Delazar, A., Javadzadeh, Y., and Chongheralu, B. M., (2013): Comparison of the effectiveness of combination of fennel extract/vitamin E with ibuprofen on the pain intensity in students with primary dysmenorrhea. *Iranian Journal of Nursing and Midwifery Research*, 18(5), 355–359.

-
- Ortiz, M. I., Rangel-Flores, E., Carrillo-Alarcón, L. C., and Veras-Godoy, H. A. (2009):** Prevalence and impact of primary dysmenorrhea among Mexican high school students. *International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics*, 107(3), 240–243.
- Pooler, C. (2010):** *Porth pathophysiology: concepts of altered health states china:* Wolters Kluwer Health / Lippincott Williams and Wilkins, P 147.
- Potur, D., and Komurcu, N. (2014):** The effects of local low-dose heat application on dysmenorrhea. *Journal of Pediatric and Adolescent Gynecology*, 27(4), 216–221.
- Rahnama, P., Montazeri, A., Huseini, H. F., Kianbakht, S., and Naseri, M. (2012):** Effect of *Zingiber officinale* R. rhizomes (ginger) on pain relief in primary dysmenorrhea: a placebo randomized trial. *BMC Complementary and Alternative Medicine*, 12(92), 1–7.
- Rakhshae, Z. (2011):** Effect of Three Yoga Poses (Cobra, Cat and Fish Poses) in women with primary dysmenorrhea: A randomized clinical trial. *Journal of Pediatric and Adolescent Gynecology*, 24(4), 192–196.
- Rigi, S. N., Navidian, A., Safabakhsh, L., and Safarzadeh, A. (2012):** Comparing the analgesic effect of heat patch containing iron chip and ibuprofen for primary dysmenorrhea: a randomized controlled trial. *BMC Women's Health*. <http://doi.org/doi:10.1186/1472-6874-12-25>.
- Rizk, S. (2013):** Effect of aromatherapy abdominal massage using peppermint versus ginger oils on primary dysmenorrhea among adolescent girls. *Journal of American Science*, 9(11), 597–605.
- Santina, T., Wehbe, N., and Ziade, F. (2012):** Exploring dysmenorrhoea and menstrual experiences among Lebanese female adolescents. *Eastern Mediterranean Health Journal*, 1(8), 857–63.
- Shaban, R. (2011):** Comparative study between three different techniques on relieving dysmenorrhea among students of faculty of nursing at Tanta University. P 86 .

-
- Tavallaee, M., Joffres, M. R., Corber, S. J., Bayanzadeh, M., and Rad, M. M. (2011):** The prevalence of menstrual pain and associated risk factors among Iranian women. *The Journal of Obstetrics and Gynaecology Research*, 37(5), 442–51.
- Unsal, A., Ayranci, U., Tozum, M., Arslan, G., and Calik, E. (2010):** Prevalence of dysmenorrhea and its effect on quality of life among a group of female University students. *J. Med. Sci.*, 115(2), 138–145.
- Wang, S. F., Lee, J. P., and Hwa, H. L. (2009):**Effect of transcutaneous electrical nerve stimulation on primary dysmenorrhea. *neuromodulation*, 12(4), 302–309.
- World Health Organization (2013):** WHO traditional medicine strategy 2014-2023. Geneva: World Health Organization.
- Younesy, S., Amiraliakbari, S., Esmaceli, S., Alavimajd, H., and Nouraei, S. (2014):** Effects of fenugreek seed on the severity and systemic symptoms of dysmenorrhea. *Journal of Reproduction and Infertility*, 15(1), 41–48.
- Zegeye, D. T., Megabiaw, B., and Mulu, A. (2009):** Age at menarche and the menstrual pattern of secondary school adolescents in northwest Ethiopia. *BMC Women's Health*, 9, 29
- Zeraati, F., Shobeiri, F., Nazari, M., Araghchian, M., and Bekhradi, R. (2014):** Comparative evaluation of the efficacy of herbal drugs (fennelin and vitagnus) and mefenamic acid in the treatment of primary dysmenorrhea. *Iranian Journal of Nursing and Midwifery Research*, 19(6), 581–584.