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## **Effectiveness of non-pharmacological pain management for severe symptoms in primary dysmenorrhea in sport**

Jana Kozłowska, ORCID <https://orcid.org/0009-0008-5278-2864>

E-mail [Jana.kozlowska1@gmail.com](mailto:Jana.kozlowska1@gmail.com)

Independent Public Specialist Western Hospital of St. John Paul II, Daleka 11, 05-825 Grodzisk Mazowiecki, Poland

Zofia Gołąbek, ORCID <https://orcid.org/0009-0000-5365-2094>

E-mail [golabek2302@gmail.com](mailto:golabek2302@gmail.com)

Independent Public Health Care Institution in Siedlce, Siedlce, Poland

Simone Szymczyk, ORCID <https://orcid.org/0009-0002-7831-3667>

E-mail [SzymczykSz12@gmail.com](mailto:SzymczykSz12@gmail.com)

Masovian Specialist Hospital, Radom, Poland

Kacper Król, ORCID <https://orcid.org/0009-0006-7608-2454>  
E-mail [krol.kacper.radom@gmail.com](mailto:krol.kacper.radom@gmail.com)  
Masovian Specialist Hospital, Radom, Poland

Sabina Józwiak, ORCID <https://orcid.org/0009-0004-5262-9967>  
E-mail [sabinajozwiak00@gmail.com](mailto:sabinajozwiak00@gmail.com)  
Masovian Specialist Hospital, Radom, Poland

Julia Nowosielska, ORCID <https://orcid.org/0009-0005-5184-0258>  
E-mail [juliairenanowosielska@gmail.com](mailto:juliairenanowosielska@gmail.com)  
Masovian Specialist Hospital, Radom, Poland

Katarzyna Jaczewska, <https://orcid.org/0009-0001-0658-9157>  
E-mail [katarzynajacz@gmail.com](mailto:katarzynajacz@gmail.com)  
Lazarski University, Warsaw, Poland

Patryk Barczuk, <https://orcid.org/0009-0004-2271-8782>  
E-mail [patryk.barczuk11235@gmail.com](mailto:patryk.barczuk11235@gmail.com)  
Masovian Specialist Hospital, Radom, Poland

Aleksandra Rejmer, <https://orcid.org/0009-0006-0613-6218>  
E-mail [aleksandra.rejmer@wp.pl](mailto:aleksandra.rejmer@wp.pl)  
Masovian Specialist Hospital, Radom, Poland

Jakub Lech, <https://orcid.org/0009-0004-0883-5819>  
E-mail [jakub.lech2016@gmail.com](mailto:jakub.lech2016@gmail.com)  
Masovian Specialist Hospital, Radom, Poland

Corresponding Author  
Simone Szymczyk E-mail [SzymczykSz12@gmail.com](mailto:SzymczykSz12@gmail.com)

## **Abstract**

**Background:** Primary dysmenorrhea predominantly affects young women, significantly impacting their well-being, quality of life, psychological and sexual health, as well as other aspects of daily functioning. This condition manifests primarily as severe menstrual pain in the absence of an identifiable organic pathology.

**Aim:** This narrative review evaluates the available treatment options for primary dysmenorrhea. Our aim was to synthesize and critically analyze the existing evidence on the effectiveness of various pain management strategies for severe symptoms of primary dysmenorrhea to inform clinical practice.

**Methods:** To assess the efficacy of pain management in severe primary dysmenorrhea, we conducted a systematic literature review using databases including PubMed, ScienceDirect, ResearchGate, and Google Scholar.

We included randomized controlled trials (RCTs), cohort studies, and case-control studies published between 2022 and 2025. Data were extracted and categorized in tables based on different characteristics.

**Results:** Physical therapy, acupuncture, herbal remedies, relaxation techniques, and psychotherapy demonstrated potential as complementary therapies. A personalized, multimodal approach integrating multiple interventions may yield superior outcomes.

