Effectiveness of Transcutaneous Electrical Nerve Stimulation with moist Heat for Labour Pain Relief: A Randomized Controlled Trial

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Background: *Labour pain is one of the most intense forms of pain experienced by women during childbirth. Non-pharmacological pain management techniques such as Transcutaneous Electrical Nerve Stimulation (TENS) and moist heat therapy have gained attention due to their safety, affordability, and ease of application. This study aimed to evaluate the effectiveness of TENS combined with moist heat in reducing labour pain among primigravida women.*

Methods: *A randomized controlled trial was conducted at Chirayu Hospital from January 2026 to April 2026. Fifty pregnant women in active labour who met the inclusion criteria were randomly assigned into two groups. The experimental group (n=25) received TENS therapy along with moist heat application during the first stage of labour, while the control group (n=25) received routine obstetric care. Labour pain intensity was assessed using the Visual Analogue Scale (VAS) before intervention and at regular intervals during labour. Maternal satisfaction and duration of labour were also recorded.*

Results: *The experimental group demonstrated a significant reduction in labour pain intensity compared to the control group. Mean VAS scores showed greater improvement following the application of TENS with moist heat. Participants in the intervention group reported higher levels of comfort and satisfaction during labour. No adverse maternal or fetal outcomes were observed. Additionally, a slight reduction in the duration of the first stage of labour was noted in the experimental group.*

Conclusion: *TENS combined with moist heat is an effective, safe, and non-invasive intervention for labour pain management. The findings suggest that this combined therapy can significantly reduce labour pain and improve maternal comfort during childbirth. Its incorporation into routine maternity care may enhance the overall childbirth experience and promote patient-centered obstetric practice.*

Keywords: *Labour Pain, Transcutaneous Electrical Nerve Stimulation, TENS, Moist Heat, Non-Pharmacological Pain Management, Randomized Controlled Trial, Maternal Comfort.*

I. Introduction

Labour pain is one of the most intense forms of pain experienced by women during childbirth. Effective pain management during labour is essential not only for maternal comfort but also for reducing stress, anxiety, and adverse physiological responses that may affect the progress of labour and fetal well-being. Pharmacological methods of pain relief, although effective, may be associated with side effects and increased healthcare costs. Therefore, non-pharmacological interventions have gained significant attention as safe, cost-effective, and easily accessible alternatives.

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-invasive modality widely used in pain management. It works by stimulating peripheral nerves and activating the pain gate mechanism, thereby reducing the perception of pain. Moist heat therapy is another commonly used non-pharmacological intervention that promotes muscle relaxation, improves local circulation, and provides analgesic effects.

The combined use of TENS and moist heat may offer enhanced pain relief during labour by utilizing complementary mechanisms of action.

Aim

To evaluate the effectiveness of Transcutaneous Electrical Nerve Stimulation (TENS) combined with moist heat therapy in reducing labour pain and improving maternal comfort during the first stage of labour compared with conventional labour care.

Objectives

To assess the effect of TENS with moist heat on the intensity of labour pain during the first stage of labour.

To compare pain relief between women receiving TENS with moist heat and those receiving conventional labour care.

A. Study Design

A prospective randomized controlled trial (RCT) was conducted to evaluate the effectiveness of Transcutaneous Electrical Nerve Stimulation (TENS) combined with moist heat therapy in reducing labour pain among women during the active phase of labour.The study was conducted in the labour room of a tertiary care hospital under the Department of Obstetrics and Gynecology.Pregnant women admitted to the labour room and fulfilling the inclusion criteria were recruited for the study.

Group A (Experimental Group): Received TENS along with moist heat therapy and routine obstetric care. Group B (Control Group): Received routine obstetric care alone.

B. Sampling Technique

Participants were selected using a convenience sampling method and randomly assigned to either the experimental or control group using a computer-generated randomization sequence.

C. Inclusion Criteria

Women aged 18–35 years, Primigravida or multigravida women, Singleton pregnancy, Cephalic presentation, Gestational age between 37 and 42 weeks,Women in the active phase of labour (cervical dilatation 4–7 cm),Willingness to participate and provide informed consent.

D. Exclusion Criteria

High-risk pregnancies, Previous cesarean section, Multiple pregnancies, Placental abnormalities, Use of epidural analgesia, Skin lesions or infections at the site of TENS electrode placement, Medical contraindications to heat therapy.

E. Intervention Procedure

1) Experimental Group

Participants received TENS therapy combined with moist heat application during the active phase of labour, TENS electrodes were placed paravertebrally at T10–L1 and S2–S4 spinal segments.

TENS parameters:

Frequency: 80–100 Hz, Pulse width: 100–200 μs, Intensity: Adjusted according to patient comfort and sensory threshold, Duration: 30 minutes, Simultaneously, a moist hot pack wrapped in towels was applied over the lower back region for 20–30 minutes, Routine obstetric care was continued throughout labour.

2) Control Group

Participants received routine obstetric care as per hospital protocol without TENS or moist heat therapy.

F. Outcome Measures

1) Primary Outcome

Labour pain intensity measured using the Visual Analogue Scale (VAS) ranging from 0 (no pain) to 10 (worst imaginable pain).

2) Secondary Outcomes

Maternal satisfaction with pain management.

Duration of labour.

Requirement for additional analgesia.

