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The role of physiotherapy interventions in alleviating physical symptoms and improving quality of life in individuals with premenstrual syndrome: A systematic review and meta-analysis

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Abstract

Premenstrual syndrome (PMS) is a frequently occurring disorder that women of reproductive age suffer. PMS often begins 6 to 12 days before menstruation and ends up to 2 to 4 days after menstruation starts. PMS has a negative impact on the Women's Physical and mental health. The aim of this study is to determine the effectiveness of various physiotherapeutic approaches in managing PMS-related discomfort, enhancing overall well-being, and improving quality of life. Databases Google Scholar, PubMed, and Medline were searched for articles published from the year 2013-2023. This systematic review with Meta-analysis was conducted from February 2024 to April 2024. The randomized controlled trials, randomized clinical trials, and pre-post experimental studies were selected for this study. Visual Analog Scale (VAS), Premenstrual syndrome scale (PMSS), Numeric Pain Rating Scale (NPRS), and Beck Depression Inventory scale (BDI) were used as outcome measures. The 14 studies included in this review were screened by the 3 authors independently and extracted the data. Meta-analysis was performed by using a random-effect model. Physiotherapy interventions were found to be effective in the reduction of depression compared to the control group whereas the p-value was significant < 0.001 . Additionally, physiotherapy was more effective in reducing pain than the control group, with VAS scores for pain showing a mean difference (95% CI) of 2.84 [-1.75, 7.43]. The present study results show that physiotherapy interventions can be promising and very effective in alleviating premenstrual symptoms and improving quality of life.

Keywords: Physical Therapy Modalities, Quality of Life, Female, Premenstrual Syndrome

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Introduction

Premenstrual syndrome (PMS) is a frequently occurring disorder that women of reproductive age suffer [1]. R.T. Frankin invented the term "premenstrual tension" in 1931, while Greene and Dalton coined the term "premenstrual syndrome" in 1953 [2]. PMS is characterized by a variety of symptoms that appear during the luteal phase of the menstrual cycle and go away with the beginning of menstruation or a few days later [3]. The disorder often begins 6 to 12 days before menstruation and can last 2 to 4 days after menstruation ends [4]. 70–90% of women have various levels of PMS symptoms, with 20–40% experiencing disruption in daily activities [5]. PMS has a negative impact on women's mental and physical wellness, and it affects around 48% of women of reproductive age [6]. The prevalence of PMS worldwide is 14.3%-74.4% [7]. According to a population-based study, women with mild to severe PMS had a major depression prevalence of 11.3% and 24.6%, respectively. Throughout their reproductive lives, women with PMS endure 20% to 76% depression [8].

PMS symptoms include fatigue, bloating, irritability, melancholy, and anxiety. Anxiety, tenseness, mood swings, difficulty concentrating, changes in appetite, sleeplessness, swelling, exhaustion, and vertigo are some of the other indications and symptoms. Changes in sexual desire and food cravings are common examples [6]. Physical symptoms include weight gain, limb swelling, back pain, stomach pain, nausea, muscle and joint pain, and tenderness and swelling of the breasts [9]. Despite the significant symptoms and high frequency of PMS, the real causes of the condition have not yet been identified, and the treatments that are now available merely aim to manage the symptoms [10]. The majority of PMS symptoms are managed, however, the aetiology of PMS is not known [11].

Treatment options often include surgery, pharmaceutical therapy, and nonpharmacological therapy [12]. Engaging in regular physical activity and exercising boosts confidence and promotes a positive body image, all of which diminish the likelihood of developing depression [13]. Exercise is the best approach for all women to reduce stress and restore the brain's chemical secretions to balance, which makes it a beneficial treatment for PMS. By raising endorphins and lowering adrenal cortisol, exercise appears to improve pain tolerance and lessen anxiety, depression, and other symptoms associated with PMS [13]. Exercise can help lower physical stress and enhance the lipid profile [14]. Treatments for medical conditions include oral contraceptives and selective serotonin reuptake inhibitors (SSRIs) [5]. The medical treatment for PMS involves limiting the use of alcohol, nicotine, caffeine, and salt, as well as the prescription

of mefenamic acid, fluoxetine, bromocriptine, GnRH agonist, progesterone, contraceptives as well diuretics, lithium, and gamma-linolenic acid [15].

