



## Efficacy of Pulsed Electromagnetic Field in Treatment of Primary Dysmenorrhea.

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### ABSTRACT

**Aims:** To investigate the effect of pulsed electromagnetic field (PEMF) in treatment of primary dysmenorrhea.

**Study design:** Experimental.

**Place and Duration of study:** Faculty of Physical Therapy Kafrelsheikh University, between December 2013 to March 2014.

**Methodology:** Thirty volunteers girl suffer from primary dysmenorrhea, their ages ranged from 17-25 years, they were received PMF one hour in first day of menstruation. All girls were evaluated before and after the end of the treatment program using present pain intensity scale for pain assessment, blood sample for assessment of prostaglandin level in blood and menstrual symptom questionnaire for assess the physical and psychological symptoms that associated with dysmenorrhea.

**Results:** The obtained results showed highly statistically significant decrease in menstrual pain intensity, ( $p < 0.0001$ ), and highly statistically significant decrease in prostaglandin level in blood, ( $p < 0.0001$ ), and improvement in physical and psychological symptoms that associated with dysmenorrhea, ( $p < 0.0001$ ) after treatment program

**Conclusion:** PEMF appears to be effective in the treatment of primary dysmenorrhea.

**Keywords:** Dysmenorrhea – PEMF– Present pain intensity scale -Prostaglandin – Menstrual symptom questionnaire

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## 1. INTRODUCTION

Dysmenorrhea is the most common gynecological complaint among adolescent and young adult females with a major impact on women's quality of life, work productivity, and health-care utilization[1]. It is defined as painful menses in women with normal pelvic anatomy, usually beginning during adolescence, may be categorized into two distinct types: primary and secondary dysmenorrhea[2]. Primary dysmenorrhea is associated with normal ovulatory cycles and with no pelvic pathology. Primary dysmenorrhea is a painful menstrual cramps without any evident pathology to account for them, and it occurs in up to 50% of menstruating females and causes significant disruption in quality of life and absenteeism[3]. In primary dysmenorrhea pain begins few hours before or after the onset of menstruation and lasts for 24-48 hours. The pain is more in the first day and rarely continues to next day. Dysmenorrhea pains are felt in lower abdomen and may radiate into inner parts of thighs. In a high percentage of cases, girls may experience systematic symptoms such as backache, nausea, vomiting, diarrhea, fatigue and headache[4]. The pain appears to be the effects of prostaglandins released by the disintegrating endometrium during menstruation[5]. Clinical research has identified a physiological reason for dysmenorrhea is the production of uterine prostaglandins. During endometrial sloughing, endometrial cells release prostaglandins as menstruation begins. Prostaglandins stimulate myometrial contractions and ischaemia. These levels are highest during the first two days of menstruation. Prostaglandins are also implicated in secondary dysmenorrhea[6]. Several approaches have been proposed for dysmenorrhea, including non-steroid anti-inflammatory drugs (NSAID), oral contraceptives and vitamins[7]. NSAID can produce side effects including increased gastric acidity (heart burn), gastric ulcer, nausea, vomiting, blood disorder (prolonged bleeding time), allergic reactions, decreased renal blood flow and renal papillary necrosis[8]. Electromagnetic fields are now used as one of the efficient modalities in field of physical therapy for treatment of many pathological conditions, it exhibits the following activities: vasodilation, analgesic action, anti-inflammatory action and antiedematous activity[9]. Electromagnetic therapy carries the promise to heal numerous health problems, even where conventional medicine has failed. Today, magnetotherapy provides a non-invasive, safe, and easy method to directly treat the site of injury, the source of pain and inflammation, and a variety of diseases and pathologies. Millions of people worldwide have received help in treatment of the musculoskeletal system, as well as for pain relief. Pulsed electromagnetic fields (PEMF) are one important modality in magnetotherapy [10].

The general effects of PEMF on biological tissues include: pain relief, reduction of inflammation, increasing the number of white blood cells and fibroblast in the wound, improve rate of edema reduction, absorption of hematoma, stimulates osteogenesis, anti-infective activity, and improves the healing of peripheral and central nervous system[11].

