

Effect of foot reflexology on premenstrual syndrome among nursing students at Faculty of Nursing, Damanhour University

Nemat Ismail Abdel Aziz Ismail¹, Naglaa Zaki Hassan Roma², Sahar Mansour Lamadah³

¹Assistant professor of Obstetrics and Gynecologic Nursing Faculty of Nursing, Damanhour University, Egypt.

²Lecturer of Obstetrics and Gynecologic Nursing Faculty of Nursing, Alexandria University, Egypt.

³Assistant professor of Obstetrics and Gynecologic Nursing, Faculty of Nursing, Alexandria University, Egypt.

Abstract

Background: Premenstrual syndrome (PMS) is a prevalent health issue among adolescents. It is one of the most frequent conditions affecting women of reproductive age, and it can have a considerable impact on daily activities and can considerably reduce female's quality of life. **The aim of the study** was to determine the effect of foot reflexology on premenstrual syndrome among nursing students at Faculty of Nursing, Damanhour University. **Subjects and method:** A quasi-experimental research design was carried out. A convenient sample of 100 students was recruited to participate in the study. Two tools of data collection were used: *Tool I* was socio demographic data and menstrual history structured interview schedule, tool II was a modified version of premenstrual symptoms screening tool for clinicians (PMSST). **Results:** The study results revealed that the total score of PMS severity was a statistically significant before and after two months of the intervention among the study group, $p=0.000$. However, the difference was not statistically significant among the control group ($P=0.379$). There was also statistically significant difference between the study and control groups after two months of the intervention in favor of the former, where ($p=0.000$). In addition, the negative effect of PMS on daily life activities significantly decreased among the study group after two months of the intervention $p=0.000$. **Conclusion and recommendations:** The study concluded that the female students who received reflexology foot massage exhibited less severity of premenstrual symptoms than those who received placebo foot massage. It is recommended that reflexology foot massage should be advised as a non-pharmacological management to relieve PMS.

Key Words: foot reflexology, premenstrual syndrome.

Introduction

Premenstrual syndrome (PMS) is a prevalent health issue among adolescents. It is one of the most frequent conditions

affecting women of reproductive age, and it can have a considerable impact on daily activities and can considerably reduce women's quality of life. PMS includes presence of physical, psychological, and behavioral symptoms that occur

cyclically during the luteal phase of the menstrual cycle and resolve at or within a few days of the onset of menstruation (O'Brien et al 2011; Buddhabyakan et al., 2017; Bhuvanewari et al., 2019 & Geta, et al., 2020). The prevalence of PMS was investigated, and the Royal College of Obstetricians and Gynecologists found that four out of every ten women suffer from premenstrual symptoms, with 5-8% of them suffering from severe PMS (Green et al., 2017). Breast tenderness, bloating, fatigue and appetite changes with food cravings are the most prevalent physical symptoms. Irritability, crying, depression, oversensitivity, and mood fluctuations are the most common mood-related symptoms. Social withdrawal and absenteeism from school and work are the most typical behavioral signs (Walsh et al., 2015 & Hofmeister and Bodden S 2016).

PMS is caused by a variety of factors that are currently unknown. Because PMS symptoms are closely linked to the menstrual cycle and affect women of reproductive age, it is linked to ovarian hormone levels, serotonin levels, and gamma-aminobutyric acid (GABA) levels (Direkvand-Moghadam et al., 2014 & Nooh 2015).

Pharmacological treatment of PMS mainly directed on relieving physical and psychological symptoms. Diuretics, gonadotropin-releasing hormone (GnRH) agonists, and non-steroidal anti-inflammatory medications (NSAIDs) are among the pharmacological therapies, with combined oral contraceptives (COCs) and selective serotonin reuptake inhibitors (SSRIs) (Nevatte et al., 2013 & Prema et al., 2017).

Complementary therapies are considered an integral part of nursing care management and the idea of it is aligned with the concept of healing and holistic nursing care. Florence Nightingale reported the importance of whole person care and supported interventions that increase individual's abilities. Many complementary therapies for reducing the symptoms of premenstrual syndrome have been proposed and attempted such as massage, use of relaxation methods, cold and heat therapies, imagery, music intervention, and reflexology. They are among the traditional nursing activities that have all been shown to help the mind and body to cope with stress, worry, and depression, allowing girl to feel relaxed and at ease (Hajbaghery and Mokhtari 2018 & Rani et al., 2021).