Aim of the study

This systematic review aims to investigate the effectiveness of physiotherapy interventions in alleviating the physical symptoms linked to premenstrual syndrome and enhancing the quality of life, and this review endeavours to offer evidence-based insights into how these interventions can alleviate PMS symptoms and improve overall quality of life.

Objectives

1. To explore the specific physical symptoms commonly associated with premenstrual syndrome that can be targeted by physiotherapy interventions.
2. To examine the evidence-based approaches used in physiotherapy to alleviate physical symptoms such as abdominal cramps, lower back pain, headaches, and fatigue in individuals with PMS.
3. To assess the effectiveness of various physiotherapy techniques including exercise therapy, manual therapy, and relaxation techniques in reducing the severity and frequency of physical symptoms experienced during the menstrual cycle.

Materials and methods

The protocol for this systematic review was registered in PROSPERO. The registration number is CRD42023459622.

Study design

Randomised Controlled Trials (RCTs), Non-Randomised Controlled Trials, Pre-Post experimental studies, and randomized clinical trials Published from the year 2013-2023 were included in this study.

The exclusion criteria for the study were having different groups, different outcome measures, and interventions other than physiotherapy were excluded.

Search strategy

Randomized Controlled Trials, Non-Randomized Controlled Trials, Pre-Post experimental studies, and randomized clinical trials published from the year 2013 to 2023 were searched using Google Scholar, PubMed, and Medline. Search terms used were “premenstrual syndrome” and “physiotherapy interventions” in an advanced search. And keywords premenstrual syndrome, Quality of life, PMS, Physical therapy modalities, Anxiety, Depression, Premenstrual pain, Premenstrual Tension, Menstrual Disturbances, Premenstrual Dysphoric Disorder, Premenstrual Dysphoric syndrome, Premenstrual treatment, and females were used. The search strategy was prepared using the Mesh terms.

Criteria for review (PICO)

Participants: Females with Premenstrual syndrome. All studies included females of age between 18-50 years

Interventions: Physiotherapy intervention to reduce physical symptoms and improve quality of life includes the effect of stretching exercises, Relaxation exercises, Aerobic exercises, Pilates, cognitive behavioural therapy, yoga, Pelvic rocking exercises, and other physiotherapy modalities.

Comparison: There is a comparison between acupuncture, alternative medicines, Pelvic rock exercises, Yoga, Pilates, and diet.

Outcomes and variables:

Main outcome: Visual Analog Scale (VAS), Premenstrual syndrome scale (PMSS), Numeric Pain Rating Scale (NPRS), Beck Depression Inventory Scale (BDI).

Additional outcome: Exercise self-efficacy scale (EXSE), Food Frequency Questionnaire.

Data extraction

The data extraction process was carried out collaboratively by three authors. Initially, the first author (S) identified articles that met the study's inclusion criteria. Subsequently, two other authors, GS and SK, were responsible for extracting information regarding outcomes and statistics required for effect size estimation. Any discrepancies were resolved through consensus. Data extraction was performed using a standardized table format, which encompassed details such as study design, study population, outcome measures, and intervention specifics for each study.

Assessment of risk of bias

The internal validity of the included studies was evaluated using the Cochrane risk of bias and the PEDro scale was employed to determine the level of evidence in the studies included. Various aspects were examined to assess bias risk, including blinding of participants and outcome assessors, allocation concealment, incomplete outcome data, and selective outcome reporting given in Figure 2a and 2b.

Data synthesis

Statistical analysis was conducted using Review Manager 5.4.1 software. The post-intervention means and standard deviations were utilized to determine the effect magnitude. Outcomes allocation concealment was analysed using the standardized mean difference with a 95% confidence interval. Results with clinical comparability were aggregated using meta-analysis utilizing the Random-effects model. In studies where meta-analysis was not possible, narrative synthesis was used as mentioned in Table 1.

Results

Study selection

A total of 283 records were identified through searches in various databases. After removing duplicates and excluding studies that did not match the inclusion criteria, 50 articles were screened. Of these, 7 studies were included in the meta-analysis, as shown in Figure 1.

Reporting bias assessment

The risk of bias for the included randomized controlled trials is depicted in Figures 2a and 2b. Out of the 14 studies included, 11 had random sequence generation, but 2 failed to conduct random sequence generation [16,17]. Allocation concealment was performed in 7 studies, while 3 did not implement it [4,5,18]. Four studies demonstrated blinding of participants and outcome assessors, whereas 2 did not [1,4]. Additionally, 4 studies had incomplete outcome data [5,6,13,18], and only 1 study showed performance bias [7]. Table 2 represents the quality scores of the included studies, with a mean PEDro score of 6.7 out of 10. Two studies had scores below 5 [12,17].

