RESEARCH PAPER

Effect of Polarized Light Therapy on Low Back Pain in Premenstrual Syndrome

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ABSTRACT

Purpose: To investigate the effect of polarized light therapy (Bioptron) on low back pain in premenstrual syndrome.

Subjects: Sixty patients with PMS complaining of low back pain were randomly selected from the Out-Patient Clinic of Gynecology Department of El Minya University Hospital. Their ages ranged from 18 to 35 years old and BMI didn't exceed 30 kg/m².

Design: Randomized controlled study. Participants were randomly divided into two equal groups (A & B). Group A (Control): 30 women received traditional medical treatment. Group B (Study): 30 women received polarized light therapy (average energy density 2.4 J/cm², 15 minutes/session, three sessions/week for 8 weeks) in addition to traditional treatment.

Assessment: Pain intensity was measured using the Visual Analogue Scale (VAS), pain pressure threshold using a pressure algometer, and functional disability using the Oswestry Disability Index (ODI) before and after treatment.

Results: Within groups; there was a statistically significant decrease in the mean values of VAS and ODI & significant increase in pain pressure threshold in both groups A and B post treatment. Between groups; Post treatment, there was a statistically significant difference between both groups A and B in the mean values of VAS, ODI and pain pressure threshold with favor of group B.

Conclusion: Polarized light therapy is effective in reducing low back pain and improving functional ability in women with PMS.

Keywords: Polarized light therapy, Premenstrual syndrome, Low back pain.

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Introduction:

Premenstrual syndrome (PMS) encompasses clinically significant somatic and psychological manifestations during the luteal phase of the menstrual cycle due to cyclical fluctuation in ovarian hormones, particularly oestrogen and progesterone and their interaction with central neurotransmitters. leading to substantial distress and impairment in functional capacity. These symptoms disappear within a few days of the onset of menstruation (**Yesildere and Orsal, 2020)**. The pooled prevalence of reproductive age women affected with PMS worldwide amounts to 47.8% (**Frey et al., 2020)**. Among these, about 20% of women experience symptoms severe enough to disrupt their daily activities, and the remaining have mild to moderate symptoms. Symptoms of PMS include changes in appetite, weight gain, abdominal pain, back pain, low back pain, headache, swelling and tenderness of the breasts, nausea, constipation, anxiety,

irritability, anger, fatigue, restlessness, mood swings and crying (**Yesildere and Orsal, 2020)**.

PMS appears to be caused by a response of the central nervous system (CNS) to factors produced by the human corpus luteum (progesterone and its neuroactive metabolites such as allopregnanolone as well as cyclic fluctuations in estrogen), because the menstrual cycle-linked symptom variation is not manifested in spontaneous or Gonadotropin Releasing Hormone (GnRH) analog induced anovulatory cycles **(Zendehdel et al., 2018).**

Low back pain may develop premenstruation without presenting any other symptoms before starting menstruation **(Kim et al., 2012).** Menstrual pain and low back pain (LBP) in young females may affect their daily activities during menstruation cycles **(Smith et al., 2009).** Usually, the pain appears in the low back, below the abdomen and the waist, abdominal pain, depression, anxiety and disturbed social activities **(Bosse-Bringewatt, 2017).**

Low back pain is a leading cause of disability worldwide and imposes a significant socioeconomic burden on individuals and societies. This burden include lost productivity due to work absenteeism, increased healthcare utilization and substantial direct and indirect costs across healthcare system and economies **(chang et al., 2024).**

Medicinal and non-medicinal treatment methods such as anti-inflammatory pain relievers, Cyclooxygenase controller drugs, contraceptives, psychotherapy, and physical therapy are applied for menstrual pains treatment **(Yekke et al., 2013)**.

There are alternative methods in physical therapy field such as TENS, Acupuncture, heat application, low-level laser and aerobic exercise have an analgesic effect and may modulate the PMS symptoms **(Rodrigues et al., 2014).**

Polarized polychromatic light therapy is a low-power light source as well like laser therapy. However, rather of being monochromatic and coherent light beam, polarized light is polychromatic and non-coherent. Further, compared to laser therapy, linear polarized polychromatic light therapy is less expensive and does not necessitate the same safety measures for both the patient and the therapist and allows wider areas to be irradiated (**Raeissadat et al., 2014).**

Polarized polychromatic light in the range of red and near-infrared rays is a non-pharmacological therapeutic modality that is user-friendly, safe, and inexpensive (**Feehan et al., 2020)**. It has been shown to promote biological activities when compared to non-polarized light (**Anders et al., 2015)**. The energy absorption by photoacceptors (chromophores) during light irradiation determines the photo-biological activities (**Passarella and Karu, 2014)**. The physiological effects of infrared radiation are assumed to be caused by two kinds of photoacceptors (i.e., intracellular water and cytochrome c oxidase). Light is converted into signals through photon absorption, which may then be used to trigger biological activities (**Bashkatov et al., 2005)**.

