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Research

An Evidence based review of effectiveness of TENS on women with primary dysmenorrhea

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Abstract

Background: Primary dysmenorrhea, marked by painful menstrual cramps without pelvic pathology, is prevalent among menstruating youth. It results from increased uterine contractions and ischemia due to elevated prostaglandin levels. Common treatments like NSAIDs and hormonal contraceptives may be ineffective or have adverse effects. Transcutaneous Electrical Nerve Stimulation (TENS), a non-pharmacological method delivering low-voltage electrical currents to the skin, offers a potential alternative. TENS is believed to relieve pain through gate control theory and the stimulation of endogenous opioid release. Despite growing interest, existing studies offer mixed results on its effectiveness and application parameters.

Methods: A systematic literature review was conducted using databases such as PubMed, Scopus, CINAHL, and Google Scholar, targeting studies from 2014 to 2024. Keywords included "TENS," "transcutaneous electrical nerve stimulation," "primary dysmenorrhea," and "non-pharmacological pain management." Studies selected included randomized controlled trials, quasi-experimental studies, and systematic reviews.

Results: Ten studies met inclusion criteria. Most found that TENS significantly reduced menstrual pain compared to placebo, no treatment, or conventional care. High-frequency TENS (80–100 Hz) applied to the lower abdomen or lumbosacral region showed the most benefit. Some studies also reported reduced analgesic use and improved daily functioning.

Conclusion: TENS appears to be a safe, well-tolerated, and potentially effective non-pharmacological treatment for primary dysmenorrhea. It offers pain relief and improves quality of life, making it a viable alternative to medication-based options.

Keywords: Primary dysmenorrhea, TENS, transcutaneous electrical nerve stimulation, menstrual pain, non-pharmacological pain management, high-frequency TENS, women's health, pain relief therapy.

INTRODUCTION

In the absence of any discernible pelvic disease, primary dysmenorrhea is a common gynecological condition marked by unpleasant menstrual cramps. It usually starts in adolescence, a few years after menarche, and can have a major effect on the lives of people who are impacted. The pain can continue for one to three days and usually starts just before or at the start of the menstrual cycle. It is frequently characterized as lower abdominal cramping or a dull, throbbing pain, and it can also be accompanied by other symptoms like headache, diarrhea, exhaustion, and nausea. The main reason is believed to be the overproduction of prostaglandins, which are hormone-like chemicals that produce pain and uterine contractions.

Pharmacological treatments, such as hormonal contraceptives and nonsteroidal anti-inflammatory medications (NSAIDs), are commonly used to treat primary dysmenorrhea. Alternative, non-pharmacological approaches are becoming more popular, though, as conventional treatments might not be appropriate or successful for everyone. One such non-invasive treatment that has showed promise in reducing menstruation pain is transcutaneous electrical nerve stimulation (TENS). Through electrodes applied to the skin, a tiny, battery-powered device provides low-voltage electrical currents as part of TENS. Through processes like the gate control theory, which prevents pain signals from reaching the brain, and by inducing the production of endorphins, the body's natural analgesics, these electrical impulses are thought to lessen pain.

TENS is a good choice for people looking for pain relief without the use of drugs because it is generally regarded as safe, simple to use, and free of serious adverse effects. Numerous clinical investigations conducted in recent years have confirmed its efficacy in treating primary dysmenorrhea, establishing it as a beneficial supplement or substitute for conventional treatment approaches.

Need of the study

One of the most common gynecological problems among people who menstruate is primary dysmenorrhea, yet it is frequently underdiagnosed and undertreated. Despite being widely used, pharmaceutical treatments like NSAIDs and hormonal contraceptives are not always successful and may have unfavorable side effects or not be appropriate for some groups. Because of this, non-pharmacological, patient-friendly methods of treating menstruation pain are becoming more and more popular.

Objective of the study

Utilizing the most recent empirical data, this review aims to demonstrate how well Transcutaneous Electrical Nerve Stimulation (TENS) improves functional outcomes and reduces pain severity in individuals with primary dysmenorrhea.