Reflexology is a special type of foot and hand massage. It is a completely natural treatment that aims to balance and normalize the body's processes. The principle behind reflexology is that there is a connection between certain spots on the feet and hands and other parts of the body. As a result, the nurse will apply pressure to certain areas in order to stimulate the parasympathetic nerve, allowing the body to heal itself. The endocrine and reproductive systems are thought to be affected by applying pressure to the area surrounding the foot and heel, reducing the symptoms of premenstrual syndrome (Jacob 2013 & Embong et al., 2016). It is thought that when the body is unwell or out of equilibrium, the energy channels become obstructed. Reflexology massage unblocks these clogged pathways, allowing energy to flow freely throughout the body and restoring health and balance. Reflexology suppresses the transmission of pain by controlling the transmission of afferent nerve impulses and the closing of

the nerve valve in the posterior branch of the spinal cord, according to the theory of neural message (Khorsand et al., 2015).

Foot reflexology is a practice including applying pressure to certain points on the feet that has an effect on the health of other parts of the body. The pressure on these points can affect the body's physiological responses. Each point of pressure on the feet functions as a sensor and is linked to certain sections of the body. These sensors will be activated using the massage technique to increase blood and energy circulation and provide a sense of relaxation. Foot reflexology is safer and has no side effects than pharmaceutical techniques (AbdollahiFard et al., 2013; Embong et al., 2015; Azima et al., 2015 & Shafaie et al., 2018). It is a non-invasive procedure. The connection between feet, as well as other body parts, via energy lines or channels, is the most essential theory about the method's effect. Regular foot reflexology has been demonstrated in some studies to reduce anxiety, enhance relaxation, and improve health (Nasiri et al., 2016 & Mohamed et al., 2016).

Significance of the study:

Premenstrual syndrome (PMS) influences about 90% of women during the reproductive period at various degrees. It is common among adolescents. PMS prevalence in Egypt is not well recorded. Of the few studies have been conducted, higher prevalence rates are very common. For example, the prevalence of premenstrual symptoms was found to be (89.6 %) among medical students of Ain Shams University (Bakr and Ez-Elarab, 2010), 86.3% among girls in Beni-Suef (Arafa et al., 2018) and 80.2% among El-Minia University students (Seedhom et al., 2013). PMS symptoms can have a

detrimental impact on adolescents' life by causing discomfort and disrupting daily functions and interpersonal relationships, as well as absenteeism from college, poor academic performance, and acute psychiatric problems. It appears to be a burden and interferes with their daily lives. There is no therapeutic cure, and taking medications on a monthly basis can cause a variety of side effects (Maleki et al., 2014 & Elgzar 2019).

Despite the negative impact of PMS on the health-related quality of life, less attention has been given to it. This increases the interest to investigate such nursing intervention for the development and provision of suitable nursing management to the most important sector of population who will be the future mothers. Foot reflexology is a nursing intervention for management of different health problems as PMS. It is safe, effective, and easy to applicable intervention for most of the girl suffers from PMS. In spite of foot reflexology plays an important role in coping with premenstrual symptoms and decreases its severity, there is lack of evidence to evaluate the effect of foot reflexology in PMS among university students in Egypt. So, the aim of this study was to assess the effect of foot reflexology on premenstrual syndrome among nursing students.

Aim of the study:

The present study aimed to determine the effect of foot reflexology on premenstrual syndrome among nursing students at Faculty of Nursing, Damanhour University

Research hypothesis:

- H0: Female students who receive foot reflexology exhibit similar severity of

premenstrual symptoms as those who receive placebo foot massage.

- H1: Female students who receive foot reflexology exhibit less severity of premenstrual symptoms than those who receive placebo foot massage.

Subjects and Method

Research design:

A quazi experimental research design was followed in the study.

Setting:

This study was conducted at faculty of nursing, Damanhour University, Elbehira governorate affiliated to Ministry of Higher education.

Subjects:

All female students enrolled in the faculty of nursing, Damanhour University during the four academic years 2019-2020 were surveyed to pinpoint those who suffer from moderate or severe premenstrual syndrome. Then according to the results of the survey, a non-probability sampling technique was used to select a convenient sample of 100 students to participate in the study according to the following inclusion and exclusion criteria:

Inclusion criteria:

1. Single
2. Had regular menstruation (22-35 days) during the last 12 months.
3. Free from any gynecological diseases
4. Suffer from moderate to severe premenstrual syndrome according to the results of modified version of the

premenstrual symptom screening tool (PMSST).

5. Willing to participate in the study.

Exclusion criteria:

1. Had skin diseases i.e eczema or severe bruises
2. Had Skin infection or ulceration.
3. Had open wound, fracture or recent burn

Each one of the 100 eligible female students was randomly assigned into two equal groups (study and control).

Tools:

Two tools were used for data collection:

Tool I: Socio demographic data and menstrual history structured interview schedule.

It was developed by the researchers to collect information related to socio-demographic data such as: age, academic year, phone number and residence. It also included the menstrual history such as: age at menarche, menstrual interval, duration, amount of blood flow and date of the last menstrual period.