**Conclusion:** Non-pharmacological therapies are effective in managing primary dysmenorrhea. Adjunctive interventions such as physical therapy, acupuncture, herbal medicine, relaxation techniques, and psychotherapy may enhance treatment outcomes.

**Keywords:**

acupuncture, dysmenorrhea, herbal remedies, menstrual pain, physical therapy

## 1. Introduction

Primary dysmenorrhea affects up to 90% of menstruating women worldwide, with a significant impact on quality of life, psychological well-being, and daily functioning. Despite the high prevalence, optimal management remains challenging due to individual variability in symptom severity, comorbidities, and response to therapy. Treatment strategies for menstrual pain include both pharmacological and non-pharmacological approaches, each supported by varying levels of evidence.[1-3]

Non-pharmacological modalities such as acupuncture, physiotherapy, transcutaneous tibial nerve stimulation, and dietary interventions have gained recognition as effective adjuncts or alternatives. Large meta-analyses and randomized trials confirm the efficacy of acupuncture and physiotherapy, with pain reductions often comparable to conventional medications and a lower incidence of adverse effects. Supplementation with vitamin D, E, B1, magnesium, and anti-inflammatory diets also demonstrates significant benefit, though heterogeneity in study design and outcome measures persists.

Given the diversity of interventions and individual patient needs, a multimodal, personalized approach is advocated. Future research should prioritize long-term, comparative studies to better inform evidence-based, patient-centered care for menstrual pain.

## 2. Materials and methods

A literature review was conducted between March 2024 and November 2025 to evaluate current evidence on treatment strategies for primary dysmenorrhea and menstrual pain. Four major academic databases—PubMed, ScienceDirect, ResearchGate, and Google Scholar—were searched using a combination of Medical Subject Headings (MeSH) and free-text terms. The following Boolean search string was applied:

((VAS OR NRS OR PPI) AND (Dysmenorrhea OR "Menstrual pain" OR "Menstrual disorders")) AND ("Pain management" OR "Analgesic ladder" OR "Non-pharmacological treatment" OR "Pain relief" OR "Treatment efficacy" OR "Physical therapy" OR Acupuncture OR "Herbal remedies" OR "Heat therapy" OR "Cognitive behavioral therapy" OR CBT OR "Relaxation techniques"))

The search was limited to peer-reviewed articles published in English between 2022 and 2025. Eligible studies included randomized controlled trials (RCTs), cohort studies, and case-control studies that evaluated the effectiveness of non-pharmacological interventions in reducing the

severity of menstrual pain, particularly in individuals diagnosed with primary dysmenorrhea. Reviews, case reports, conference abstracts, and duplicate records were excluded.

Three independent reviewers screened the titles, abstracts, and full texts for relevance and eligibility. Disagreements were resolved by consensus. Studies that met inclusion criteria were assessed for methodological quality and risk of bias, with particular attention to sample size, follow-up duration, pain intensity scales (VAS), treatment efficacy, adverse effects, and reported limitations.

Data were extracted and organized into structured tables based on the type of intervention, study design, participant characteristics, outcomes, and safety profiles.

### **3. Results and discussion**

#### **3.1. Acupuncture in the Management of Primary Dysmenorrhea**

Acupuncture and its variants—electroacupuncture, acupressure, and moxibustion—modulate pain by stimulating specific acupoints, thereby influencing neural transmission, regulating the flow of Qi, and producing neurohormonal effects. Current studies suggest that acupuncture's analgesic action is linked to the activation of the endogenous opioid system, increased secretion of endorphins and enkephalins, and modulation of serotonergic and noradrenergic pathways in the central nervous system [4,5]. Stimulation of the SP6 point, widely used for menstrual pain, has been shown to reduce prostaglandin levels, key mediators of dysmenorrhea. Electroacupuncture further enhances analgesia through targeted electrical impulses, while acupressure and moxibustion offer less invasive alternatives that patients can apply independently [5,9].