The direct impact of Bioptron light therapy (BLT) on nerve terminals and the entire neurological system, is via stimulating neurotransmitters and increasing secretion of endorphins **(Colic, 2012).** In addition to its analgesic effects, the peripheral vasodilation caused by this treatment enhances the delivery of oxygen as well as nutrients to injured soft tissues, accelerates their recovery, and decreases pain **(Medenica and Lens, 2003).**

Polarized light has the advantage of deeper tissue penetration to a depth of up to 5 cm, that has been shown to accelerate ulcer healing and musculoskeletal injuries (**Feehan et al., 2018).**

The polarized polychromatic non-coherent low energy light (PPL), emitted by the Bioptron apparatus with its infrared light causes warming of the skin, irritation activation of segment-reflexive and local reactions, improves microcirculation and the nutrition of the exposed tissues, changes the skin sensitivity, and raises the tactile sensitivity and lowers the pain sensitivity **(Mihaylova et al., 2017).**

Recent evidence indicates that polarized light and photobiomodulation therapies can reduce pain and improve functional outcomes by modulating inflammatory mediators, enhancing microcirculation, and increasing tissue elasticity, which collectively contribute to decreased nociceptor sensitivity and improved pain thresholds. For example, a randomized controlled trial demonstrated that polarized polychromatic light therapy significantly reduced pain intensity and increased pain pressure threshold in individuals with chronic non-specific low back pain compared with sham treatment, suggesting beneficial

effects on musculoskeletal pain conditions **(Shiryan et al., 2022).**

Up to available literature, there is limited researches on the effect of Polarized light on the premenstrual related low back pain. Based on this, the purpose of this research was developed.

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Subjects, Materials and Methods:

I- Subjects:

This study was conducted to investigate the effect of polarized light therapy (Bioptron) on low back pain in premenstrual syndrome. Sixty patients with premenstrual syndrome complaining of low back pain participated in this study. They were selected randomly from the Out-Patient Clinic of Gynecology Department of El Minya University Hospital in El Minya. Their ages were ranged from 18 to 35 years old. Their BMI was not exceeded 30 kg/m². They were medically stable and consented to participate in the study. Patients with irregular menstrual cycles and pelvic pathology were excluded from the study. The duration of the study was from August 2022 to January 2024.

The study was approved from the ethical committee of Faculty of Physical Therapy, Cairo University (Approval No.: P.T.REC/012/003805).

Design of the study was randomized controlled study. All women were divided randomly into two equal groups (A&B). Group A (Control group): It was consisted of thirty patients and were treated by traditional medical treatment (NSAID). Group B (Study group): It was consisted of thirty patients and were treated by polarized light therapy with energy density of an average of 2.4 J/cm² 15 minutes/session, 3 times/week for 8 weeks in addition to traditional medical treatment. Standard weight height scale was used to measure weight and height to calculate body mass index (BMI) for each patient before treatment.

I- Procedures:

All patients were given a full explanation of the protocol of the study and consent form was signed for each patient before participating in the study, the purpose and nature of the study was explained to all patients.

A- Evaluation procedures:

1- Visual analogue scale (VAS):

Pain was assessed through VAS for each patient in both groups (A&B) before and after treatment.

2- Pressure algometer.

An electronic algometer was used to measure pain pressure threshold at the trigger point for all patients in groups A & B before and after treatment.

3- Oswestry Disability Index (ODI):

Used to assess pain-related disability for all patients in groups A & B before and after treatment.

B- Treatment procedures:

Polarized Light Therapy:

Applied to all patients in group B, 3 sessions/week for 8 weeks. During the procedure, the patient was placed in a comfortable lying position. The head of the device was directed perpendicular to the lower back region at a distance of approximately 10 cm from the skin. The degree of polarization of the light was greater than 95%. The power density of the polarized light therapy was about 40 mW/cm², which is equivalent to an average energy density of 2.4 J/cm² per minute. The treatment was then started and continued for 15 minutes.

Statistical analysis:

Results are expressed as mean ± standard deviation. Test of normality, Kolmogorov-Smirnova test, was performed to measure the distribution of data measured at pre-treatment. Data are normally distributed so comparison between variables in the two groups was performed using unpaired t test. Comparison between pre- and post-treatment data in the same group was done using paired t test. Statistical Package for Social Sciences (SPSS) computer program (version 19 windows) was used for data analysis. P value ≤ 0.05 was considered significant.

Results:

I- General characteristics of the two studied groups:

There was no statistically significant difference between the two groups as regards age (t= 0.521, p= 0.604) and BMI (t= 0.938, p= 0.352) (Table 1).