The purpose of this study: to investigate the effect of PEMF in treatment of primary dysmenorrhea.

## 2. MATERIALS AND METHODS

This study is carried out on 30 student females with regular menstrual cycle 21-35 days lasting 3-7 days suffering from primary dysmenorrhea, they selected randomly from Faculty of Physical Therapy Kafrelshiekh University, their age ranged from 17-25 years old, their body mass index (BMI) ranged from 18.5-25 kg/m<sup>2</sup> with no medical or psychological problems. All data and information of each female who was participate in this study was recording data sheet in addition to menstrual history including age of menarche, menstrual interval, amount of blood flow. Pain assessed by present pain intensity (PPI) [12] before and after treatment procedure, it is a graphic rating scale with numerical values placed equidistantly along the line. The descriptors and numbers help the subject to place her estimate on line in which 0 mean no pain, 1 equal mild pain, 2 equal moderate pain, 3 mean severe pain and 4 mean unbearable pain, this test was applied to determine the severity of pain before and after treatment procedure, sample of blood was taken before and after application of treatment to detect the level of prostaglandin, and each subject asked to complete the menstrual symptom questionnaire[13][14] before and after treatment procedures. Each female was lying in a comfortable modified side lying position with small pillows under her body curves. Then, PEMF applied one electrode above suprapubic region and another electrode on the lumbar region from (T10 – L1) supported by long strap for 1 hour in first day of menstruation with frequency 50 Hz and intensity of 60 gauss. The data of this study were analyzed statistically by using the following:

Descriptive statistics was used for the collected data to calculate the mean, standard deviation (SD), percentage and student t- test for comparing between pre and post treatment measures, Chi-square for qualitative analysis. P value is the degree of significance, which is selected at 5% level. p- Value > 0.05 indicates non significant results, while p- value < 0.05 indicates significant results and p-value < 0.001 indicates highly significant results.

## 3. RESULTS

### 3.1 Physical characteristics of the patients

There was no significant difference (P= .068, 0.71, 0.068 and 0.15) in the group regarding to their ages, age of menarche, duration of menstrual history and amount of blood flow (Table 1).

**Table 1. physical characteristic of subjects**

Basic data	number	percent	Significant test
<b>Age</b>			
≤17	10	33.33%	0.068 NS
17-22	20	66.67%	
<b>Age of menarche</b>			
≤12	14	46.67%	0.71 NS
12-15	16	53.33%	
<b>Duration of menstrual cycle</b>			
≥4 days	10	33.33%	0.068 NS
4-6 days	20	66.67%	
<b>Amount of menstrual flow</b>			
Scanty (1 pad)	13	43.33%	0.15 NS
Average (2-3 pads)	5	16.67%	
excessive≥4 pads	12	40%	

### 3.2 Pain Severity.

The intensity of pain assessed by present pain intensity scale as experienced by each female before and after treatment procedures. Before starting the procedures, pain was felt unbearable in 2 cases (6.6%), severe pain in 3 cases (10%), moderate pain in 11 cases (36.6%) and mild pain in 14 cases (46.6%), while after treatment the pain was felt mild in 6 cases (20%), moderate in 1 case (3.3) and 23 cases (76.6%) did not feel any pain. The mean value of pain severity for patients before starting the study was  $1.770 \pm 0.90$  and it was decreased after the end of the treatment program to  $0.27 \pm 0.52$  with mean difference of 1.55 The difference is highly statistically significant ( $p < 0.0001$ ) with percentage of change 84.7% in pain severity at the end of study. (Table 2)

**Table 2. percentage of pain intensity before and after treatment procedures**

PPI scores	PPI scores			
	Before starting treatment		After treatment rogram	
	Number	%	Number	%
No pain	-		23	76.6%
Mild pain	14	46.6%	6	20%
Moderate pain	11	36.6%	1	3.3%
Sever pain	3	10%	-	
Unbearable pain	2	6.6%	-	
mean	1.77		0.27	
SD	±0.9		±0.5	
Percentage of change	84.7%			
Level of significant	0.0001			