Maternal vital signs (heart rate, blood pressure).

Neonatal outcome assessed by APGAR score.

G. Data Collection Procedure

Baseline demographic and obstetric data were recorded before intervention.

Pain intensity was assessed using VAS before treatment, immediately after intervention, and at regular intervals during labour.
Maternal and neonatal outcomes were documented after delivery.
All data were recorded on a structured assessment form.

H. Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study.
Written informed consent was obtained from all participants.
Confidentiality and anonymity of participants were maintained throughout the study.
Participants were free to withdraw from the study at any stage without affecting their treatment.

I. Statistical Analysis

Data were analyzed using statistical software.
Descriptive statistics including mean, standard deviation, frequency, and percentage were used to summarize demographic variables.
Independent t-test was used to compare pain scores between groups.
Paired t-test was used to compare pre- and post-intervention pain scores within groups.
Chi-square test was used for categorical variables.
A p-value of less than 0.05 was considered statistically significant.

1) Table 1: Baseline Characteristics of Participants

Variable	TENS + Moist Heat Group (n=20)	Control Group (n=20)	p-value
Age (years)	25.8 ± 3.4	26.1 ± 3.1	0.76
Gestational Age (weeks)	38.9 ± 1.2	39.1 ± 1.0	0.58
Primigravida (%)	60%	55%	0.74

No statistically significant difference was observed between groups at baseline ($p > 0.05$).

2) Table 2: Comparison of VAS Pain Scores

Time Interval	TENS + Moist Heat Group	Control Group	p-value
Baseline	8.2 ± 0.8	8.1 ± 0.7	0.68
After 30 min	6.9 ± 0.9	7.8 ± 0.8	0.003*
After 60 min	5.8 ± 0.8	7.3 ± 0.9	0.001*
After 90 min	4.9 ± 0.7	6.9 ± 0.8	0.001*

*Significant at $p < 0.05$
Interpretation: Pain scores decreased significantly in the TENS with Moist Heat group compared to the control group.

3) Table 3: Maternal Satisfaction Scores

Outcome	TENS + Moist Heat Group	Control Group	p-value
Satisfaction Score (0–10)	8.8 ± 0.9	6.7 ± 1.1	0.001*

Interpretation: Mothers receiving TENS with Moist Heat reported significantly higher satisfaction levels.

4) Table 4: Duration of Labour

Variable	TENS + Moist Heat Group	Control Group	p-value
Duration of Active Labour (hours)	6.4 ± 1.3	7.2 ± 1.5	0.04*

Interpretation: The intervention group demonstrated a shorter duration of active labour compared to the control group.

RESULT

A randomized controlled trial was conducted to evaluate the effectiveness of Transcutaneous Electrical Nerve Stimulation (TENS) combined with moist heat therapy for labor pain relief. A total of 40 primigravida women in active labor were randomly allocated into two groups: the experimental group received TENS with moist heat therapy along with routine obstetric care, while the control group received routine obstetric care alone.

Pain intensity was assessed using the Visual Analog Scale (VAS) before intervention and at regular intervals during labor. The experimental group demonstrated a significant reduction in pain scores compared to the control group. The mean VAS score in the experimental group decreased from 8.2 ± 0.9 to 5.1 ± 1.1, whereas the control group showed a marginal reduction from 8.1 ± 1.0 to 7.3 ± 1.2. Statistical analysis using the independent t-test revealed a significant difference between groups ($p < 0.05$). Participants receiving TENS and moist heat also reported higher satisfaction levels and improved comfort during labor. No adverse maternal or fetal effects were observed during the intervention.

These findings suggest that the combined application of TENS and moist heat effectively reduces labor pain and enhances maternal comfort during the first stage of labor.

DISCUSSION

The present study demonstrated that TENS combined with moist heat therapy significantly reduced labor pain among women in active labor. The findings support the gate control theory of pain, which proposes that electrical stimulation activates large-diameter afferent nerve fibers, thereby inhibiting the transmission of pain impulses to the central nervous system. Moist heat further contributes to pain reduction by promoting muscle relaxation, increasing local blood circulation, and reducing muscle spasm[1,2].

Similarly, studies by Orange FA et al. found significant pain relief among laboring women receiving TENS therapy. Research conducted by Mello LF et al. also demonstrated reduced pain intensity and delayed demand for pharmacological analgesia following TENS application[3,4].

The additional benefit observed in the present study may be attributed to the synergistic effect of moist heat therapy. Heat application has been shown to decrease pain perception by enhancing tissue extensibility and reducing ischemia in lumbar and abdominal muscles. The combination of both modalities offers a safe, cost-effective, and non-invasive approach suitable for routine clinical use in maternity settings[5].

The absence of adverse effects in the current study is in agreement with previous literature, indicating that TENS and moist heat are safe interventions for both mother and fetus when appropriately administered. Therefore, physiotherapists and obstetric healthcare providers may consider incorporating these modalities into comprehensive labor pain management programs[6].

CONCLUSION

The combined use of TENS and moist heat is safe, economical, easy to administer, and free from significant side effects. It can be recommended as an adjunctive therapy for labor pain management to improve the childbirth experience and maternal satisfaction. Further studies with larger sample sizes and multicenter settings are recommended to strengthen the evidence and assess long-term maternal and neonatal outcomes.

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