The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 5, 2025

EFFECTIVENESS OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION ON PAIN INTENSITY IN PATIENTS WITH PRIMARY DYSMENORRHEA

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DOI: https://doi.org/10.5281/zenodo.15400917

Keywords
Dysmenorrhea, Transcutaneous Electrical Nerve Stimulation (TENS), Female undergraduates

Article History
Received on 02 April 2025
Accepted on 02 May 2025
Published on 10 May 2025

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Abstract

The main purpose of this study is to check effectiveness of Transcutaneous Electrical Nerve Stimulation (TENS) on pain intensity in female undergraduates with primary dysmenorrhea. This is a randomized control study including 100 participants with primary dysmenorrhea lasting for 3 days equally. They were randomly divided into two groups: Transcutaneous Electrical Stimulation (TENS) and Control. Subjects in TENS group were treated with Conventional TENS for 15 minutes once daily while the other group has no treatment. Patients were treated for first 3 days, the severity of pain was examined by Visual Analogue Scale (VAS) in both groups pre-treatment and post-intervention. The data obtained in analyzed through Statistical Packages for Social sciences. Descriptive statistics was used to the participant's age, Primary dysmenorrhea history, menstrual history, duration of periods, regularity, family history of dysmenorrhea and Day 1 average pain. Independent T test is further used to compare pain intensity of session 1, 2 and 3 between Experimental group and control group. Alpha was set at < 0.05. Results of this study showed Transcutaneous Electrical Nerve Stimulation (TENS) group has significant reduction in pain intensity between pre-treatment and post-intervention (P<0.001). Also there was a significant difference in pain intensity of session 1, 2 and 3 between Experimental group and Control group with (P<0.001). Transcutaneous Electrical Nerve Stimulation (TENS) was found to be effective modality in treating primary dysmenorrhea among female undergraduates.

INTRODUCTION

Dysmenorrhea is defined as a chronic, cyclic pelvic pain and occurrence of painful menstrual cramps of uterine origin. It can be intermittent with great variation in frequency, duration, intensity and clinical characteristics. (1) The occurrence of painful menstrual flow that, along with other symptoms, leads to considerable morbidity. The prevalence of dysmenorrhea varies between 16% and 91% in adolescents and females of reproductive age, with severe pain in 2%-29% of cases even causing absenteeism from university and work. (2) Dysmenorrhea has two types, primary and secondary dysmenorrhea. Primary dysmenorrhea is a painful menstruation in women due to contractions of the uterus which induce ischemia, with normal pelvic anatomy, usually begins during adolescence (3).

Secondary dysmenorrhea is defined as painful menstrual cramps associated with pelvic organ pathology such as uterine myoma or ovary cyst(4). Typically, primary dysmenorrhea has an onset within 6 months to 2 years (mostly 6-12 months) after menarche; when cycles become ovulatory. Decreased progesterone level at the end of the luteal phase induces lysosome degradation and releases phospholipase A2. The enzyme synthesizes prostaglandins through arachnoid acids by way of the cyclooxygenase pathway. Mentioned metabolites cause vasoconstriction, myometrial contractions, ischemia, and eventually pain. Usually, the patient present's typical features such as spasmodic and painful cramps in the suprapubic region which start a few hours before or during menses and last up to 72h. The pain may also radiate to the lumbar area or inner thighs and be associated with nausea, vomiting or diarrhea (5). The current PD pathogenesis is mainly related to an excessive release of prostaglandins by the endometrium into menstrual fluid. Prostaglandin F2 alpha (PGF2α) and natural prostaglandin E2 (PGE2) induce vasoconstriction and contractions of the myometrium. High levels cause uterine hyper contractility that triggers hypoxia and endometrial mucosa ischemia. This uterine hyper contractility together with hypoxia and