Tool II: A modified version of premenstrual symptoms screening tool for clinicians (PMSST) (Steiner et al., 2003). It contains two main sections:

Section one:

It has 40 items and is divided into three subscales (physiological, psychological, and behavioral symptoms screening scale). The first is a 16-item physiological symptoms screening scale. The second is a 12-item psychological

symptom screening questionnaire. The behavioral symptoms screening scale, which has 12 items, is the third. The participant had to choose one of five responses for each of the 40 items: Never was scored (1), rarely (2), sometimes (3), very often (4) and always (5).

❖ Scoring system:

The total score for physiological symptoms screening (16 items) ranges from 1 to 80. The subject is considered to have:

- No physiological PMS if her score ≤ 16
- Mild physiological PMS if her score 17-32
- Moderate physiological PMS if her score 33-48
- Severe physiological PMS if her score 49-64
- Very severe physiological PMS if her score ≥ 65

The total score for psychological symptoms screening (12 items) ranges from 1 to 60. The subject is considered to have:

- No psychological PMS if her score ≤ 12
- Mild psychological PMS if her score 13-24
- Moderate psychological PMS if her score 25-36
- Severe psychological PMS if her score 37-48
- Very severe psychological PMS if her score ≥ 49

The total score for behavioral symptoms screening (12 items) score ranges from 1 to 60. The subject is considered to have:

- No behavioral PMS if her score ≤ 12

- Mild behavioral PMS if her score 13-24
- Moderate behavioral PMS if her score 25-36
- Severe behavioral PMS if her score 37-48
- Very severe behavioral PMS if her score ≥ 49

Total score of premenstrual symptoms (PMS) ranges from 1 to 200. The subject is considered to have:

- No PMS if her total score ≤ 40
- Mild PMS if her total score 41-80
- Moderate PMS if her total score 81-120
- Severe PMS if her total score 121-160
- Very severe PMS if her total score ≥ 161

Section two:

It is concerned with the negative PMS effect on daily activities. It contains four items. For each one of the four items the subject had chosen one of four responses: absent was scored as (0), mild as (1), moderate as (2) and severe as (3).

❖ Scoring system: total score ranges from 0-12. The subject is considered to have:

- No effect if her total score < 3
- Mild effect if her total score 3-6
- Moderate effect if her total score 7-9
- Severe effect if her total score ≥ 10

Method

The study was executed according to the following Steps:

1. Approval:

- An Ethical agreement was maintained by obtaining the approval of Ethical

Research Committee of Faculty of Nursing, Damanhour University before conducting the research.

- Approval to conduct the study was obtained from the Dean of Faculty of Nursing, Damanhour University after explaining the purpose of the study.

Researcher training:

- Researcher attended a training program on reflexology for 3 days (18 hours) at Arab African Union, supreme body for complementary medicine affiliated to ministry of culture and investment at Alexandria Governorate and accredited certificate was obtained.

Tools:

- **Tool (I)** was developed by the researchers after comprehensive review of recent and relevant literature.
- **Tool (II)** was adopted and modified then translated into Arabic language by specialist in English language translation.

Validity of the tools:

Tools were tested for content validity by a jury of 5experts in the field to check the tool's content, accuracy, relevancy and appropriateness to the research objective.

Reliability of the tools:

It was done by test-retest method within three weeks interval on 10 students using cronbach's alpha test which seemed to be reliable (tool II= 0.85).

Pilot study:

A Pilot study was carried out on 10 students who were excluded from the study sample to ascertain relevance, clarity and the applicability of the tools.

Booklet preparation:

The researchers reviewed the relevant literature then developed a booklet. It entailed information about PMS definition, causes, symptoms, and management like foot reflexology, its benefits, duration of it, time of performing it and how. It also included illustrative pictures and simple language. An attractive presentation was considered during the preparation. The booklet was then reviewed by a jury of 5 experts in Obstetrics and Gynecologic Nursing Department. After that, the needed modifications were done. 50 booklets were printed and given to each student in the study group before the beginning of the study.

Data collection

Collection of data lasted about four months from the beginning of October 2019 until the end of January 2020. The data were gathered through the following phases:

Assessment phase:

- First, according to the student's academic schedules and year, the researchers divided them into groups. Then, the researchers met each group during one of their free sessions or in between lectures to introduce themselves and gave a brief overview of the study's nature and objective.
- Then, oral consents were obtained from all female students who agreed to be screened for PMS using tool II. Those

who were diagnosed as moderate or severe cases of PMS considered target population.

- A number of 100 eligible students from the target population were recruited to participate in the study. Written consent about the participation in the study was obtained.
- Finally, the 100 students were randomly divided into study and control group. Then the tool I was collected from both groups.