Clinical trials and meta-analyses consistently indicate that acupuncture and related techniques significantly reduce menstrual pain intensity. Auricular acupuncture, as demonstrated by Trinh et al., significantly decreased pain and ibuprofen consumption (mean VAS reduction:  $-1.08$ ) [4]. Comparative studies by Chien et al. revealed that electroacupuncture is more effective and rapid than laser acupuncture in autonomic regulation and pain relief [5]. A large network meta-analysis involving over 5,700 participants showed that combined massage and acupuncture is the most effective approach for pain and symptom reduction [26]. Zhai et al. reported that wrist-ankle acupuncture yielded a rapid and substantial reduction in pain following treatment [7]. Preliminary data from Liu et al. support the efficacy of transcutaneous electrical acupoint stimulation (TEAS), while Dincer and Oskay found that SP6 acupressure is a simple, low-cost, and effective intervention [8,9]. Other studies highlight that acupuncture not only relieves pain but also improves quality of life and reduces associated symptoms in endometriosis, although effects may diminish post-treatment [10,11]. Notably, acupuncture and moxibustion are associated with fewer adverse effects compared to pharmacotherapy [11]. Individual variability in acupoint responses suggests the need for personalized treatment protocols [12] (Table 1).

Table 1. Summary of Key Clinical Studies and Reviews on Acupuncture for Primary Dysmenorrhea [4-12]

<b>Intervention Type</b>	<b>Population (n)</b>	<b>Main Outcome (Pain Reduction)</b>	<b>Additional Benefits</b>	<b>Safety Profile</b>
<b>Auricular acupuncture</b>	78	Significant reduction in Visual Analogue Scale (1.08); reduced use	Improved quality of life; reduced ibuprofen use	No major adverse effects
<b>Electroacupuncture vs. Laser acupuncture</b>	60	Electroacupuncture: faster, greater pain reduction	Better autonomic regulation	Well tolerated
<b>Acupuncture + Massage (Network meta-analysis)</b>	5772	Greatest pain reduction among modalities	Decreased associated symptoms	Good
<b>Wrist-ankle acupuncture</b>	120	Significant pain reduction—within 30 minutes		No major adverse effects
<b>Transcutaneous Electrical Stimulation (protocol)</b>	Ongoing	Preliminary data: effective— for pain		Under evaluation
<b>Acupressure (SP6)</b>	80	Significant pain/discomfort reduction	Simple, economical intervention	No adverse effects
<b>Acupuncture (endometriosis)</b>	100	Reduced pain duration, improved Quality of Life	Effects diminished post-treatment	Mild side effects
<b>Acupuncture Moxibustion</b>	&200	Improved pain and endometriosis symptoms	Fewer effects vs. medication	Very good vs.
<b>Acupoint reactivity study</b>	50	Variable responses by pain— type		Not specified

All forms of acupuncture—traditional, electroacupuncture, acupressure, and moxibustion—consistently reduce dysmenorrheic pain, though the magnitude, onset, and duration of effect vary. Electroacupuncture offers rapid and pronounced pain relief but requires specialized equipment and expertise. Acupressure, especially at SP6, is user-friendly, economical, and safe, albeit potentially less potent than invasive methods. Moxibustion and similar non-invasive point therapies show comparable efficacy to traditional acupuncture and have minimal risk of complications. Notably, acupuncture often outperforms pharmacotherapy in pain reduction and quality of life improvement, with milder side effects. However, the therapeutic response can vary depending on point selection and practitioner expertise, reinforcing the importance of individualized care [6,9,11,12].

Despite increasing evidence, important limitations persist in acupuncture research for dysmenorrhea. Many studies are limited by small sample sizes, lack of blinding, and inconsistent treatment protocols, hindering direct comparisons and definitive conclusions. Long-term follow-up is rarely reported, so the durability of treatment effects remains uncertain. The heterogeneity of acupuncture techniques and individualization of therapy further complicate methodological standardization. Placebo effects are difficult to eliminate in acupuncture trials. To strengthen the evidence base, future research should focus on large, well-

designed, randomized controlled trials with standardized protocols and extended observation periods across diverse populations.