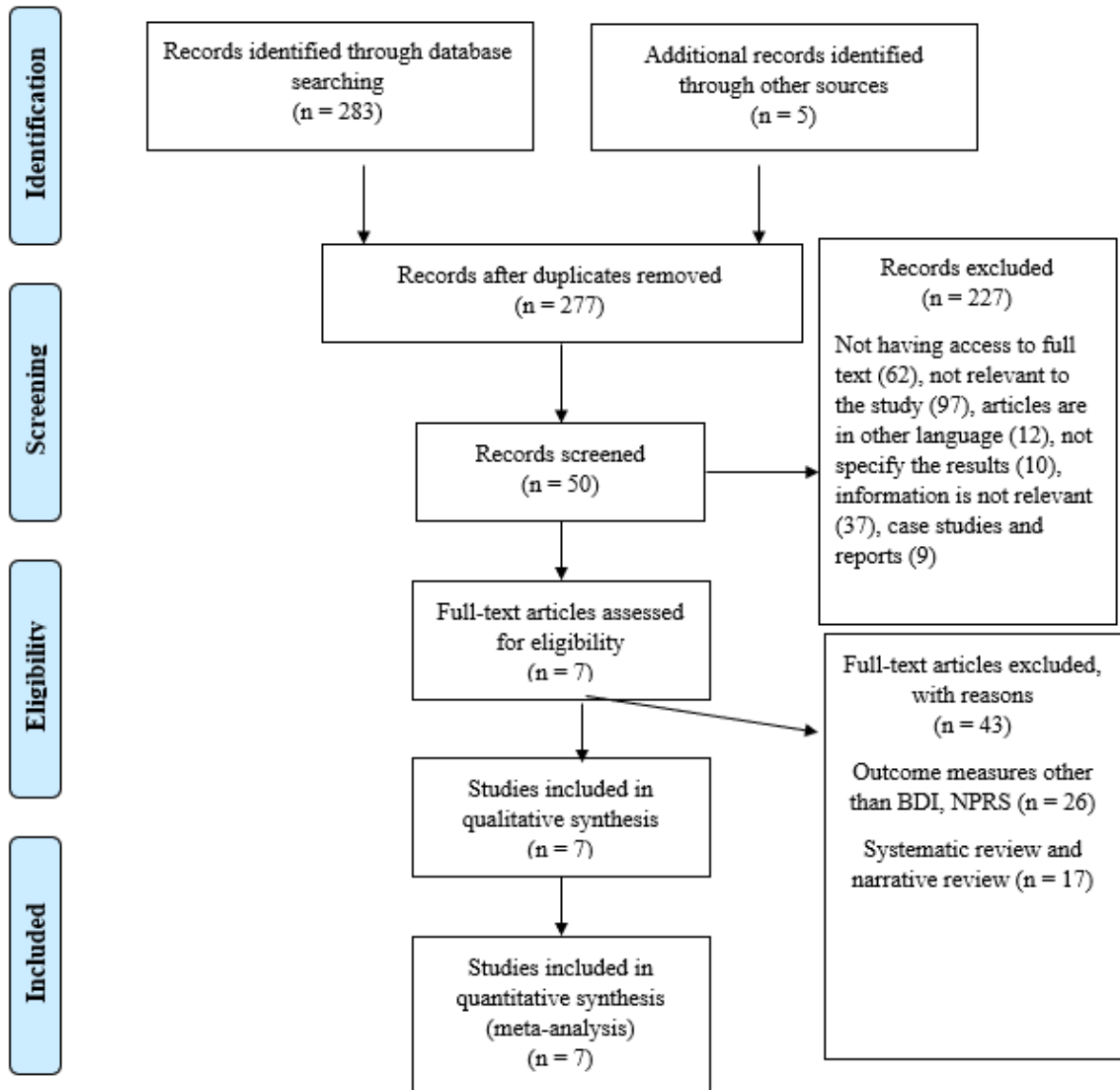


Fig. 1. PRISMA flow diagram

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Akyuz,2019	+	+	+	+	+	+	?
Bandrawy,2020	+	+	+	+	+	+	+
Bazarganipour, 2017	+	+	?	?	+	+	?
Dehnavi,2018	+	?	?	?	?	+	+
Faeze,2016	+	+	?	?	?	+	?
George,2018	+	+	?	?	+	+	?
Ghaffarilaleh,2019	+	+	+	+	+	+	?
Heba Embaby,2022	+	+	+	+	+	+	?
Hemalatha,2023	+	?	?	?	?	+	+
Ibrahim,2020	+	+	?	?	+	+	?
Karthika. S. R,2022	?	?	?	?	+	+	?
Ovgun,2023	+	+	+	+	?	+	?
Raipure,2023	+	+	+	+	+	+	?
Veena,2014	+	?	?	?	?	+	?

Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

Fig. 2a. Risk of bias summary for included study

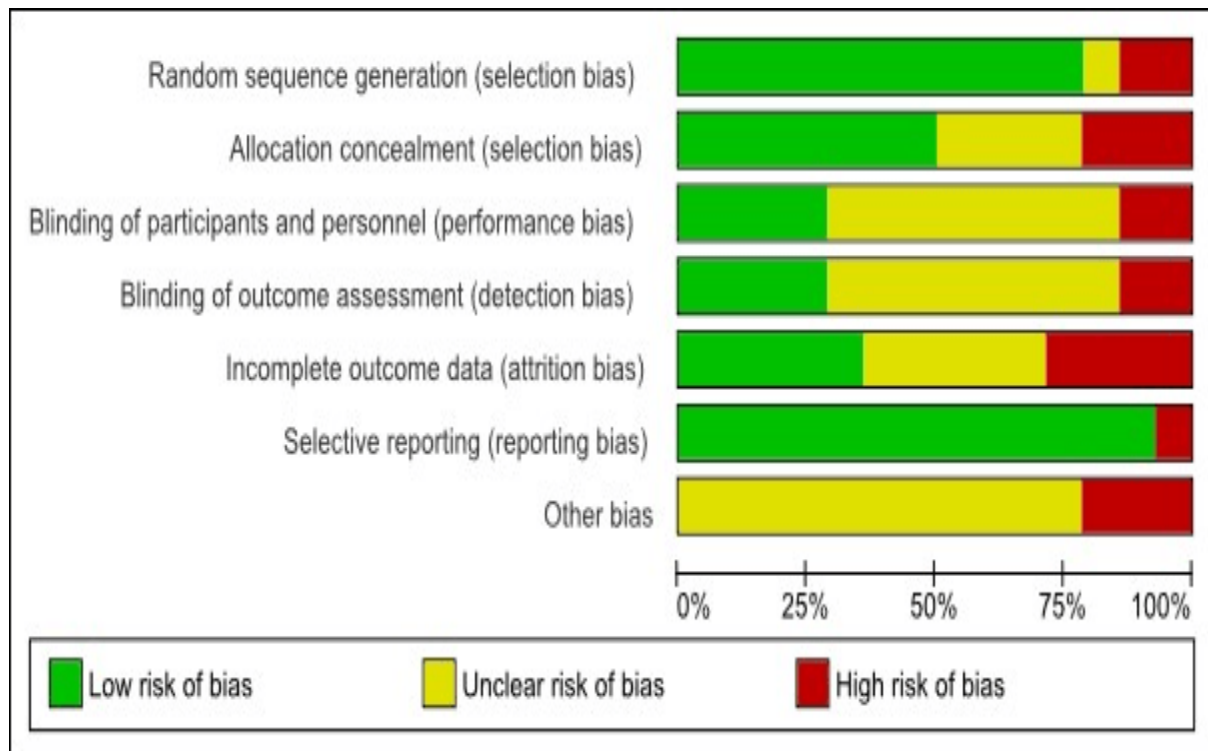


Fig. 2b. Risk of bias graph

Tab. 1. Characteristics of included study

Study	Sample size (n)	Participants	Intervention	Outcomes	Result
Cisel Demiralp Ovgunet al. (2023) [1]	94	18 - 30 aged female studying at Mediterranean University	MRT (n=31), PRE (n=32) and Control group (n=31) 2 times a week, each session for 20 to 30 minutes.	Demographic information form, McGill Pain Questionnaire, Pittsburgh Sleep quality index, Health-related quality of life (HRQOL)	MRT and PRE Provide relaxation, increase blood flow, improve symptoms, improve sleep and quality of life
Mohebbi Dehnavi, Zahra et al (2018)[9]	65	Female students living in dormitories of Mashhad University	Intervention group (n=35) Aerobic exercise for 8 weeks, 3 times a week, 30 minutes each time Control group (n=30) no intervention	Premenstrual syndrome questionnaire, Beck Depression, and Borg scale.	The results of this study showed that the physical symptoms of PMS in the intervention group at the end of the study, shows significant reduction
Elvan YILMAZ-AKYUZ et al. (2019)[6]	106	18 - 35 aged female students studying at the Faculty of Health Sciences of a public university	Exercise Group (n=37) but 35 completed treatment 2 dropped out, Diet Group (n=37) but 35 completed treatment 2 dropped out, control group(n=37) 1	Visual Analogue Scale (VAS), Premenstrual Syndrome Scale (PMSS) and Food Frequency Questionnaire (FFQ)	The diet and aerobic exercise groups mean scores decreased significantly after the intervention. There was a

			dropped out for 12 weeks,3 days a week and 30 minutes		significant difference in VAS scores between the groups after the intervention
Asmaa M. El-Bandrawy et al. (2020)[4]	50	18-25 aged girls were selected from the Faculty of Physical Therapy, Deraya University	Group A (n=25) received aquatic exercises and relaxation Group B (n=25) relaxation exercises three sessions a week for 8 weeks for 30 min	Premenstrual syndrome scale (PMSS), Visual analogue scale	Both groups showed a significant increase in VO ₂ max and a significant reduction in PMSS, VAS, and blood cortisol levels