Implementation phase:

- This phase started at different times for each student according to the beginning of her menstrual cycle.
- **The study group** included 50 female students upon whom foot reflexology was applied by the researcher. The researcher interviewed each female student in this group for about 30 minutes in Obstetrics & Gynecologic Nursing lab.
- Tool (II) was obtained from each student before application of foot reflexology (pre-test). Then, the researcher provided information to the students regarding premenstrual syndrome through discussion with the aid of the booklet and performing the reflexology to the students.
- Initially, before performing the reflexology, the researcher washed her hands and made them warm. Then, student's whole foot was washed by warm water and olive oil was used to lubricate the foot. The researcher asked the student to lie in semi setting position and the student's foot was elevated by supporting it with a pillow. The researcher applied a whole foot massage slowly and gently for 2 minutes to

improve the overall health of the student because it promotes good blood circulation in the lower extremities. Then, gentle pressure and massage in a circular motion was applied for about 2 minutes for each reflex point of the uterus, ovary, fallopian tubes and pituitary gland. The students were assessed continuously for tolerance of the amount of pressure applied. The pressure was firm enough to activate the body's healing potentials, but also tolerable to the subjects. The researchers used the thumb to give pressure on the reflex points of each foot. The reflex points of the genital organs of the woman are in the form of band around the front aspects of the ankle (see the following diagram). The ovarian and uterine reflex points located at both feet under the lateral and medial malleolus respectively. The fallopian tubes reflex point begins at the uterus on the inside part of the foot (medial) and wraps around the top of the ankle to the ovaries on the outside part of the foot (lateral). While the pituitary gland reflex point located exactly in the planter aspect of the center of big toe of both feet (Williamson, 2010).

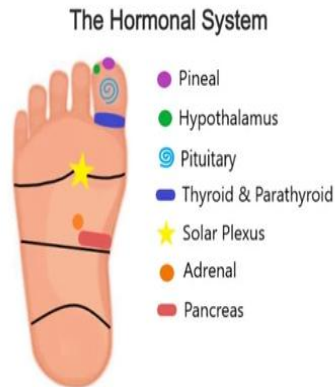
- Duration of reflexology foot massage was 20 minutes (10 minutes for each foot).
- Foot reflexology was performed once in a day for 7 days (starts from 5 days before menstruation and ends with 2nd day of menstrual cycle) in two consecutive menstrual cycles.
- **The control group** comprised 50 female students who received the generalized foot massage (placebo foot massage) without any pressure on the reflex points. Duration of foot massage was 20 minutes (10 minutes in each foot)

once in a day for 7 days (starts from 5 days before menstruation and ends with 2nd day of menstrual cycle) in two consecutive menstrual cycles.

- There were five dropouts cases (two in the study group and three in the control group) that were substituted by another potential subjects.

Evaluation phase:

- Pre-test was done for the study group before the intervention and for the control at day five before menstruation by using tool (II).
- Posttest was done after two consecutive menstrual cycles of intervention for the study and control groups by using the same tool at the second menstrual day.
- The effect of foot reflexology was determined by comparing between the study and control groups before and after intervention.



Ethical considerations:

Each student in both groups was interviewed individually to assure privacy and to inform about the purpose of the study, in order to obtain her oral and written informed consent for participation in the study. The confidentiality and anonymity of students' answers was assured, volunteer participation and right to reject participation in the study as well as withdrawal at any time were stressed to the students without any consequences.

Statistical analysis:

After collection of data, statistical analysis was done using statistical package for social sciences (SPSS) version 20. A descriptive and analytical statistics were utilized. Frequencies and distribution of the severity of total PMS symptoms were calculated. Chi-Square test, Monte Carlo test, and Fisher Exact test and independent sample t-test were used to test differences between the two groups. P value considered significant at ≤ 0.05

Results

Table (1): Illustrates distribution of the study subjects according to their socio-demographic characteristics, it can be observed that less than two thirds (60%) of the study group were 18 < 20 years old compared to 52% of the control group. Moreover, 42% of the study group were in the first academic year compared to 36% of the control one. More than two thirds of the study group (68%) were rural residents compared to 62% of the control group. Mother's education of a considerable percent from the study and control groups (64%, 58%) respectively were secondary.

Table (2): As shown in the age of menarche of more than three quarters from the study and control groups (76%, 80%) respectively was 12<14 years. Most of the girls in both groups (84%, 90%) respectively had menstrual interval 26<30 days. Menstrual duration of the majority of the study group (94%) was 4-5 days compared to 96 % of the control group. The amount of blood flow was moderate among (90%, 94%) respectively of both study and control group. In addition, menstruation was regular among (88%, 90%) respectively of each group. Furthermore, no family history of PMS among 62 % of the study group compared to 58 % of the control one.