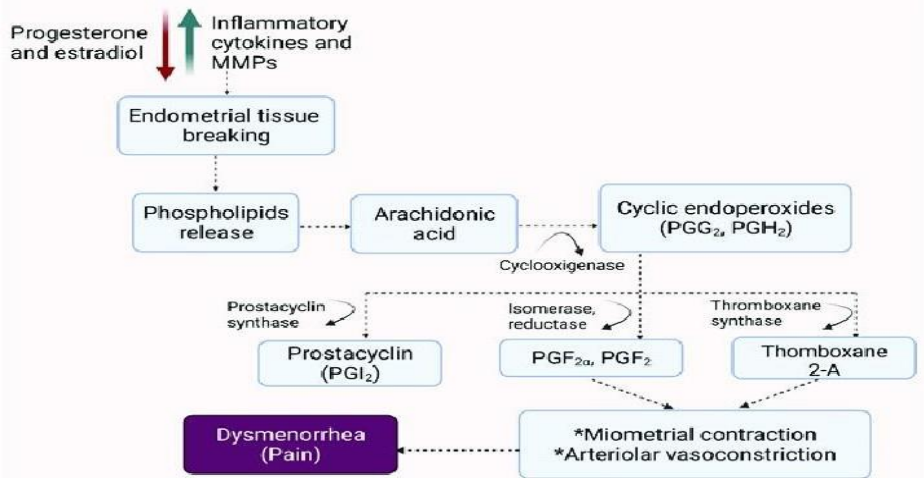
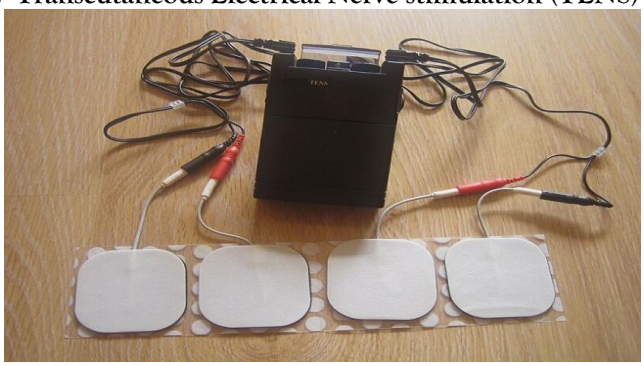


Figure 1. Pathophysiology of dysmenorrhea

Ischemia could be the cause of the cramp-like pain in PD. It also has associated systemic symptoms with vasopressin (uterine flow viii reduction), local factors (cervix stenosis) and, sometimes, psychological factors. Primary dysmenorrhea affects approximately between 45–95% of women; however, a high prevalence has been found in adolescents and young women (16–25 years old) (6). It interferes both in their social and work/academic life, leading to a high rate of absenteeism). Pain during primary dysmenorrhea usually lasts 8-72(7). Primary dysmenorrhea brought on by an increase in prostaglandin (PG) F2- alpha hormone and cyclooxygenase (COX-2) resulting in the myometrium becoming hypertonic and constricted (8). Primary dysmenorrhea is mostly treated with non-steroidal anti-inflammatory drugs (NSAID), heat packs, oral contraceptive tablets, and non-pharmacological techniques. However, some people experience some adverse consequences from these methods (9). Non-steroidal anti-inflammatory drug (NSAID) was found to have properties not allowing for the production of prostaglandin. Non-steroidal anti-inflammatory drugs are reported to be effective; nonetheless, there are studies on their associated side effects such as dizziness, nausea, dry mouth, and paresthesia in controlling primary dysmenorrhea (10). Various studies have proven that physiotherapy treatment such as stretching, pelvic mobilization, treadmill and electrotherapy modalities to be effective for pain relief in primary dysmenorrhea(9). Dysmenorrhea is a symptom complex, not only affecting life quality but also reducing productivity. In addition to its interference with daily function and its impact on the physical and emotional conditions, it

negatively influences academic and daily activities. Ovulation increases the production of fatty acids, which is the precursor for the production of prostaglandins; the implication is that women, who do not ovulate, may not experience cramps and primary dysmenorrhea. Therefore, primary dysmenorrhea can be treated by inhibiting ovulation with oral contraceptives (10). Methods like Transcutaneous Electrical Nerve Stimulation (TENS), acupuncture, continuous topical heat, or exercise and yoga seem to be effective in reducing the symptoms of primary dysmenorrhea(11) . It is easy to use, with no reported side effects. TENS is an electro physical therapy that patients can self-administer. The device is small-sized and connects with patches applied on the painful area or thoracic spine.

Figure 1. Transcutaneous Electrical Nerve stimulation (TENS) machine



Therefore patients themselves adjust the intensity and duration of therapy(5). (TENS), is a noninvasive technique widely used to promote analgesia in acute and chronic health condition(7).Without triggering the nociceptive fibers, TENS activates the skin's large-diameter Aß ix proprioceptive nerve fibers. Under these circumstances, the "gate control" theory states that pain signals from the uterus are unable to reach the spinal cord, blocking their transmission to the brain's receptors. Additionally, beta endorphins, which also aid in pain reduction, may be released in response to TENS stimulation. TENS is also thought to lessen ischemia discomfort by enhancing blood circulation in the uterus(10).Pain associated with primary dysmenorrhea has been a challenge among young ladies especially in higher institution. They have attempted to find approaches to alleviating the pain using various analgesia(4). Studies have shown that TENS can lead to a decrease in pain in those females suffering from primary dysmenorrhea. However, TENS, in a general manner, has been poorly used as the parameters used to improve pain symptoms in several kinds of pain are not adequate, and data on optimal dosing, which include electrode positioning, are still not available.