Fatemeh Bazarganipour et al. (2017)[5]	90	18-45 aged females of Hormozgan University	Acupressure on LIV3 point(n=30), Acupressure on LI4 point (n=30), Acupressure on placebo point (n=30)	PSST questionnaire, QOL (Quality of life)	Acupressure and applying pressure at LIV3 and LI4 are an effective method to decrease the physical symptoms and to improve the Quality of Life
Susan Annie George et al. (2018)[18]	30	18-23 aged females from Medical Sciences	Experimental group (n=15) physical activities stretching, core strengthening and relaxation technique and control group (n=15) given relaxation technique 3 times per week for 28 days	VAS and Beck Depression Inventory Scale	Both groups showed a reduction in pain and depression, comparing the between groups there is a huge change in mean value hence it is not significant
Veena Jasuja et al. (2014)[17]	60	18-40 years females from the department of physiology at SBKS MI & RC, Vadodara, Gujarat, India	Group A (Relaxation technique, PMR), Group B (No intervention) for 2 times/week for 1 month	Beck Depression Inventory (BDI-II) and State Trait Anxiety Inventory (STAI)	PMR showed a significant reduction in BDI II and STAI scores
Anushka Raipure et al. (2023)[7]	70	Females aged 18 to 35 with PMS in tertiary care hospital in Sawangi, Wardha	Group A(n=35) Laura Mitchell's PRT, and Group B(n=35) received Benson's relaxation for 30 mins	Premenstrual syndrome questionnaire, and Numerical pain rating scale (NPRS)	The result showed an improvement in both groups whereas Group B shows a more marked decrease in the PMS symptoms
Karthika. S. R et al. (2022)[19]	25	14-30 years females at Lakshmi maternity hospital, Chennai	(n=25) given both stretching and walking for 3 months	Premenstrual syndrome questionnaire and Physical and Mental health	The result of the study shows a reduction in PMS symptoms and there is improvement in the mental health
Monica H. Ibrahim et	30	18-25 aged females were selected from	Group A(n=15) Breathing exercise, Group B (n=15) Breathing exercise and	Visual Analog Scale (VAS) and Daily	Both groups showed no significant