Table (3): reveals distribution of the study subjects according to their PMS symptoms severity before and after two months of intervention, it was noticed that (52 % and 32 %) of the study group had moderate and severe physiological symptoms respectively before the intervention. while 58% of them had no symptoms and 28% had mild symptoms after two months of the intervention and the difference was statistically significant

where $p=0.000$. On the other hand, 60% & 22% of the control group had moderate and severe symptoms respectively before the intervention compared to 50% & 20% of them respectively after two months of the intervention with no statistically significant difference. It was also statistically significant difference between the two groups after two months of the intervention in favor of the study group where ($p=0.000$).

Regarding the psychological symptoms, it was found that 46% and 40% among the study group had moderate and severe psychological symptoms respectively before the intervention. There was a statistically significant improvement after the intervention where 66% of them had no symptoms while 30% had mild symptoms $p=0.000$. On the other hand, there was no statistically significant difference among the control group before and after two months of the intervention regarding the psychological symptoms.

In relation to the behavioral symptoms, 50% of the study group suffered from moderate symptoms and 32 % of them had severe symptoms before the intervention. However, the severity of behavioral symptoms was significantly decreased among the study group after two months of the intervention where 62% of them had no symptoms and 32% had mild symptoms $p=0.000$. On the other hand, no statistically significant difference was observed among the control group before and after two months of the intervention.

As regards to the total score of premenstrual symptoms severity, it can be noted that, there was a statistically significant difference between the total score before and after two months of the

intervention among the study group, $p=0.000$. However, the difference was not statistically significant among the control group before and after two months of the intervention ($P=0.379$). There was also statistically significant difference between the study and control groups after two months of the intervention in favor of the former, where ($p= 0.000$).

Table (4): exhibits percent distribution of study subjects according to the negative effects of PMS on their daily life activities before and after two months of intervention. Before the intervention, there were no statistically significant differences among the study and control groups in relation to the negative effects of PMS on academic productivity, relationships with others, social life activities and home responsibilities. After two months of the intervention, the negative effects of PMS on all parameters of daily life activities were significantly decreased among the study group than the control group. The severe negative effects of PMS on all parameters of daily life activities didn't present among the study group after intervention.

Meanwhile, 36%, 22 %, 26% and 32% of the control group were still suffering from severe negative effects of PMS on their academic productivity, relationships with others, social life activities and home responsibilities, respectively.

Table (5): represents the distribution of the study subjects according to the total score of negative effects on their daily life activities before and after two months of the intervention, it can be noticed that PMS had moderate effect on 54 % and severe effect on 46 % among the study group before intervention. This worse effect decreased after two months of the intervention where 70 % of them had no effect and 28 % suffered mild effect. The difference was significant where $p=0.000$. Regarding the control group, 66% of them suffered from moderate effect while 34% had severe effect before intervention, and there was no statistically significant improvement after two months of the intervention. There was also statistically significant difference between the study and control groups in favor of the former after two months of the intervention, where $P = 0.000$.

Table (1): Distribution of the study subjects according to their socio-demographic data.

Variables	Study group = 50		Control group= 50		FET/X ² (P)
	No.	%	No.	%	
Age in years:					
18-	30	60.0	26	52.0	0.649
20-	15	30.0	18	36.0	(0.723)
22+	5	10.0	6	12.0	
Mean + SD	19.460±1.528		19.560±1.417		<i>T</i> (P) 0.339(0.735)
Academic year:					
- First	21	42.0	18	36.0	Fisher's Exact Test
- Second	15	30.0	19	38.0	1.651
- Third	10	20.0	7	14.0	(0.652)
- Fourth	4	08.0	6	12.0	
Residence:					
- Urban	16	32.0	19	38.0	0.396
- Rural	34	68.0	31	62.0	(0.529)
Mother's education:					
- Primary/ preparatory.	10	20.0	12	24.0	0.388
- Secondary	32	64.0	29	58.0	(0.824)
- University or more	8	16.0	9	18.0	

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; T (P): T-test & P for T-test.

Table (2): Distribution of the study subjects according to their menstrual history.