Table (1): Comparison between mean age and BMI values of the two studied groups.

	Group A	Group B	t value	p value

Age (yrs.)	27.83 ± 4.02	27.30 ± 3.86	0.521	0.604 (NS)
BMI (kg/m²)	26.48 ± 1.74	26.93 ± 1.97	0.938	0.352 (NS)

Data are expressed as mean ± SD. NS= p> 0.05= not significant.

II- VAS, Pressure algometer and Oswestry disability index:

Within groups; there was a statistically significant decrease in the mean values of VAS and ODI & significant increase in pain pressure threshold in both groups A and B post treatment (Table 2).

Between groups; pre treatment, there was no statistically significant difference between both groups A and B in the mean values of VAS, ODI and pain pressure threshold (Table 2).

Post treatment, there was a statistically significant difference between both groups A and B in the mean values of VAS, ODI and pain pressure threshold with favor of group B (more decrease in VAS, ODI and more increase in pain pressure threshold) (Table 2).

Table (2): Inter- and intra-groups comparison between values of VAS, Pressure algometer and ODI in the two studied groups measured at pre- and post-treatment.

		Group A	**Group B**	**t-value**	**P-Val**
VAS	Pre-treatme	7.30 ±	7.60 ±	1.210	0.231
	Post-treatme	3.60 ±	2.13 ±	-6.20	0.001 (S)
	Mean differen	3.70 ±	5.47 ±	6.856	0.001 (S)
	% change	50.62 ↓↓	72.04 ↓↓		
	t# value	19.203	31.952		
	p value	0.001 (S)	0.001 (S)		
Pressure algometer	Pre-treatme	2.56 ±	2.52 ±	-0.24	0.804
	Post-treatme	3.13 ±	3.39 ±	2.319	0.024 (S)
	Mean differen	0.57 ±	0.87 ±	4.906	0.001 (S)
	% change	25.03 ↑↑	36.42 ↑↑		
	t# value	-10.9	-29.0		
	p value	0.001 (S)	0.001 (S)		
ODI	Pre-treatme	51.27 ±	52.23±	0.484	0.630
	Post-treatme	23.90 ±	13.33±	-10.9	0.001 (S)
	Mean differen	27.37 ±	38.90 ±	8.592	0.001 (S)
	% change	53.30 ↓↓	74.74 ↓↓		
	t# value	15.229	24.568		
	p value	0.001 (S)	0.001 (S)		

Data are expressed as mean ± SD. t value= unpaired t test, t#= unpaired t test. NS= p> 0.05= not significant; S= p≤ 0.05= significant.

Discussion:

The purpose of this study was to investigate the effect of polarized light therapy on low back pain in women suffering from premenstrual syndrome. The result revealed that there were no statistically significant differences between both groups before treatment. However, after treatment there were statistically significant improvement in pain intensity (VAS),pain pressure threshold and functional disability (ODI) in favor of the study group (B), indicating that polarized light therapy provided additional benefits beyond traditional medical treatment alone.

The significant improvement observed in pain intensity, pain pressure threshold, and functional disability in the Bioptron group suggests that polarized light therapy may have a clinically beneficial effect on low back pain associated with premenstrual syndrome. This improvement may be attributed to enhanced microcirculation, stimulation of cellular metabolism, reduction of inflammatory mediators and modulation of nerve conduction. Additionally, polarized light may stimulate endorphin release and improve tissue oxygenation which could explain the increased pain threshold and reduction in disability scores observed in the present study **(El-Deep et al., 2025).**

All the previous researches found a significant reduction in pain intensity and an increase pain pressure threshold among patient suffering from low back pain **(Ahmed et al., 2024, Bernaola-Pauli et al.,**

2019, Mihaylova et al., 2017 and Shiryan et al., 2022).

On the other hand, some studies have reported inconclusive or less favorable findings regarding polarized light therapy. **(Djavid et al., 2007)** suggested that the observed pain reduction may be partially attributed to placebo effects or concurrent conventional treatment. **(Chow et al., 2009)** indicated that low-level laser therapy may provide more consistent analgesic effects compared to polarized light due to more specific wavelength parameters. Moreover, **(Hamblin, 2016)** highlighted that the biological mechanisms underlying polarized light therapy are not yet fully clarified, and strong evidence supporting its use as a standalone pain management modality remains limited. These discrepancies may be explained by variations in treatment parameters, duration, sample size, and methodological design among different studies. This encourages us to apply this further research and recommend more research to be applied to verify the effect of polarized light on premenstrual low back pain.

Conclusion:

It can be concluded that polarized light therapy is effective in reducing low back pain in premenstrual syndrome through improvements in pain intensity, pain pressure threshold and functional disability.

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