



**POTENTIAL BENEFITS OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION IN PRIMARY DYSMENORRHEA: A REVIEW**

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**A B S T R A C T**

**Background:** Dysmenorrhea is one of the most common gynecological complaints among adolescent girls and adult females. It is classified as Primary, occurs without any underlying gynecological disease and Secondary, accompanied by some gynecological pathology. Transcutaneous Electrical Nerve stimulation (TENS) is an efficient pain relieving method for treating dysmenorrhea. **Aim:** The aim of this review is to investigate the potential benefits of high and low frequency TENS in primary dysmenorrhea. **Methods:** Extensive search of electronic databases from Google scholar, Pubmed, PEDro and Cochrane library were performed between 2010 to 2018 to identify relevant experimental studies. Ten experimental studies fulfilled the inclusion criteria for this review. **Results and Conclusion:** There are limited studies to determine the effect of low frequency TENS. However, high frequency TENS is effective for pain relief in primary dysmenorrhea. Therefore, there is need of more moderate to high quality experimental studies to affirm the effectiveness of high and low frequency TENS in primary dysmenorrhea.

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**INTRODUCTION**

Menstruation is a normal biological process in the woman's body that plays a key role in the continuation of human race (Bano & Mulyhan, 2014). It is a periodic and cyclical endometrium shedding resulting in to genital bleeding, lasting up to 2 to 6 days. The normal interval of menstrual cycle is around 21 to 45 days, with a mean blood loss of 20 to 60 ml and about 67 months of menstrual bleeding in a lifetime. Although due to wide variation in initial year of menarche, the interval of cycle may also be less than 20 days and greater than 45 days (Dars *et al*, 2014). The onset of menarche may vary between 9 to 18 years of age. In India, the average range of menarche is around 12 years (Khadilkar *et al* 2006, Chumlea *et al* 2003).

Dysmenorrhea is the most common menstrual abnormality among all types. It is defined as painful menstrual cramps that usually starts few hours before or with the onset of bleeding and may persist for hours or days. According to various research studies, prevalence of dysmenorrhea may vary in a wider range between 16 to 93% and it also depends upon their different types of dysmenorrhea, their ethnic, biological and socio-cultural background (Grandi *et al*, 2012).

Associated symptoms of dysmenorrhea are headache, vomiting, nausea, tiredness, dizziness, diarrhea which may lead to school or work absenteeism as well as affect quality of life (Omidvar *et al*, 2016).

Dysmenorrhea is further classified into two subcategories, Primary and Secondary dysmenorrhea. Primary Dysmenorrhea (PD) often starts at 6 to 12 months after menarche and occurs without any underlying gynecological disease. Its symptoms usually begin with the onset of menstruation and may persist for 8 hours to 3 days (Habibi *et al*, 2015) whereas Secondary dysmenorrhea (SD) occurs at any time period between menarche to menopause with accompanying gynecological pathology such as endometriosis, ovarian cysts, pelvic inflammatory disease and intrauterine adhesions (Sanctis *et al*, 2015). SD commonly arises in women after 25 years of age, it may also occur occasionally among adolescents with the sign of heavy bleeding along with the clot formation (Habibi *et al*, 2015).

The present narrative review focuses on PD, as it is highly prevalent among adolescent girls. In India, various prevalence studies reported its range between 50 to 87.8% (George *et al*, 2002; Patel *et al*, 2006; Nair *et al*, 2007). The etiological factors of PD include increase in the synthesis & secretion of Prostaglandins (PGs) from endometrial cells which causes hyper contractility of uterus, raised vasopressin & oxytocin level that further enhance the PG secretion and stimulation of type C pain fibers (Habibi *et al*, 2015). PD is characterized by symptoms such as pain in lower abdomen or in suprapubic

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region and it may refer to thighs and lower back (Dawood *et al*, 1983). Pain sensations may be described as cramping or colicky and a dull constant ache which may be most severe during first or second day of menstrual cycle (Akinbo *et al*, 2007).

Methods of Treatment for PD include Pharmacological and Non pharmacological approaches. Non Steroidal Anti-inflammatory Drugs (NSAIDs) are most widely used pharmacological methods but there are several side effects to it and some females do not wish to use medications (Dawood *et al*, 1990).