Variables	Study group = 50		Control group= 50		FET/X ² (P)
	No.	%	No.	%	
Age of menarche:					
10-	7	14.0	5	10.0	0.385
12-	38	76.0	40	80.0	(0.825)
14 or more	5	10.0	5	10.0	
Mean + SD	12.320(1.096)		12.460(1.054)		T (P) 0.651(0.517)
Menstrual interval:					
22 day –	3	06.0	1	02.0	(^{MCP} P=0.675)
26 day –	42	84.0	45	90.0	
30 day or more	5	10.0	4	08.0	
Mean + SD	28.080(1.275)		28.020(1.134)		T (P) 0.249(0.804)
Duration of menses (day):					2.050
2-3 day	1	02.0	2	04.0	(0.310)
4-5 day	47	94.0	48	96.0	
6-7 day	2	04.0	0	00.0	
Mean + SD	4.320(0.653)		4.240(0.518)		T (P) 0.679(0.499)
Amount of blood flow:					
- Light	3	06.0	1	02.0	1.102
- Moderate	45	90.0	47	94.0	(0.593)
- Heavy	2	04.0	2	04.0	
Rhythm of menstrual cycle:					
- Regular	44	88.0	45	90.0	0.102
- Irregular	6	12.0	5	10.0	(0.749)
Family history of PMS:					
- Yes	19	38.0	21	42.0	0.167
- No	31	62.0	29	58.0	(0.683)

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; T (P): T-test & P for T-test. ^{MCP}P: Monte Carlo test

Table (3): Distribution of the study subjects according to their PMS symptoms severity before and after two months of intervention.

Severity of premenstrual symptoms	Study group = 50				Control group= 50				FET/X ² (P) Before	FET/X ² (P) After
	Before intervention		After two months of intervention		Before intervention		After two months of intervention			
	No	%	No	%	No	%	No	%		
Physiological symptoms:										
No symptoms	0	00.0	29	58.0	0	00.0	0	00.0	1.270 (0.530)	61.325 (0.000)
Mild	0	00.0	14	28.0	0	00.0	6	12.0		
Moderate	26	52.0	7	14.0	30	60.0	25	50.0		
Severe	16	32.0	0	00.0	11	22.0	10	20.0		
Very severe	8	16.0	0	00.0	9	18.0	9	18.0		
x² (P)	77.939 (0.000)				6.502 (0.165)					
Psychological symptoms:										
• No symptoms	0	00.0	33	66.0	0	00.0	0	00.0	1.067 (0.587)	FET 91.242 (0.000)
• Mild	0	00.0	15	30.0	0	00.0	5	10.0		
• Moderate	23	46.0	2	04.0	28	56.0	25	50.0		
• Severe	20	40.0	0	00.0	17	34.0	15	30.0		
• Very severe	7	14.0	0	00.0	5	10.0	5	10.0		
FET/x² (P)	92.64 (0.000)				5.295 (0.258)					
Behavioral symptoms:										
• No symptoms	0	00.0	31	62.0	0	00.0	1	02.0	0.300 (0.861)	FET 79.514 (0.000)
• Mild	0	00.0	16	32.0	0	00.0	5	10.0		
• Moderate	25	50.0	3	06.0	26	52.0	23	46.0		
• Severe	16	32.0	0	00.0	17	34.0	14	28.0		
• Very severe	9	18.0	0	00.0	7	14.0	7	14.0		
FET/x² (P)	89.286 (0.000)				(MCP=0.481)					
Total score of premenstrual symptoms:										
• No symptoms	0	00.0	31	62.0	0	00.0	0	00.0	0.647 (0.724)	FET 85.360 (0.000)
• Mild	0	00.0	15	30.0	0	00.0	4	08.0		
• Moderate	24	48.0	4	08.0	28	56.0	25	50.0		
• Severe	18	36.0	0	00.0	15	30.0	14	28.0		
• Very severe	8	16.0	0	00.0	7	14.0	7	14.0		
• FET/x² (P)	86.286 (0.000)				(MCP=0.379)					

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; MCP: Monte Carlo test

Table (4): Distribution of study subjects according to the negative effects of PMS on their daily life activities before and after two months of intervention.

Negative effects of PMS on daily life activities	Study group = 50				Control group= 50				FET/X ² (P) Before	FET/X ² (P) After
	Before intervention		After two months of intervention		Before intervention		After two months of intervention			
	No.	%	No.	%	No.	%	No.	%		
Academic productivity										
• No effects	0	00.0	32	64.0	0	00.0	0	00.0	MCP=	MCP=
• Mild	3	06.0	13	26.0	5	10.0	7	14.0	0.588	0.000
• Moderate	25	50.0	5	10.0	27	54.0	25	50.0		
• Severe	22	44.0	0	00.0	18	36.0	18	36.0		
MC (P)	MCP= 0.000				MCP= 0.062					
Relationships with others										
• No effects	0	00.0	35	70.0	0	00.0	2	04.0	MCP=	MCP=
• Mild	3	06.0	11	22.0	3	06.0	6	12.0	0.942	0.000
• Moderate	30	60.0	4	08.0	32	64.0	31	62.0		
• Severe	17	34.0	0	00.0	15	30.0	11	22.0		
MC (P)	MCP= 0.000				MCP= 0.731					
Social life activities										
• No effects	0	00.0	37	74.0	0	00.0	0	00.0	FET	MCP=
• Mild	0	00.0	12	24.0	1	02.0	5	10.0	0.982	0.000
• Moderate	33	66.0	1	02.0	33	66.0	32	64.0	(0.597)	
• Severe	17	34.0	0	00.0	16	32.0	13	26.0		
MC (P)	MCP= 0.000				MCP= 0.651					
Home responsibilities										
• No effects	0	00.0	33	66.0	0	00.0	0	00.0	X ²	MCP=
• Mild	0	00.0	15	30.0	0	00.0	4	08.0	0.042	0.000
• Moderate	30	60.0	2	04.0	31	62.0	30	60.0	(0.838)	
• Severe	20	40.0	0	00.0	19	38.0	16	32.0		
MC (P)	MCP= 0.000				MCP= 0.080					