al. (2020)[12]		Gynecological Clinic, Egypt	treadmill walking for 8 weeks	record of severity of problems (DRSP)	differences in serum cortisol levels, resting HR, and DRSP But there were significant decreases in resting RR and abdominal pain
Heba Embaby et al. (2022)[20]	60	17-21 aged females with PMS were selected and a study from Faculty of Physical Therapy, Cairo University	Group A (Kinesio Tape) (n = 30) and Group B (pelvic rocking exercise) (n = 30) 3 times/week for 2 months	Visual analog scale (VAS) and Modified Calendar of Premenstrual Experiences (COPE)	The result showed that both interventions are beneficial in reducing PMS symptoms
Ghafoureh Ghaffarilaleh et al. (2019)[8]	62	20-45 aged females were selected and a study was conducted in Tabriz, Iran	Group A(n=31) consists of yoga, but only 26 completed the follow-up 2 months, in 3 sessions/week for 60 minutes, Control group (n=31) only 28 completed the follow-up	Premenstrual symptoms screening tool (PSST), Beck Depression Inventory scale (BDI-II)	After giving yoga there is a significant reduction in depression scores
Hemalathar et al. (2023)[16]	45	18-25 aged females were selected and the study was conducted in the Department of Physiotherapy, India	Group A- Barre exercise (n=15), Group B- Pilates (n=15), and Group C- Aerobic exercise (n=15) for 8 weeks	Premenstrual syndrome scale (PMSS)	Barre exercises group showed more significant improvement in PMS symptoms, whereas Pilates and Aerobic exercises are also effective
Faeze Panahi et al. (2016)[21]	60	60 females were selected, the study was conducted at Mazandaran University	one group receives Mindfulness-Based Cognitive Therapy (MCBT) (n=30) and control group (n=30) for 8 sessions each for 8 weeks	Premenstrual Assessment Scale (PAS), Beck Depression Inventory (BDI), and Beck Anxiety Inventory (BAI)	MCBT is effective in reducing depression and Anxiety. It could be used as a treatment option for PMS

Tab. 2. Showing the level of evidence (PEDro checklist)

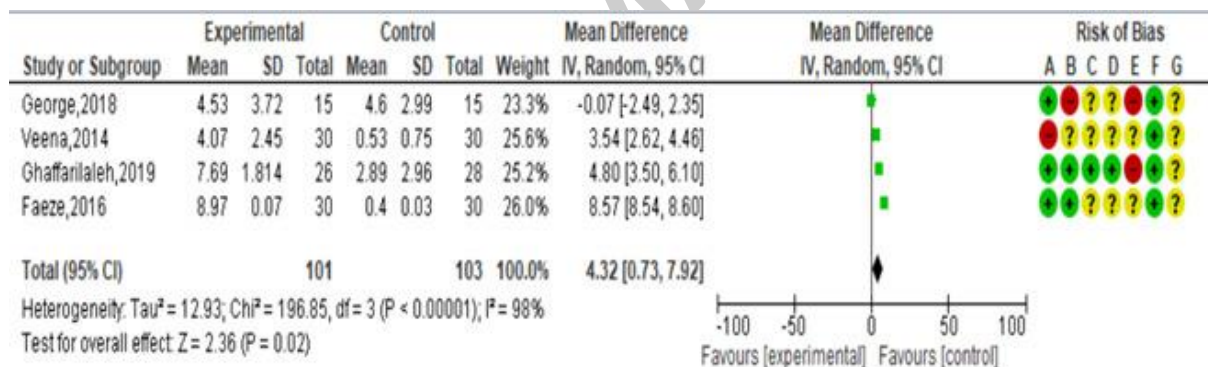
Study	2	3	4	5	6	7	8	9	10	11	Total yes score
George et al. (2018) [18]	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Bandrawy et al. (2020) [4]	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Heba Embaby et al. (2022)[20]	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	9
Ibrahim et al. (2020)[12]	Y	Y	Y	N	N	N	Y	N	N	N	4
Veena et al. (2014)[17]	Y	N	Y	N	N	N	Y	Y	Y	N	5

Ghaffarilaleh et al. (2019)[8]	Y	Y	Y	N	Y	Y	Y	Y	Y	N	8
Faeze et al. (2016)[21]	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9

Y- Yes, N- No.

Effect of physiotherapy intervention on BDI in participants with PMS

Four RCTs were included in the comparison of BDI in participants with PMS [7,8,17,18] as mentioned in Figure 3. Four Included studies involved the participants with PMS. The Present study examined the effect of Mindful-based cognitive therapy (MBCT), Stretching, core strengthening with relaxation techniques, Yoga, and Progressive muscular relaxation (PMR) techniques that can decrease the severity of PMS symptoms and help in reducing depression, and anxiety. In this study total of 4 studies included 204 participants where there was Heterogeneity in both the experimental and control groups that was found to be considerable ($I^2 = 98\%$). The mean difference in BDI (95% CI) was found to be 4.32 [0.73,7.92]. All the studies show a significant p-value < 0.001 .