For primary dysmenorrhea treatment, other studies have shown that TENS is effective in reducing pain, and a systematic review has shown evidence for that effect. The parameters usually used include high frequencies (100-200 Hz) and should include adequate amplitudes but do not take into account patients' preferences and perceptions, which are key factors when considering the practical evidence-based physiotherapy(7).The purpose of the present study is to evaluate the effect of High frequency TENS on dermatomal level at different menstrual pain among adolescent girls with primary dysmenorrhea(4).Considering the high prevalence of primary dysmenorrhea in adolescents and young women, this study aimed to assess and to compare the effects of low- and medium-frequency electrotherapy on primary dysmenorrhea in young women, regarding the following variables: pain during menstrual cycle, pain interference in activities of daily living, and sleep quality.

METHODOLOGY

The study was a randomized controlled trial conducted from September 2023 to May 2024 at Abasyn University, Islamabad, Chak Shahzad. After obtaining ethical approval from the Rehabilitation Department of the university, female students meeting the inclusion criteria aged 18–25 years, with a diagnosis of primary dysmenorrhea and a history of lower

abdominal pain for more than three menstrual cycles were recruited through simple random sampling using the lottery method. Exclusion criteria included secondary dysmenorrhea due to pelvic disease, use of analgesics within 48 hours prior to evaluation, and a history of lower abdominal surgery. A total of 100 participants were selected using Cochran's formula and divided equally into experimental and control groups. Data were collected using a self-structured questionnaire and Visual Analogue Scale (VAS). The intervention involved application of Transcutaneous Electrical Nerve Stimulation (TENS) using the Comfy Stim Combo Model EV-804 device (EVERYWAY MEDICAL INSTRUMENTS CO. LTD., Taiwan), applied for 15 minutes daily on the first three days of menstruation. Electrode placement followed the quadripolar method with two electrodes at the inguinal region and two at the pubic symphysis, positioned 3–5 cm below the navel and spaced approximately 5 cm apart. The TENS was set to a frequency of 50–100 Hz, pulse width of 100–300 μs, and intensity adjusted to patient tolerance. Participants were asked to rate their pain using VAS before and after each session. All procedures were documented, and the same protocol was followed for three consecutive days. Data were analyzed using SPSS version 22. Descriptive statistics were used to summarize demographic and menstrual history, while independent t-tests compared pain intensity across sessions between the two groups, with significance set at $p < 0.05$. The study ensured confidentiality, voluntary participation, and informed consent, with no risk of harm to participants.

RESULTS

A total one hundred female undergraduate students between age 18 and 25 were included in the study. Mean age of the participants was 20.50 with 11% female participants were of age 18 years, 14% participants was of age 19 years, 15% were of age 20 year, 18% of age 21 year, 22% of age 22, 17% of age 23, 2% of age 24 and only 1% of age 25.

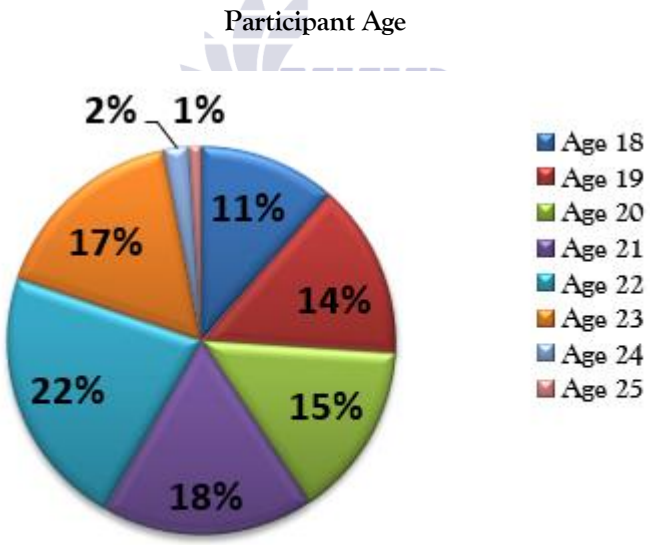


Figure 4. Age of the participants

History was taken from 120 female undergraduate students of Abasyn University Islamabad campus; 20 participants were excluded because they not met the inclusion criteria of our study 100 participants included in the study having history of primary dysmenorrhea. Percentage of participant's average day 1 pain intensity, menstrual cycle length, duration, regularity, family history of PD, relevant medical condition and referred pain is shown below:

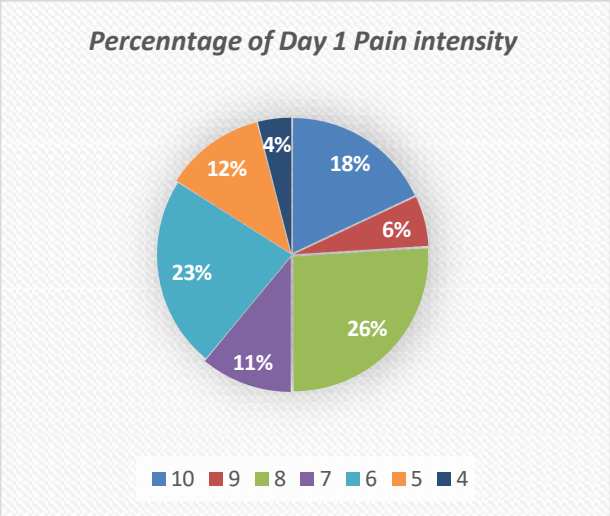


Figure 4. Percentage of average day 1 pain intensity

Figure 4.2 shows result of average day 1 pain intensity percentage among participants of PD. (18%) have reported average pain of scale 10 on VAS, (6%) reported scale 9 pain, (26%) have scale 8 pain intensity, (11%) have pain of 7, (23%) have pain level of 6, (12%) have pain level of 5 and only (4%) reported pain level of 4 on Visual Analog Scale (VAS).

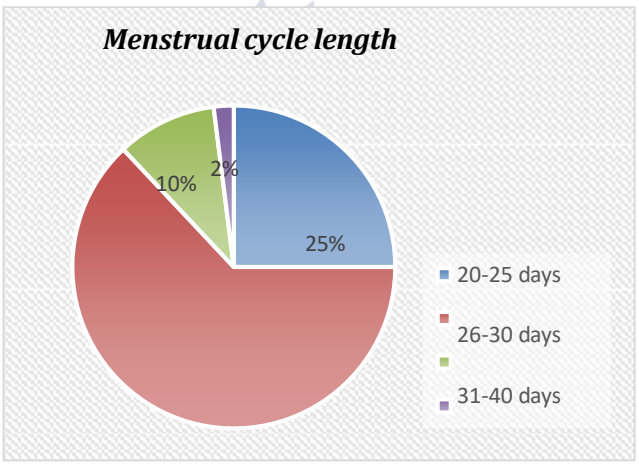


Figure 4. Percentage of Menstrual cycle length

Figure 4.3 shows the percentage of average length of menstrual cycle. (63%) have cycle length between 26-30 days, (25%) have cycle length between 20-25 days, (10%) have menstrual cycle length of 31-40 days, and only (2%) have very long cycle length that is above 40 days.

Table 4. Table shows family history of PD, relevant medical condition and referred pain in participants

Characteristics	Yes	No
Family history	57%	43%
Relevant medical condition	7%	93%
Pain Referred	86%	14%

During the history taking we asked the patient about their family history of PD, any relevant medical condition and pain pattern of PD. The results shows that (57%) of participants have family history of primary dysmenorrhea, (86%) have pain referred to specific areas and only (7%) have relevant medical conditions (i.e. PCOS). That is shown in the table 4.1.

Table 4. Table shows duration of menstruation in participants

Duration of periods	5-7 days	3-5 days
Percentage	73%	27%

Table 4.2 shows results of participant's duration of menstruation. On average (73%) participants have duration of 5-7 days, while (27%) have duration of 3-5 days of menstruation.

Table 4. Table shows Regularity of Menstruation

Regularity	Regular	Irregular
Percentage	88%	27%

Table 4.3 shows the regularity of menstruation among primary dysmenorrhea participants the results shows that (88%) participants have regular menstruation every month, while (27%) participants have irregular menstruation.

As the table no 4.1 and table no 4.2 indicates the demographics and clinical characteristics of participants in experimental and control group respectively. These results shows that the participants in both groups were homogeneous in term of age, pain intensity before treatment, Menstrual history, duration of periods, regularity and family history.