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; MCP: Monte Carlo test

Table (5): Distribution of study subjects according to the total negative effects of PMS on their daily life activities before and after two months of intervention.

Effect of PMS on daily life activities	Study group = 50				Control group= 50				FET/X ² (P) Before	FET/X ² (P) After
	Before intervention		After two months of intervention		Before intervention		After two months of intervention			
	No	%	No	%	No	%	No	%		
▪ No effect	0	00.0	35	70.0	0	00.0	0	00.0		
▪ Mild	0	00.0	14	28.0	0	00.0	5	10.0		
▪ Moderate									1.500	81.392
▪ Severe	27	54.0	1	02.0	33	66.0	30	60.0	(0.221)	(0.000)
	23	46.0	0	00.0	17	34.0	15	30.0		
MC/x² (P)	X ² 96.143 (0.000)				(MCP=0.348)					

Note. X² (P): Chi-Square Test & P for X² Test; FET (P): Fisher Exact Test & P for FET-Test; MCP: Monte Carlo test

Discussion:

PMS is a collection of physical, emotional, psychological, and behavioral changes that occur following a woman's ovulation, or it is defined as the recurrence of psychological and physical symptoms in the luteal phase of the menstrual cycle, which subside in the follicular phase (Joseph et al., 2016). The prevalence of PMS as much as 99.5% of adolescents had at least one premenstrual symptom (Kustriyanti & Rahayu, 2020). Successful management of PMS will improve adolescent's quality of life. Moreover, therapies used should be safe and do not lead to any complications. PMS can be relieved by the use of pharmacological and non-pharmacological methods. Reflexology is a non-pharmacological method for management of different health problems including PMS (Yılmaz & Başer, 2019). The results of the current study achieved its hypotheses in demonstrating that foot reflexology decreased the severity of physiological, psychological and behavioral symptoms of PMS and improved the daily life activities among the subjects.

The results of present study revealed that the participants of both the study and the control groups were matching in almost all aspects of their socio-demographic data and menstrual history (Table I & II). This matching may help understand and/or justify the relevance of the forthcoming results of the current study. It may also provide logic rational in relation to the possible positive effects of foot reflexology on the severity PMS symptoms

The results of the present study showed a statistically significant reduction in the severity of physiological, psychological and behavioral symptoms of PMS after two months of the implementation of foot reflexology among the study group. Meanwhile, such reduction was not observed among the control group after two months of the implementation of placebo foot massage. Also, there was significant reduction in the total score of premenstrual symptoms among the study group after two months of the intervention while the control group remained the same as pre intervention. This finding may be attributed to what is elicited in the literature about the possible positive effects of foot reflexology to reduce severity PMS symptoms. Where, reflexology induces meditative relaxation, which activates the parasympathetic nervous system. As a result, it has an impact on physical symptoms of PMS induced by better parasympathetic functions of the body (Hasanpour et al., 2019). The mechanism of reflexology's effectiveness on psychological symptoms could be due to the release of β -endorphins and enkephalins from the brain as endogenous opiate peptides with Euphoriant effects that increase girl's sense of well-being. In addition, Endorphin is a body's natural pain-relieving chemical that helps the body how to adapt any injuries (Lakasing & Lawrence 2013). The alleviation of behavioral symptoms could be related to the stimulation of reflex points, which caused the body to relax in general. Stress messages ended and sympathetic nervous system activity improved after this relaxation. As a result, it's assumed that

after having reflexology, students' behavioral change-related symptoms improved more than before because their worry and stress levels decreased (**Affi et al., 2017**).