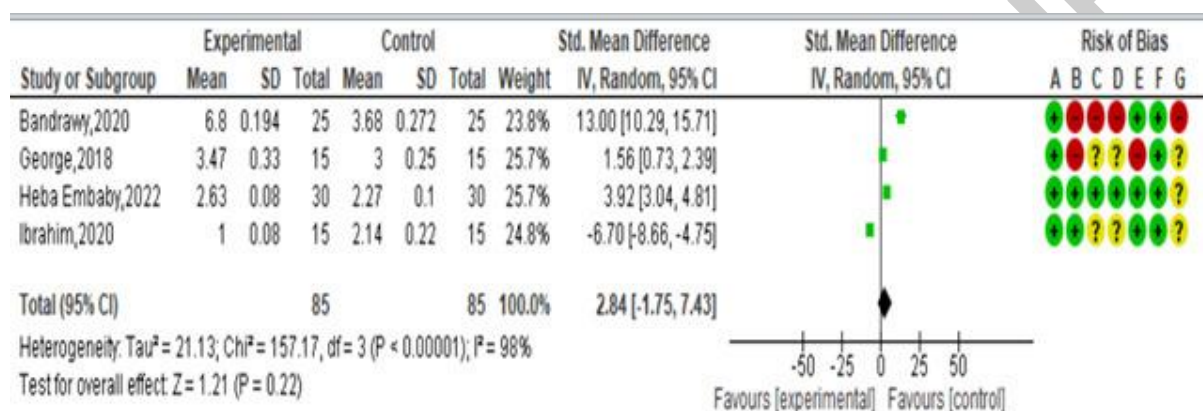
Risk of bias legend

- (A) Random sequence generation (selection bias)
- (B) Allocation concealment (selection bias)
- (C) Blinding of participants and personnel (performance bias)
- (D) Blinding of outcome assessment (detection bias)
- (E) Incomplete outcome data (attrition bias)
- (F) Selective reporting (reporting bias)
- (G) Other bias

Fig. 3. Forest plot of comparison of Physiotherapy intervention on BDI in Participants with PMS.

Effect of physiotherapy intervention on VAS in participants with PMS

Four RCTs were compared in this study [4,12,18,20] as mentioned in Figure 4. These studies reported that physiotherapy interventions are effective in reducing pain. In this study, 4 studies were included, comprising a total of 170 participants with PMS. The effects of aquatic exercises, relaxation training, stretching, relaxation exercises, core strengthening, Kinesio-taping, and pelvic rocking exercises, as well as walking and breathing exercises, were examined in reducing pain severity. The studies showed significant p-values for physiotherapy interventions (< 0.001) compared to the control group. The mean difference (95% CI) in VAS for PMS was found to be 2.84 [-1.75,7.43]. The studies were found to be considerably heterogeneous ($I^2 = 98\%$).



Risk of bias legend

- (A) Random sequence generation (selection bias)
- (B) Allocation concealment (selection bias)
- (C) Blinding of participants and personnel (performance bias)
- (D) Blinding of outcome assessment (detection bias)
- (E) Incomplete outcome data (attrition bias)
- (F) Selective reporting (reporting bias)
- (G) Other bias

Fig. 4. Forest plot of comparison of Physiotherapy intervention on VAS in Participants with PMS

Discussion

To the best of our knowledge, this is the first systematic review with meta-analysis on role of physiotherapy interventions in reducing PMS symptoms. This review directly compares the effect of physiotherapy interventions in reducing pain and depression in PMS. A total of 14 studies were included in this systematic review, but only 7 studies were included in the meta-analysis. The meta-analysis was done to address the effect of physiotherapy interventions in the reduction of pain as well as depression. The results imply that physiotherapy approaches such as relaxation therapy, core strengthening, stretching, deep breathing exercises, yoga, and aquatic activities have a significant effect in reducing PMS symptoms. The majority of studies investigate the effects of

physiotherapy interventions on reducing pain, depression, and anxiety caused by PMS. This study result is supported by the previous scoping review suggested that the psychotherapeutic interventions and complementary and alternative practices such as exercise, yoga, and acupuncture can be very effective in reducing PMS [22].