The site of pain for each female before and after treatment procedures. Before treatment number of female who felt pain in lower abdomen and radiated to back and thigh were (18) cases with percent of 60% and at lower abdomen were (12) cases with percent of 40%, , while after treatment the number of cases who became free from pain were ( 23) cases with percent of 76.67%, pain in lower abdomen radiate to back and thigh was (1) case with percent of 3.33%, and pain in lower abdomen were (6) cases with percent of 20%. Comparison between before and after treatment showed a statically significant change ( $p < 0.0001$ ) in location of pain after treatment program. (Table 3).:

**Table 3. Number and percent distribution of the study subjects according to site/location of pain before and after treatment**

Presence of pain	Before treatment	Percent	After treatment	percent
yes	30	100%	7	23.33%
no	-	-	23	76.67%
Significant test	0.0001 S			
At lower abdomen radiate to back and thigh	18	60%	1	3.33%
At lower abdomen	12	40%	6	20%
no	-	-	23	76.67%
Significant test	0.0001 S			

### 3.3 Prostaglandin level blood

The mean value of prostaglandin level in blood for patients before starting the study was (33.970±12.34) and it was decreased after the end of the treatment program to (13.07±7.08) with mean difference of 20.9. The difference is highly statistically significant ( $p < 0.0001$ ) with percentage of change 61.4% in prostaglandin level at the end of study (Table. 4)

**Table 4. the mean value of prostaglandin level before and after treatment**

Prostaglandin level in blood		
	Before starting treatment	After the end of treatment
mean	33.97	13.07
SD	±12.34	±7.08
Mean difference	20.90	
Percentage of change	61.52%	
Level of significant	0.0001	

### 3.4 Menstrual symptom questionnaire

#### Severity of physical symptom.

The number of subjects before treatment program who hadn't any physical symptom were (4) subjects with percent of 13.33%, mild physical symptom were (12) subjects with percent of 40%, moderate physical symptom (10) subjects with percent of 33.33% and severe symptom were (4) subjects with percent of 13.33%, while after treatment the number of subjects who became free from physical symptoms were (23) subjects with percent of 76.67%, mild physical symptoms (6) subjects with percent of 20%, moderate physical symptoms (1) subjects with percent of 3.33%. Comparison between before and after treatment showed a statistically significant decrease ( $p < 0.0001$ ) in severity of physical symptom after treatment program. (Table 5)

**Table 5. Number and percent distribution of the study subjects according to severity of physical symptom.**

Severity of associated physical symptom of primary dysmenorrhea	Before treatment	percent	After treatment	percent
absent	4	13.33%	23	76.67%
mild	12	40%	6	20%
moderate	10	33.33%	1	3.33%
severe	4	13.33%	-	-
Significant test	0.0001 S			



**Severity of associated symptom**

The effect of primary dysmenorrhea on associated physical symptom as : there were significant improvement( $p < 0.001$ ), ( $p < 0.0001$ ), ( $p < 0.003$ ), ( $p < 0.04$ ), ( $p < 0.0001$ ), ( $p < 0.0001$ ), ( $p < 0.0001$ ) regarding to, associated nausea and vomiting, anorexia , diarrhea , water retention, dizziness and fatigue ,headache and mood change after treatment program. (Table (5)a)

**Table 5. Numbers and percent distribution of the study subjects according to associated physical symptom of primary dysmenorrhea**

Severity of symptom		Before treatment		After treatment	
		Number	percent	number	percent
Nausea	Absent	8	26.67%	17	56.66%
	Mild	5	16.66%	11	36.67%
	Moderate	11	36.67%	-	-
	Severe	6	20%	2	6.67%
Significant test		0.001 S			
Anorexia	Absent	3	10%	17	56.67%
	Mild	10	33.33%	12	40%
	Moderate	8	26.67%	-	-
	Severe	9	30%	1	3.33%
Significant test		0.0001 S			
diarrhea	Absent	7	23.33%	18	60%
	Mild	10	33.33%	10	33.33%
	Moderate	7	23.33%	2	6.67%
	Severe	6	20%	-	-
Significant test		0.003 S			
Water retention	Absent	17	56.67%	22	73.33%
	Mild	6	20%	8	26.67%
	moderate	2	6.67%	-	-
	Severe	5	16.67%	-	-
Significant test		0.04 S			
Severity of PMS symptom		Before treatment		After treatment	
		Number	percent	number	percent
Dizziness & fatigue	Absent	3	10%	15	50%
	Mild	7	23.33%	14	46.67%
	Moderate	12	40%	1	3.33%
	Severe	8	26.67%	-	-
Significant test		0.0001 S			
Headache	Absent	2	6.67%	15	50%
		8	26.67%	14	46.67%