Thus, a safe & effective non pharmacological management is quite beneficial which include hot pack, acupuncture, biofeedback, spinal manipulation, relaxation techniques, microwave diathermy, infrared ray filament belt and TENS (Transcutaneous Electrical Nerve Stimulation).

TENS is a non invasive and efficient pain relief method without any significant side effects. It has been effectively used in controlling post operative low back pain, labor pain and dysmenorrhea (Shah *et al*, 2014). TENS is classified into two subtypes, High and Low frequency.

Authors	Type of study (sample size)	Objectives	Results	Conclusion
Parsa & Bashirian (2013)	Randomized controlled study (64)	To examine the effect of high frequency TENS on primary dysmenorrhea	Pain intensity in active TENS was significantly decreased than placebo group (p=0.000). Concurrent use of analgesic was reduced significantly in the active TENS (p<0.01); but not after placebo TENS.	TENS could be effective in pain reduction among adolescents with primary dysmenorrhea.
AlYousef et al (2013)	Pre-Post Experimental study (40)	To assess the effect of transcutaneous electrical nerve stimulation on the relief of dysmenorrheal pain	There was significant improvement in the level of dysmenorrheal pain.	Transcutaneous electrical nerve stimulation (TENS) is safe and effective non pharmacological method for pain relief of dysmenorrhea.
Chaitali Shah (2014)	Randomized clinical study (30)	To compare the effect of high & low frequency tens at dermatome & root level.	PPR (mean percentage of pain relief) is found to be statistically significant between patients of group 1 and group 2 since P=0.001. While LMP (length of menstrual period), PDB (painful days during menstruation) shows no significant difference between patients of group 1 and 2 since p>0.05.	High TENS at Dermatome level and Low TENS at root Level both are effective in reducing pain but High TENS at dermatome Level is more effective.
Sokunbi et al (2014)	Randomized controlled study (36)	To compare the effectiveness of acupuncture and acupuncture-like transcutaneous electrical nerve stimulation in treating primary dysmenorrhea	Overall percentage improvements in PRI (Pain rating index) scores were 10.41%, 50.23% and 52.26% for the control, acupuncture and ACUTENS groups respectively. Similarly, the overall improvement in VAS scores were 8.89%, 74.58% and 75.56% for the control, acupuncture and ACUTENS groups respectively.	Results concluded that pain relief was approximately the same for the acupuncture and the ACUTENS groups over time.
Mistry et al (2015)	Quasi-Experimental study (50)	To examine the effect of Conventional TENS and Spinal mobilization on pain in Primary Dysmenorrhea	Pain relief was approximately similar for both Conventional TENS and Spinal mobilization group p<0.05.	The results concluded that TENS and mobilization both are effective in reducing pain among adolescent girls with primary dysmenorrhea.
Lee et al (2015)	Randomized controlled study (115)	To evaluate the efficacy and safety of combined effect of high-frequency transcutaneous electrical nerve stimulation (hf-TENS) and thermotherapy in relieving primary dysmenorrheal pain.	The dysmenorrheal score was significantly reduced in the experimental group compared to the control group following the intervention. The duration of pain relief was significantly increased in the experimental group compared to the control group.	The combined effect of hf-TENS and thermotherapy was effective in relieving acute pain in women with moderate or severe primary dysmenorrhea.
Patel et al (2016)	Quasi-Experimental study (30)	To study the effect of Transcutaneous Electrical Nerve Stimulation on Pain in Subjects with Primary Dysmenorrhea.	Results reveal that VAS score was significantly reduced in Group A (intervention on 3 premenstrual days) and Group B (intervention during initial 3 days of menstrual cycle). There was significant difference between both groups (p=0.042)	The results concluded that TENS delivered for 3 days before or during menstrual cycle is effective in reducing pain. However use of TENS in premenstrual phase is more effective for reducing menstrual pain.
Kanwal et al (2016)	Randomized controlled study (66)	To compare the effectiveness of tens vs. stretching exercises on primary dysmenorrhea.	There was a significant improvement within TENS group (p ≤ 0.05). Additionally, significant differences in some domains of quality of life were also observed between both groups.	The results concluded that TENS is more effective for pain relief but to improve quality of life stretching exercises are more effective.
Muragod et al (2017)	Randomized clinical study (32)	To compare the effect of Transcutaneous Electrical Nerve Stimulation and Diadynamic current in Primary Dysmenorrhea.	Within group comparison was statistically significant with p < 0.001 for both groups in terms of VAS, McGill pain questionnaire and Moos Menstrual distress questionnaire. Between group comparison was statistically insignificant.	The result indicate that both Diadynamic Current and TENS are effective in reducing Dysmenorrhea pain. However, Diadynamic currents were more effective.
Bai et al (2017)	Randomized controlled study (134)	To examine the effect and safety of transcutaneous electrical nerve stimulation (TENS) therapy for relieving pain in women with primary dysmenorrhea	TENS reported significant effect in pain relief with regard to the numerical pain rating scale (p<0.001) and number of ibuprofen tablets taken (p<0.001). However, no significant differences in the quality of life were found between 2 groups.	Results concluded that TENS was effective and safe in relieving pain in subjects with PD.