### 3.2. Physiotherapy in the Management of Menstrual Pain

Physiotherapy employs interventions such as manual therapy, exercise, relaxation techniques, yoga, and electrotherapy to modulate muscle tone, improve pelvic blood flow, and influence pain transmission. Manual therapies, including deep tissue massage and pelvic floor stretching, help alleviate myofascial tension, while TENS may inhibit spinal pain signaling. Aerobic exercise and yoga are linked to endorphin release and better physical fitness, contributing to symptom relief [13–19].

Meta-analyses and systematic reviews confirm the effectiveness of physiotherapeutic modalities in reducing menstrual pain. Manual therapy, compared to no intervention or NSAIDs, showed significant pain reduction (mean difference up to –3.01 on the VAS) and a higher response rate, with minimal adverse effects [14,15]. Exercise interventions—such as aerobic training, stretching, yoga, and relaxation exercises—consistently decreased pain intensity and improved quality of life, with relaxation techniques demonstrating the largest effect (VAS reduction up to –3.87) [16,18,19]. TENS, evaluated in smaller trials, resulted in marked pain relief for most participants and no reported adverse effects [24]. All reviewed interventions demonstrated high safety profiles (Table 2).

Table 2. Efficacy and Safety of Physiotherapy Methods in Menstrual Pain Management [15-19]

<b>Intervention</b>	<b>Mean Pain Reduction Visual Analog Scale</b>	<b>Safety</b>	<b>Additional Benefits</b>
<b>Manual therapy</b>	–1.8 to –3.01 [2,3]	High	Muscle function, Quality of life improvement [22]
<b>Relaxation exercises</b>	–3.87 [4]	High, low dropout	Stress reduction, well-being [23]
<b>Aerobic exercise</b>	–1.7 to –2.1 [6,7]	High	Physical fitness, endorphin release [25,26]
<b>Transcutaneous Electrical Nerve Stimulation</b>	–2.1 [5]	High	Adjunct therapy, convenient [24]
<b>Yoga</b>	–1.5 [4]	High	Flexibility, mind-body balance [23]

Physiotherapy often outperformed NSAIDs for short-term pain relief, especially with relaxation exercises and manual therapy. Additionally, physiotherapy methods improved other patient-centered outcomes, such as quality of life and stress reduction. No serious adverse events were noted across studies, further supporting the safety of these interventions [20-23].

Despite positive findings, the quality of evidence remains limited due to risks of bias and methodological heterogeneity. Most studies assessed only short-term outcomes (up to 8 weeks), and populations often consisted of young, relatively healthy women, limiting generalizability. There is a lack of comparative studies directly evaluating different physiotherapy modalities or long-term outcomes. Future research should focus on well-designed, long-term comparative trials involving more diverse populations to clarify optimal physiotherapy regimens and their role in multimodal pain management [14–19].

### 3.3. Transcutaneous Tibial Nerve Stimulation in Primary Dysmenorrhea

Transcutaneous Tibial Nerve Stimulation (TTNS) is a non-invasive technique that stimulates the tibial nerve via surface electrodes placed near the ankle. The primary mechanism is thought

to involve modulation of sensory pathways, activating descending inhibitory circuits, and altering neuronal activity in the dorsal horn of the spinal cord. These effects may contribute to reduced pain perception and influence both central and peripheral pain mechanisms, potentially including modulation of uterine smooth muscle tone and improved pelvic blood flow [24].

A recent randomized controlled trial protocol is evaluating TTNS in women with primary dysmenorrhea, comparing active TTNS (12 sessions, twice weekly for six weeks) with sham stimulation using identical electrode placement without current. The primary outcomes include pain intensity (VAS), quality of life (SF-36), analgesic use, and daily functioning, aiming to provide high-quality data on both efficacy and safety (Table 3).