	Mild				
	Moderate	16	53.33%	1	3.33%
	Severe	4	13.33%	-	
Significant test		0.0001 S			
Mood change	Absent	1	3.33%	13	43.33%
	Mild	4	13.33%	15	50%
	Moderate	19	63.33%	2	6.67%
	Severe	6	20%	-	
Significant test		0.0001 S			

**Severity of psychological symptoms.**

The number of subjects who had mild psychological symptom were (9) subjects with percent of 30%, moderate symptom(10) subjects with percent of 33.33% and severe symptom were(11) subjects with percent of 36.67%, while after treatment the number of subjects who hadn't any psychological symptom became(16) subjects with percent of 53.33%, mild symptoms (8) subjects with percent of 26.67%, moderate symptoms(6) subjects with percent of 20%. Comparison between before and after treatment showed a statically significant decrease (( $p < 0.0001$ )in severity of psychological symptoms after treatment program. (Table 6)

**Table 6. Number and percent distribution of the study subjects according to severity of psychological symptom**

Severity of psychological affect daily activity	Befor treatment	percent	After treatment	percent
absent	-		16	53.33%
mild	9	30%	8	26.67%
moderet	10	33.33%	6	20%
severe	11	36.67%	-	
Significant test	0.0001 S			

**Effect of primary dysmenorrheal on daily activity**

There were significant improvement ( $p < 0.0001$ ), ( $p < 0.0001$ ), ( $p < 0.0001$ ) regarding to academic productivity, home responsibility and social life activity after treatment program.

**Table 6a. Number and percent distribution of study subjects according to the effects primary dysmenorrhea on their daily life activates before and after treatment**

Severity of symptom on daily activity		Before treatment		After treatment	
		Number	percent	number	percent
Academic productivity	Absent	-	-	15	50%
	Mild	9	30%	13	43.33%
	Moderate	16	53.33	1	3.33%
	Severe	5	16.67%	1	3.33%
Significant test		0.0001 S			
Home responsibility	Absent	-	-	13	43.33%
	Mild	11	36.67%	14	46.67%
	Moderate	13	43.33%	3	10%



	Severe	6	20%	-	
Significant test		0.0001 S			
Social activity life	Absent	-		12	40%
	Mild	12	40%	15	50%
	Moderate	10	33.33%	3	10%
	Severe	8	26.67%	-	-
Significant test		0.0001 S			