MATERIALS AND METHODS

Study design

this literature review is based on the PRISMA (Preferred reporting Items for Systemic review and Meta analysis)

Inclusion criteria

- Peer-reviewed articles written in English
- Studies involving human participants diagnosed with primary dysmenorrhea
- Research that evaluated the use of TENS as a treatment intervention
- Randomized controlled trials (RCTs), quasi-experimental studies, or systematic reviews

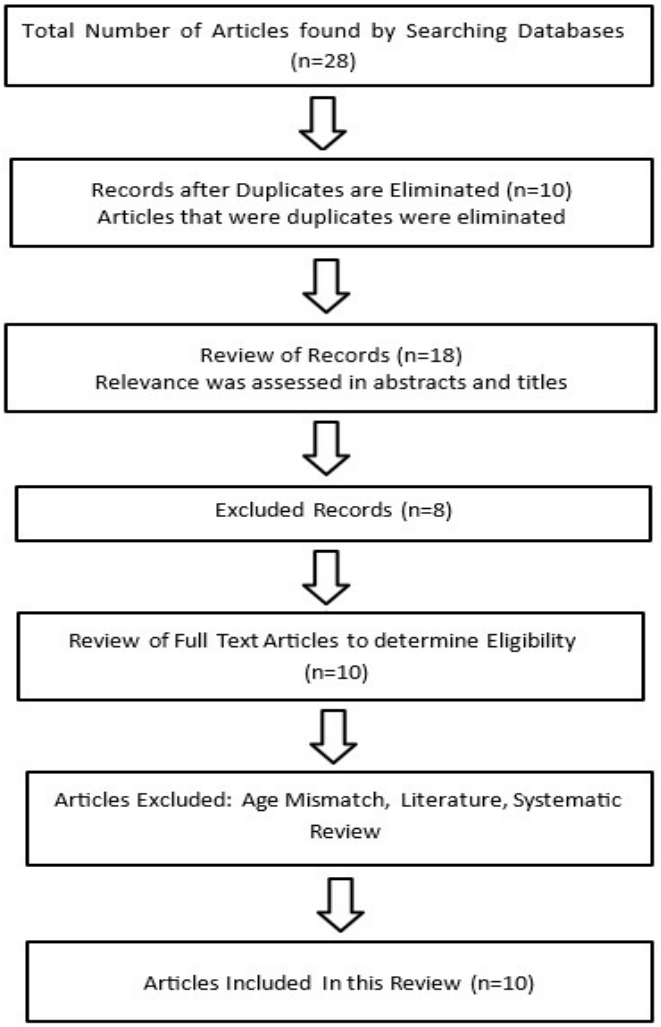
Exclusion criteria

- Studies focused on secondary dysmenorrhea or other pelvic pathologies
- Animal studies or case reports

METHODOLOGY

The evidence was collected from online papers found using various search engines, such as PubMed, Google Scholar, and other journals on Diabetic Neuropathy. To find pertinent publications, a customised search was performed using keywords such "Primary dysmenorrhea, TENS, pain releief. In order to collect accurate and up-to- date information from all around the world for the last ten years, the time frame was set as 2014–2024. 10 articles in all have been found to satisfy our precise inclusion and exclusion criteria. For the purpose of analysis and additional research, all ten articles were acquired in their entirety. For improved understanding, the results are presented in a tabular manner after being obtained from all articles using a methodical process.