Table 4. : Demographic and clinical characteristics of TENS group

Variables	N	Mean	Std. Deviation	Variance
Age	50	20.520	1.7171	2.949
PD history	50	1.02	.141	.020
Menstrual history	50	1.24	.555	.309
Duration of eriods	50	1.68	1.203	1.477
Regularity	50	1.06	.240	.158
Family history	50	1.44	.501	.251
Day 1 Average pain	50	7.32	1.708	2.916

Table 4. : Demographic and clinical characteristics of Control group

Variables	N	Mean	Std. Deviation	Variance
Age	50	21.120	1.6860	2.842
PD history	50	1.12	.328	.108
Menstrual history	50	1.28	.640	.410
Duration of periods	50	1.54	.503	.253
Regularity	50	1.18	.388	.151
Family history	50	1.88	.328	.108
Day 1 Average pain	50	7.32	1.708	2.916

Figure 4.2 compares Experimental and Control groups in terms of pain intensity on Day 1, 2 and 3. On first day there is no significant difference in pain intensity between both groups. However, on Day 3 there is significant reduction in pain intensity as compared to control group.

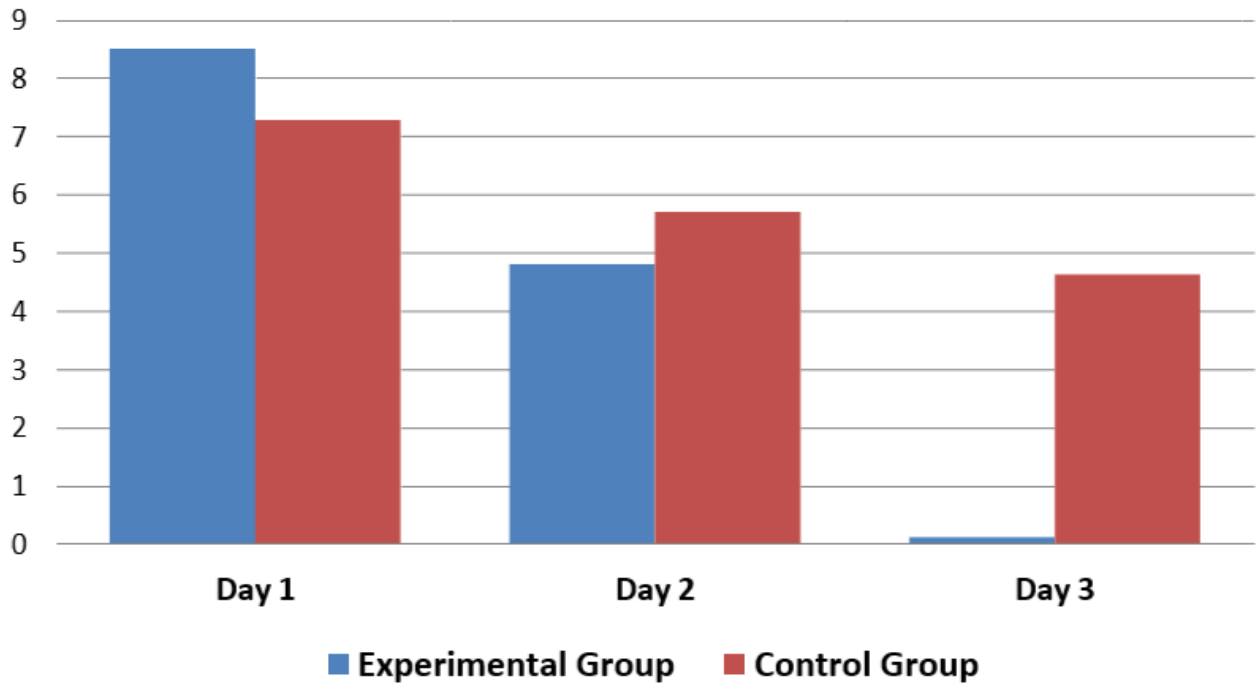


Figure 4. The figure shows the comparison between the experimental and control group regarding pain intensity on day 1, 2 and 3

In Table 4.3 Independent T test is used to compare pain intensity between TENS group and control group where there is significant difference (F=25.728, P<0.001)

Table 4. : Independent sample Test for comparison of pain intensity between TENS group and Control group

Variables	N	Mean	Std. Deviation	P- value	Mean Difference	F
Control Group	50	5.8667	1.911431			
Experimental Group	50	.8000	.99431	< .001	−5.06667	25.728

CONCLUSION

Pain is significantly reduced in TENS group as compared to Control group, pain intensity differences is seen pre and post treatment in participants that received treatment. This study suggest that TENS seems to be effective modality in managing primary dysmenorrhea among females. It has no adverse effect as compared to analgesics.

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