SD: standard deviation, P: probability, S: significant, NS: non significant

#### 4- DISCUSSION

Primary dysmenorrhea or painful menstruation is one of the most common complaints of women and is also the most common gynecological problem worldwide[15]. These cramps are recurrent and 90% adolescent girls and about 50% woman suffer from it[16]. The etiology of primary dysmenorrhea is not precisely understood, but most symptoms can be explained by the action of uterine prostaglandins, particularly PGF2α. During endometrial sloughing, the disintegrating endometrial cells release PGF2α as menstruation begins. PGF2α stimulates myometrial contractions, ischemia and sensitization of nerve endings, increase the amplitude and frequency of uterine contraction and causes vasospasm of the uterine arterioles resulting in ischemia and cyclical lower abdominal cramps[17]. Prostaglandin inhibitor drugs cause hepatic, renal, hematologic, gastrointestinal discomfort and central nervous system toxicity including indigestion, nausea, abdominal pain, constipation, diarrhea, vomiting, headache, dizziness, vertigo, visual disturbances as blurred vision, rashes and bronchospasm. In addition contraindications to the use of PGSI include gastrointestinal ulcer, asthma, and hypersensitivity to aspirin and similar agents On other hand some experimental studies have found alternative methods as TENS, Acupuncture, heat application, low level laser and aerobic exercise[18]. Magnetic field therapy now used as one of the efficient modalities in the field of physical therapy for the treatment of many pathological condition with out side effects. It has analgesic, anti inflammatory, vasodilatation and anti edematous activity [9] PEMFs have been used extensively in many conditions and medical disciplines. PEMFs produced significant reduction of pain, improvement of spinal functions and reduction of paravertebral spasms[19] In this study thirty subjects were suffering from primary dysmenorrhea and receive PEMF one hour in first day of menstruation. Result of this study showed that a highly statistically significant (p<0.0001) decrease in pain severity, this results agree with[9] stated that magnetic field therapy has analgesic, anti inflammatory, vasodilatation and anti oedematous activity without side effect and accompanied by an increase in the threshold of pain sensitivity and activation of the anticoagulation system. PEMF treatment stimulates production of opioid peptides; activates mast cells and increases electric capacity of muscular fibers[20]. And this result are in line with [21] stated that high frequency PEMF over 10-15 single treatments every other day either eliminates or improves, even at 2 weeks following therapy, in 80% of patients with pelvic inflammatory disease, 89% with back pain, 40% with endometriosis, 80% with postoperative pain, and 83% with lower abdominal pain of unknown cause. The result was supported by [22] stated that PEMFs have also been found only slightly useful in treating pain, muscle spasms and swelling during wisdom tooth extraction. PEMF therapy has been used successfully in the management of postsurgical pain and edema, the treatment of chronic wounds, and in facilitating vasodilatation and angiogenesis[23] Concerning the effect of PEMF on the level of prostaglandin caused which is the main cause of pain the result was a highly statistically significant (p<0.0001) decrease in level of prostaglandin in blood, this result agree with[11] concluded that, the general effects of PEMF on biological tissues include: pain relief, reduction of inflammation, increasing the number of white blood cells and fibroblast in the wound, improve rate of edema reduction, bsorbtion of hematoma, stimulates osteogenesis, anti-infective activity, and improves the healing of peripheral and central nervous system, the results are in line with [24] mention that PEMF used in treatment of Pelvic pain of gynecological origin as ruptured ovarian cysts, postoperative pelvic hematomas, chronic urinary tract infection, uterine fibrosis, dyspareunia and endometriosis . This study examined the effects of extremely-low-frequency magnetic fields in the treatment of a group of 650 patients suffering from a host of various diseases. Treatment consisted 15-25 minute daily exposures 5 days per week over a total of 20-25 days. Most patients experienced improvements after 2-3 exposures. Marked improvements were seen with respect to analgesic, anti-inflammatory, anti-tumor, and immune-enhancing effects, [25], also, the results of this study was supported by[26] stated that the administration of constant magnetic field in combination with other treatment modalities led to significant beneficial effects in patients suffering from acute endometritis following abortion.

Concerning on severity of physical symptom associated with dysmenorrhea, the result showed that a highly statistically significant (p<0.0001) decrease in the severity of physical symptom associated with dysmenorrhea. The results of present study can be explained by [4]and [27] concluded that, in a high percentage of cases, girls may experience systematic symptoms such as backache, nausea, vomiting, diarrhea, fatigue and headache, the main cause of primary dysmenorrhea is prostaglandin production and also is the main cause of other symptoms associated with primary dysmenorrhea, like nausea and vomiting. The result showed that a highly statistically significant (p<0.0001) decrease in the severity of psychological symptom of dysmenorrheal the results are agree with[28] and [29] stated that although not life threatening, dysmenorrhoea can be particularly disruptive to a woman's daily life and productivity. In the absence of appropriate pain relief, women with severe dysmenorrhoea may not be able to carry out their normal activities, Menstrual pain is associated with decreased academic performance, participation in social or activities and absence from work [30] In the United



States, dysmenorrhea is the leading cause of recurrent short-term school absenteeism. In certain study showed that adolescents with dysmenorrhea report that, it effects their academic performance, social and sports activities[31].

## 5.CONCLUSION

It could be concluded that PEMF appears to be effective in treatment of primary dysmenorrhea, providing a simple, safe, inexpensive and successful alternative rather than pharmacological treatment.

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