The results of the present study agree with the results of at least seven other researches. *The First*, **Lee (2011)** performed a study about effects of Aroma-foot-reflexology on premenstrual syndrome, dysmenorrhea and lower abdominal skin temperature of nursing students. She found that foot reflexology decreased premenstrual syndrome and raised lower abdomen skin temperature of students. *The Second*, **Sareh et al., (2013)** who reported that foot reflexology is effective in decreasing mental and physical symptoms of PMS. *The third*, **Fard et al (2013)** who mentioned that the average reduction in PMS symptom intensity in the foot reflexology group was 23.39% compared to 9.68% in the control group ($p = 0.000$). *The fourth*, **Affi et al (2017)** who found that the mean PMS score continued to decrease in the post and follow up tests compared to the pre-test before reflexology. *The fifth*, **Hasanpour et al., (2019)** who had done a systematic review and Meta analysis about the effects of reflexology on premenstrual syndrome. They concluded that the reflexology could relieve PMS symptoms, so that overall scores, somatic and psychological symptoms of PMS decreased by applying the reflexology intervention. Furthermore, an increase in the length of reflexology time in each session increased its efficiency. Reflexology can be used as an effective intervention in a patient care program by nurses and its efficiency can be enhanced by increasing intervention time in each reflexology treatment session. *The Sixth*, **Praba et al (2019)** who concluded that the foot reflexology is effective in

reducing the PMS. *The Seventh*, **Khalil et al (2020)** who had studied the effect of relaxation training augmented with foot reflexology on symptoms of premenstrual syndrome among nursing female students. They reported that on post-intervention, more than three-quarters of the study students in the relaxation, reflexology, and the majority in the combined group had no physical symptoms and there was no improvement among the control group.

However, the findings of the present study contradicted with those of **Ansari et al (2014)** who investigated "The effect of sole reflexology (Reflex Zone Therapy) on the intensity of premenstrual syndrome: A single-blinded randomized controlled trial." They found that there is no statistically significant difference between the mean differences of the intensity of behavioral symptoms among real and unreal reflex zone therapy group. They also concluded that the real reflex zone therapy was not effective in decreasing the intensity of behavioral symptoms. This difference between the present study and the study of **Ansari et al (2014)** may be related to the difference in the duration and time of the intervention. Where, **Ansari et al** apply the foot reflexology once a week for half an hour in each session (without considering the menstrual phases) for eight weeks. While in the present study the duration of foot reflexology was 20 minutes (10 minutes in each foot) once in a day for 7 days (starts from 5 days before menstruation and ends with 2nd day of menstrual cycle) synchronous with PMS symptoms in two consecutive menstrual cycles.

PMS sometimes prevents girls from attaining the best level of performance, with social isolation, work inefficiency or even absenteeism as

possible consequences. As expected in the current study, the more the severe PMS symptom the more the negative effects on subject's daily life activities. As illustrated in the present study, PMS had moderate and severe effects on daily life activities such as academic productivity, relationships with others, social life activities and home responsibilities among the study and control groups before the intervention. These results are in line with **Dennerstein et al (2010)** who conducted a study about the effect of premenstrual symptoms on activities of daily life, they reported that all premenstrual symptoms were found to have significant effects on activities of daily living and there were no differences between the effect of physical and mental premenstrual symptoms in this regard. In addition, **Hammam, et al (2017)** also found that PMS showed significantly greater impairment on housework and relationship with others. Moreover, the study of **Schoep et al (2019)** revealed that 38% of all women said that they couldn't do all of their typical daily tasks during their menstrual period. Only 48.6% of the women who had to skip chores due to their symptoms told their families that menstrual problems were the reason for the work transfer.

The results of the current study also revealed that the negative effects of PMS on daily life activities significantly decreased after two months of the implementation of foot reflexology among the study group. Meanwhile, such decreased was not found among the control group after two months of the implementation of placebo foot massage. Where all parameter of daily life activities as academic productivity, relationships with others, social life activities and home responsibilities significantly improved in the study group

than in control group. This may be due to reflexology has been shown to be helpful at reducing tension and stress throughout the body by triggering the relaxation response. It also improves nerve and blood flow throughout the body by assisting the nervous and circulatory systems in their functions (**Schoep et al 2019**). Reflexology helps to normalize body functioning by relaxing tight muscles, encouraging proper endocrine gland function, and speeding up the elimination of toxins (**Chandrababu et al 2019**).

Conclusion:

Based on the results of the present study, it can be concluded that; H1 is accepted; while H0 is rejected as evidenced by female students who received reflexology foot massage exhibited less severity of premenstrual symptoms than those who received placebo foot massage. In addition, the severity of the negative effects of PMS on the daily life activities was significantly decreased among the study group than the control group. Therefore, reflexology foot massage can be used to improve PMS physical, psychological and behavioral symptoms.

Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

1. Reflexology foot massage should be recommended as a non-pharmacological management to relieve PMS.
2. Counselling and educational programs to encourage nursing female students

to practice reflexology foot massage during PMS.

3. Nurses and midwives should get training about reflexology foot massage, and encourage the girls with PMS to practice it.
4. Further researches are also recommended, replication of the current study using a large probability sample and different settings to allow greater generalization of the results.

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