Table 3. Characteristics of TTNS and Sham Stimulation in Primary Dysmenorrhea [24]

Method	Description	Frequency/Duration	Proposed Mechanism	Main Outcomes
<b>Transcutaneous Tibial Stimulation</b>	Tibial nerve surface electrodes	2×/week, 6 weeks, with× 30 min	Neural modulation, uterine effects	Visual Analog Scale, analgesic use, function
<b>Sham stimulation</b>	Electrodes without current	2×/week, 6 weeks, active× 30 min	No physiological effect	Same as above

Current evidence for TTNS in menstrual pain is limited. Most existing studies are small, lack standardization of stimulation parameters, and primarily focus on conditions other than dysmenorrhea, such as urinary incontinence. There is little data on long-term efficacy and safety, and reliance on subjective pain scales and small samples further restricts conclusions.

If effective, TTNS may provide a valuable non-pharmacological alternative for patients unable or unwilling to use standard medications. Future research should aim to optimize stimulation parameters, assess long-term outcomes, compare TTNS directly with other physiotherapeutic interventions, and comprehensively evaluate impacts on quality of life and daily functioning.

### 3.4. Diet and Supplementation in the Management of Menstrual Pain

Recent meta-analyses and randomized controlled trials support the role of dietary interventions and targeted supplementation in reducing menstrual pain. Strongest evidence exists for supplementation with vitamin D, E, B1, magnesium, calcium, and zinc, as well as for anti-inflammatory diets with low processed food intake [25–28,31,32]. Vitamin D and E supplementation consistently yielded significant pain reductions in meta-analyses, while magnesium, B1, and omega-3 fatty acids have demonstrated superiority over placebo in randomized studies [27,30,31,32]. Observational data confirm that diets high in fish, dairy, fruit, and minimally processed foods are associated with less pain, while high sugar and processed food intake exacerbate symptoms [26,28]. Additional benefits were reported for lowering BPA exposure and for phytotherapeutic approaches such as herbal baths [33].

Vitamin D and B-group vitamins reduce uterine prostaglandin synthesis, lowering inflammation and pain. Magnesium relaxes smooth uterine muscle and decreases prostaglandin production, while omega-3 fatty acids oppose pro-inflammatory effects of omega-6, resulting in fewer pain-inducing prostaglandins. Anti-inflammatory diets further decrease systemic inflammation, and herbal interventions may support microcirculation and muscle relaxation [26–30,33] (Table 4).

Table 4. Efficacy and Mechanisms of Selected Dietary and Supplement Interventions for Menstrual Pain [26-30,33]

<b>Intervention</b>	<b>Mechanism of Action</b>	<b>Effectiveness / Meta-Safety / Additional analysis</b>	<b>Benefits</b>
<b>Vitamin D</b>	↓ Prostaglandin synthesis (endometrium)	SMD: -1.02 (95% CI: -1.9 to -0.14); p = 0.024	Good; supports bone, immune health
<b>Vitamin E</b>	Antioxidant; ↓ oxidative stress	SMD: -0.47 (95% CI: -0.74 to -0.2); p = 0.001	Good; may support reproductive health
<b>Vitamin B1, B12</b>	Cyclooxygenase, prostaglandin synthesis	↓B1 effective at 100mg/day	Good; benefits nerve health
<b>Magnesium</b>	Relaxes uterine muscle, prostaglandin production	↓Superior to placebo, no adverse events	Good; helps sleep, stress
<b>Omega-3 fatty acids</b>	↓ Pro-inflammatory prostaglandins (series 2)	Superior to placebo	Good; cardiovascular benefit
<b>Anti-inflammatory diet</b>	↓ Systemic inflammation; low sugar/processed food, high fish/fruit	Linked to less pain	General health, hormonal balance
<b>BPA exposure reduction</b>	↓ Endocrine disruption inflammation	$\chi^2 = 119.64$ ; p = 0.000	Good; less hormonal disruption
<b>Herbal therapy (baths)</b>	Improved microcirculation, muscle relaxation	RR 1.18 (95% CI: 1.12-1.23); p = 0.00001	Good; few adverse events