Flow chart



Review literature

Sl. No.	Author name	Year	Conclusion
01	Camilo	2023	This study examines the effectiveness of a novel interactive transcutaneous electrical nerve stimulation (iTENS) regimen for treating primary dysmenorrhea that is customized to each patient's preferences for electrode placement. 124 women participated in the trial and were randomly assigned to one of two groups: the TENS group (TG) or the placebo group (PG). A single 35-minute iTENS session was given to TG participants, during which the electrode placement was modified in response to real-time input in order to obtain the best possible analgesia. The findings showed that the TG used less pain medication than the PG, had analgesia for more than eight hours, and experienced a substantial decrease in pain intensity ($p<0.001$). The iTENS technique, which takes patient-specific electrode placement into account, was found to be a safe and successful non-pharmacological treatment for primary dysmenorrhea.
02	Arik MI	2022	The systematic review and meta-analysis by Arik et al. (2022) evaluated the effectiveness of transcutaneous electrical nerve stimulation (TENS) for pain relief in women with primary dysmenorrhea. The study included four randomized

			controlled trials with a total of 260 participants. The primary outcome was pain intensity, and the analysis revealed that TENS was statistically more effective than sham TENS in reducing pain (SMD = 1.384; 95% CI: 0.505–2.262; p = 0.002) . The meta-analysis demonstrated a significant reduction in pain intensity with TENS compared to sham TENS. The authors concluded that TENS is a safe and well-tolerated electrophysical therapy that may be effective for relieving pain in primary dysmenorrhea.
03	Guy et.al	2022	examines the effectiveness and security of using a transcutaneous electrical nerve stimulation (TENS) device that has been preprogrammed to treat primary dysmenorrhea (PD).Forty women in need of analgesics and/or non-steroidal anti-inflammatory medications due to severe dysmenorrhea controlled, double-blind, crossover, and randomized study. According to randomization, participants self-applied either a placebo (SHAM) or TENS device to their lumbar or abdominal areas, switching between the two.During the first two TENS applications, there was a 53% (P<0.0001) statistically and clinically significant reduction in pain, as opposed to no analgesic effect (-5%, P=0.318) with SHAM.Ten non-serious adverse events were reported by seven subjects, two of which may have been caused by TENS. The tested TENS device is a non-pharmacological analgesic treatment that is well-tolerated, quick, and long-lasting, and that can be used in place of or in addition to analgesics.
04	Manisha U	2021	This study examines the effectiveness of root-level application of high-frequency transcutaneous electrical nerve stimulation (TENS) in reducing menstrual pain related to primary dysmenorrhea. The experimental group exhibited highly significant ($p < 0.001$) variations in pain intensity across all assessed sites (lower belly, low back, and bilateral thighs) in both intragroup and intergroup comparisons. According to the study's findings, high-frequency TENS administered at the root level is a secure and efficient non-pharmacological treatment for teenage girls' primary dysmenorrhea. Blood pressure normalization and a notable decrease in pain intensity demonstrate this modality's therapeutic promise in clinical settings.
05	Elboim-Gabyzon	2020	TENS as a non-pharmacological treatment for primary dysmenorrhea is thoroughly reviewed in this article. The pathophysiology of primary dysmenorrhea, TENS's mechanisms, clinical effectiveness, and usefulness are all covered by the writers. On the basis of previously published research, they also offer clinical recommendations regarding TENS parameters. In order to develop standardized TENS parameters and assess its long-term safety and effectiveness, the paper highlights the necessity for additional research. It also emphasizes how crucial it is to incorporate non-pharmacological therapies, such as TENS, into the treatment of primary dysmenorrhea in order to lessen dependency on pharmaceuticals.
06	Machado	2019	The effectiveness of microwave diathermy (thermotherapy) and transcutaneous electrical nerve stimulation (TENS) in treating primary dysmenorrhea is evaluated in this article. The study aimed to assess pain severity, pressure pain threshold (PPT), and conditioned pain modulation (CPM) in women with primary dysmenorrhea. Machado et al. (2019) carried out a randomized controlled experiment to investigate the effects of thermotherapy, TENS, and their combination in primary dysmenorrhea. The study found that thermotherapy alone was more effective than TENS and a placebo at reducing stomach discomfort and increasing PPT.
07	Perez Machado	2017	This article describes a randomized controlled study (RCT) intended to assess how transcutaneous electrical nerve stimulation (TENS) and microwave diathermy (MWD) affect primary dysmenorrhea. Women with primary dysmenorrhea will have their pain severity, pressure pain threshold (PPT), and conditioned pain modulation (CPM) evaluated. Four groups—MWD + TENS, MWD + placebo TENS, placebo MWD + TENS, and placebo MWD + placebo TENS—will be randomly assigned to the participants. The Visual Numeric Scale (VNS) and the