Low frequency TENS (acupuncture like TENS) consists of pulses range between 1 Hz to 4 Hz, at high intensity and long pulse width. High frequency TENS (Conventional TENS) consists of pulses range between 50 Hz and 120 Hz at a low intensity (Mannheimer, 1985; Kaplan, 1997).

In 2010, a Cochrane systematic review evaluated the effectiveness of high and low frequency TENS for primary dysmenorrhea and concluded that high TENS is effective for the treatment of dysmenorrhea (Proctor *et al*, 2010).

Although, previous review has evaluated the effect of TENS in primary dysmenorrhea, further literature review for updating new research articles is required that have been published after 2010. Therefore, the purpose of this review is to determine the potential benefits of high and low frequency TENS in treating primary dysmenorrhea.

## METHODS

A detailed search of electronic databases Google scholar, Pubmed, PEDro and Cochrane library was conducted from 2010 and 2018. Articles were located using the terms such as "dysmenorrhea" and "TENS". Inclusion criteria were: i) articles with complete text; ii) articles should be written in English; iii) articles published between 2010 and 2018; iv) subjects should be from primary dysmenorrhea population; v) articles addressing the effect of TENS to treat primary dysmenorrhea; vi) all randomized clinical, controlled and experimental studies. Excluded studies were: i) review articles and systematic reviews; ii) pharmacological studies addressing the treatment in primary dysmenorrhea; iii) secondary dysmenorrhea subjects; iv) animal studies; v) other non pharmacological intervention studies.

The search has resulted in 85 articles; 70 were excluded (not under proposed stipulated period, not fulfilling the inclusion and exclusion criteria). Out of 15, 5 articles again excluded due to full text unavailability and remaining 10 articles were included in the review. The characteristics of included studies are given in table 1.

## DISCUSSION

This review highlights the effect of high and low frequency TENS in treating primary dysmenorrhea. Mechanism of pain relief through TENS involves the pain gate theory proposed by melzack & wall or endorphin mediated pain relief method. In pain gate theory, pain is stimulated when gate opens by activity in small diameter pain carrying fibers and it is inhibited by closing the gate with the activity of large diameter fibers. On the other hand at brain level, pain is suppressed by action of endogenous opioids like endorphins (natural pain killing chemicals) which are released by neurons. TENS stimulates endorphins & its increased release cause analgesic effect (Hughes *et al*, 1984; Shah, 2014).

High frequency TENS relieves pain by a segmental mechanism which suggests that TENS induce A-delta fibres and causes long-term depression of central nociceptive cell activity for up to 2 hours. Low frequency TENS activates extra segmental descending pain inhibitory pathways and induce activity in small diameter afferents (A-d) leads to activation of the midbrain, medulla and inhibition of descending pain facilitatory pathways. High frequency TENS is effective for menstrual pain relief in primary dysmenorrhea. As per our search of literature, there are limited number of studies leading

to conflicting results to determine whether high frequency TENS is more effective than low frequency TENS.

## CONCLUSION

TENS is safe and effective alternate non-pharmacological treatment option for subjects with primary dysmenorrhea. Therefore, further research is needed to strengthen the evidence of high frequency and low frequency TENS effect in primary dysmenorrhea. Moreover, there is a need of more moderate to high quality experimental studies in future research.

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