Most dietary and supplement interventions are well-tolerated and safe, making them attractive adjuncts or alternatives to pharmacological treatments especially for women preferring natural approaches. Benefits include not only pain reduction, but also positive effects on general health, hormonal balance, and well-being [27,28,31]. Nevertheless, heterogeneity in study design, dosing, duration, and outcome measures complicates direct comparisons between interventions. Despite promising results, limitations include variability in study populations, intervention periods, and reliance on subjective pain assessment. Long-term safety and efficacy data are scarce, and evidence for secondary dysmenorrhea or comorbid conditions is limited [27,29,30,31]. Research on phytotherapy and dietary interventions remains methodologically inconsistent.

Future research should focus on standardizing interventions, validated outcome measures, and diverse populations—including women with secondary dysmenorrhea. Exploration of gut microbiota, inflammatory biomarkers, and diet-pharmacotherapy interactions may enhance understanding. The effect of dietary education on patient behavior and long-term health outcomes also deserves further investigation[34].

#### 4. Conclusion

The effective management of primary dysmenorrhea and menstrual pain requires a comprehensive, individualized approach that considers both pharmacological and non-pharmacological strategies. Evidence supports that optimal outcomes are more likely when treatments are tailored to individual needs, preferences, and risk profiles, rather than relying solely on a single modality.

Growing body of research underscores the value of non-pharmacological approaches such as TENS, acupuncture, vitamin supplementation, and relaxation techniques which demonstrate comparable efficacy to the pharmacological interventions. Favorable safety profiles, stress reduction and overall health improvement as a multimodal treatment model should be explored further for women with complex pain profiles or contraindications to standard pharmacotherapy.

To advance this field, future studies must prioritize long-term, head-to-head comparative trials that evaluate both monotherapies and combination treatments using standardized outcome measures, such as the Visual Analogue Scale (VAS) for pain intensity, as well as validated quality-of-life instruments. It is also essential to explore the psychosocial dimensions of menstrual pain—such as emotional well-being, functionality, and partner or family impact—using tools like the Menstrual Distress Questionnaire (MDQ) or the Short Form Health Survey (SF-36).

Ultimately, embracing a patient-centered, interdisciplinary framework will not only improve pain relief but also enhance the quality of life for those experiencing menstrual pain. Such an approach acknowledges the complexity of dysmenorrhea and aligns with modern principles of integrative and personalized medicine.

## **Disclosure**

**Supplementary Materials:** Not applicable.

### **Author Contributions:**

**Conceptualization:** Jana Kozłowska, Simone Szymczyk, Zofia Gołąbek, Kacper Król

**Methodology:** Sabina Józwiak, Julia Nowosielska, Simone Szymczyk, Katarzyna Jaczewska

**Software:** Kacper Król, Patryk Barczuk, Aleksandra Rejmer

**Check (Validation):** Zofia Gołąbek, Jakub Lech, Katarzyna Jaczewska

**Formal analysis:** Simone Szymczyk, Sabina Józwiak, Patryk Barczuk

**Investigation:** Jana Kozłowska, Aleksandra Rejmer, Jakub Lech, Katarzyna Jaczewska

**Resources:** Jakub Lech, Zofia Gołąbek, Kacper Król

**Data curation:** Patryk Barczuk, Aleksandra Rejmer, Katarzyna Jaczewska

**Writing – rough preparation:** Simone Szymczyk, Jana Kozłowska, Sabina Józwiak

**Writing – review and editing:** Simone Szymczyk, Zofia Gołąbek, Kacper Król, Jakub Lech

**Visualization:** Patryk Barczuk, Aleksandra Rejmer, Kacper Król

**Supervision:** Simone Szymczyk, Jana Kozłowska, Zofia Gołąbek

**Project administration:** Simone Szymczyk, Jakub Lech, Katarzyna Jaczewska

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## **AI.**

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. AI were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

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