			McGill Pain Questionnaire (MPQ) will be used to quantify the intensity of pain, and a digital algometer and the cold pressor test will be used to evaluate PPT. These studies have examined the effects of TENS and thermotherapy on primary dysmenorrhea. For example, a randomized, placebo-controlled, double-blind clinical trial by Machado et al. (2019) evaluated the effects of thermotherapy and TENS on pain intensity, PPT, and CPM in patients with primary dysmenorrhea. The study found significant reductions in pain intensity and increases in PPT with the combined use of thermotherapy and TENS. For instance, Machado et al. (2019) assessed the effects of TENS and thermotherapy on pain intensity, PPT, and CPM in patients with primary dysmenorrhea in a randomized, double-blind, placebo-controlled clinical experiment. The study discovered that using TENS and thermotherapy together significantly increased PPT and decreased pain intensity.
08	Igwea	2016	The purpose of the systematic review was to compile data regarding the efficacy of heat therapy and transcutaneous electrical nerve stimulation (TENS) in reducing pain and enhancing quality of life in people with primary dysmenorrhea. Three heat therapy studies and six TENS studies—all randomized controlled trials (RCTs)—were included in the review. Menstrual pain intensity was the main result that was measured, while quality of life was the secondary objective. The PEDro scale was used to evaluate the studies' methodological quality; TENS trials had an average score of 4.8 out of 10, whereas heat therapy trials received an average score of 6.3 out of 10. The authors came to the conclusion that although heat therapy and TENS have promise as supplemental treatments for primary dysmenorrhea,
09	Lee	2015	The trial involved 115 women with moderate to severe primary dysmenorrhea who were randomly assigned to either the experimental group (hf-TENS and thermotherapy) or the control group (sham device). A visual analog scale was utilized to evaluate the intensity of the pain. The research group had pain alleviation for a longer period of time and had a significantly lower dysmenorrheal score than the control group. There was no difference in the ratings on the Brief Pain Inventory, the quantity of ibuprofen tablets taken, or the World Health Organization Quality of Life (BREF) between the groups. The use of the research instrument was not associated with any negative consequences. This study contributes to the growing body of evidence showing that thermotherapy combined with the non-pharmacological hf-TENS intervention is an effective way to treat primary dysmenorrhea.
10	Lauretti	2015	This study assesses the safety and efficacy of a portable TENS device (TANYX®) in treating primary dysmenorrhea-related menstrual cramps. Forty women with primary dysmenorrhea participated in the double-blind, prospective, randomized trial. The study comes to the conclusion that, with no known side effects, the portable, disposable, active TENS device (TANYX®) is useful in enhancing quality of life and quickly relieving pain in women with primary dysmenorrhea.

DISCUSSIONS

This literature study set out to assess the efficacy of transcutaneous electrical nerve stimulation (TENS) in treating primary dysmenorrhea, a prevalent and incapacitating ailment that affects people who menstruate. According to the results of the ten included research, TENS can be a useful non-pharmacological treatment for menstruation pain, and other studies have shown that using it significantly reduces pain intensity. The need for more standardized procedures and additional research to maximize its use is highlighted by the variation in study design, TENS parameters, and outcome measurements.

Optimal TENS Parameters

The fact that different studies used different treatment parameters had a significant impact on how successful TENS was. It was challenging to reach firm findings about the best treatment plan for primary dysmenorrhea because the frequency, intensity, and duration.