The previous study conducted also supported the result of this study aerobic exercise reduces renin levels and improves estrogen-progesterone balance, reducing water and sodium absorption. Aerobic activity conducted twice or three times per week for a period of two to six months, could reduce Pain [23–25]. Eight-week aerobic activities can improve pain tolerance by increasing beta-endorphin levels [4,9,24]. The Aerobic activities were ineffective in alleviating the physical symptoms of PMS as headaches, nausea, bowel problems, abdominal bloating, flushing, hunger, hyperhydration, menstrual cramps, and pain in the back [26].

TENS and interferential currents could be effective and beneficial for reducing menstrual pain [27]. A systematic review conducted in 2023 shows that diadynamic current has better results than TENS in reducing pain [28]. High-Intensity Laser Therapy (HILT) and Pulsed Electromagnetic Field (PEMF) both are effective in reducing pain [29]. Connective tissue Manipulation (CTM) including Pelvic zones sacral, lumbar, lower thoracic, and anterior pelvic regions, was manipulated for five days per week. CTM with Lifestyle modification is very effective in menstrual-related pain reduction [30]. Kinesio taping with auricular acupressure has positive results in reducing menstrual pain in females [31]. Kinesio taping with pelvic rocking exercises is effective in improving pain and improving depression and anxiety [20].

Stretching can be effective in reducing the PMS symptoms as well as reducing the severity of PMS. This can release neurotransmitters (Endorphins, dopamine). It can improve uterine blood flow, which can decrease pain perception [19,32]. Isometrics Exercises for 8 weeks are effective in the reduction of pain intensity and improve quality of life [33]. Performing stretching, jogging pelvic floor strengthening exercises, and relaxation techniques for 50 minutes, 3 times per week can be very effective in reducing menstrual-related pain [34].

Exercise induces endorphin by inhibiting C Fibers in synapses and delta A in the dorsal horn of the spinal cord, activating A-beta sensory fibers and blocking pain signals in the spinal cord. Due to this, pain perception will decrease. release, which significantly decreases pain, anxiety, and depression in PMS [35]. Exercise can relieve muscle cramps by improving blood circulation. Progressive Relaxation Exercise (PRE) was introduced by Jacobson in 1924. It helps in reducing oxygen consumption, and respiratory rate and helps in reducing pain by production of endorphin levels [1]. Relaxation therapy can help in reducing stress, Depression, and reduction of pain [15]. CBT and relaxation therapy can be beneficial on curing the various physical symptoms

of PMS [36]. A 10-week program combining CBT) with relaxation techniques has been shown notable improvements in premenstrual symptoms [37].

Previous two studies supported the result of study that performing yoga for 10 weeks for 60 minutes, 3 session per week can improve the various physical symptoms and vital signs as well as showed positive effects in reducing depression as well as diastolic blood pressure among females [8,38]. Another two studies suggested that performing twelve-week yoga program can be effective in reducing stress, improving muscle strength, and reduce pain and PMS symptoms [34,39]. Short time yoga can be very affective for improving attention and reducing depressive symptoms, physical symptoms, anger and improve the quality of life [40]. Acupressure combined with yoga was shown to be more effective in reducing the severity of premenstrual symptoms and enhancing overall quality of life [41]. Both yoga and aerobic exercise were effective in reducing pain intensity and alleviating symptoms of PMS in women with the condition. However, yoga proved to be more advantageous than aerobic exercise in relieving PMS symptoms [42]. yoga can induce endorphin, which leads to pain reduction and also reduces stress level and promotes relaxation [43].

Pilates improves physical health, muscle strength, endurance, core stabilization, respiratory muscle strength, psychological health, and motor functions. Pilates exercises and Benson relaxation methods are recommended therapies for reducing PMS symptoms [44]. Massage for 15 minutes with isometric exercise is effective in reducing menstrual-related pain and discomfort [29]. Myofascial release Technique with connective tissue massage can be effective in reducing menstrual-related pain. MRT increases fascial mobility, reduces adhesions, and reduces pain [1].

Limitations

This review solely concentrates on outcomes related to pain and depression, quality of life outcome were not assessed due to scarcity in the literature.

Future scope

Further studies can explore the comparative effects of various physiotherapy modalities and complementary therapies. Additionally, physiotherapy interventions could be investigated as viable treatment options for addressing PMS symptoms.

Conclusions

This study showed that Physiotherapy interventions can be used as treatment options for treating Premenstrual syndrome. These interventions could be promising and highly effective in alleviating premenstrual symptoms and improving quality of life.

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Conflicts of interest

The authors declare no conflict of interest.

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