Effectiveness of TENS in Pain Relief

According to the majority of the research in this review, TENS considerably lessened the severity of discomfort in those with primary dysmenorrhea. According to the gate control theory, which holds that electrical stimulation of sensory neurons can prevent pain signals from reaching the brain, this is consistent with other research that suggests TENS can moderate pain through mechanisms like this. The analgesic effects of TENS are also believed to be facilitated by the stimulation of endogenous opioid release. Most frequently employed, high-frequency TENS (usually 80–100 Hz) seemed to offer the highest pain alleviation results. According to these results, TENS is a good substitute for pharmaceutical treatments like NSAIDs, which may not work as well or have unfavorable side effects for some people.

However, different studies showed varying degrees of pain reduction, with some demonstrating very slight improvements. Numerous factors, such as variations in sample size, TENS parameters (such as strength, frequency, duration, and electrode placement), and outcome measures, might be blamed for this disparity. For instance, some research examined physiological indicators of pain, including uterine contractility or muscle tension, while others used self-reported pain measures, which are subjective and open to bias.

stimulation varied from trial to trial. For example, several studies experimented with low-frequency settings (2-4 Hz) to enhance longer-lasting effects, while numerous studies employed a high-frequency setting (80-100 Hz) for acute pain alleviation. Additionally, the location of the electrodes differed; in some trials, TENS was applied to the lower abdomen, while in others, it was applied to the sacral region or lower back. In order to enable doctors customize therapies for each patient and guarantee the best results, future research should concentrate on developing uniform criteria for TENS application.

Safety and Side Effects

In every study we looked at, TENS was generally well tolerated, with very few complaints of negative side effects. Skin irritation at the electrode sites and a tingling or buzzing feeling during treatment were common adverse effects, which are usually mild and temporary. TENS is a particularly attractive alternative for people who want adverse effects. to stay away from pharmaceutical therapies because of contraindications, side effects, or personal preference because of its non-invasive nature and low Because of this, TENS is a convenient and secure option for many people with primary dysmenorrhea, especially young women and adolescents who could be more susceptible to the negative effects of medications.

Long-Term Effects and Adherence

Although the majority of research concentrated on temporary pain management, nothing is known about TENS's long-term efficacy in treating primary dysmenorrhea. The long-term effect on menstrual pain across several cycles is still unknown, although pain reduction was typically seen following acute or immediate treatments. Furthermore, there is a dearth of data regarding patient adherence to TENS therapy, which is crucial for assessing its usefulness in practice. Future studies should look at the possibility for long-term pain management with consistent TENS use as well as the maintenance of benefits over multiple menstrual cycles.

Limitations of Current Evidence

Notwithstanding the encouraging results, a number of restrictions need to be noted. Direct comparison of outcomes is challenging due to the variability in study designs, which includes variations in TENS settings, sample demographics, and methodological quality. Small sample sizes were used in many investigations, which may have limited how broadly the results may be applied. Additionally, the strength of the evidence is at best moderate due to the dearth of large-scale, high-quality randomized controlled trials (RCTs). Additionally, the majority of research did not look into combined strategies, which could be helpful in treating more severe cases of primary dysmenorrhea (e.g., TENS plus medication or other therapies).

Implications for Future Research

Future studies should concentrate on carrying out carefully planned RCTs with bigger sample sizes, longer follow-up times, and standardized TENS protocols in order to fully comprehend the potential of TENS for primary dysmenorrhea. Furthermore, investigating TENS's combined application with other non-pharmacological treatments like heat therapy or acupuncture may shed light on how effective it is as part of a multimodal treatment strategy. To evaluate the long-term advantages of TENS and its function in halting the recurrence of dysmenorrhea over time, longitudinal research is also required.

CONCLUSION

To conclude, TENS is a useful supplemental or alternative treatment for primary dysmenorrhea, especially for those who would rather not use pharmaceutical methods. To completely establish its place in clinical practice and maximize its utility as a treatment for menstrual pain, more thorough study with bigger sample sizes,

consistent methodologies, and long-term follow-up is necessary. Notwithstanding these encouraging results, it is difficult to reach firm conclusions due to variations in study design, TENS application parameters, and outcome measurements. To identify the best treatment plans and evaluate TENS's long-term efficacy in treating menstruation pain, more rigorous, standardized research is required.

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