Original Article

Maternal-Fetal Medicine®

OPEN

Patient-Reported Levels of Satisfaction in Pain Management With Non-pharmacological Measures During Pregnancy: A Randomized Double-Blind Controlled Trial

Aníbal Báez-Suárez[1,*], Estela Martín-Castillo[2], Josué García-Andújar[3], María P. Quintana-Montesdeoca[4], Juan Francisco Loro-Ferrer[5]

Abstract

Objective: To analyze factors influencing satisfaction in pregnant women during labor as patients and the relationship of the level of satisfaction with pain management through transcutaneous electrical nerve stimulation (TENS).

Methods: A randomized and double-blind controlled trial was conducted. All participants completed the satisfaction scale immediately after childbirth. A total of 63 participants were randomly assigned to one TENS device to relieve the pain, with a different dose in each group. Patients' responses were measured with 2 scales; the satisfaction level was measured with the Care in Obstetrics: Measure for Testing Satisfaction scale, and pain was measured with the visual analogue scale.

Results: A total of 63 women were randomized into three groups: Active TENS (n = 21), Placebo TENS (n = 21), and Control (n = 21). Baseline characteristics, including maternal age (mean 27.3 ± 4.1 years), parity, body mass index, and gestational age, showed no significant differences among the groups ($P > 0.05$). The active TENS group showed significantly greater pain relief, with a mean visual analogue scale score reduction of 3.3 ± 1.2 compared to 1.1 ± 0.9 in the placebo group and 0.8 ± 0.7 in the Control group ($P < 0.001$). Maternal satisfaction scores were also highest in the Active TENS group (median 8.0, IQR: 7.0–9.0) compared to Placebo (6.0, IQR: 5.0–7.0) and Control (5.0, IQR: 4.0–6.0) groups ($P < 0.001$). Multivariate linear regression indicated that only the type of TENS used was significantly associated with maternal satisfaction ($\beta = 0.42$, $P = 0.007$). Other variables, including parity, BMI, perceived support, and baseline pain severity, were not statistically significant predictors ($P > 0.05$).

Conclusion: Overall, a high level of satisfaction with care during the labor process was obtained; we recommend the use of TENS for pain relief to improve general satisfaction.

Registration: ClinicalTrials.gov ID: NCT03137251

Keywords: Labor pain; Patient satisfaction; Physical therapy modalities; Randomized controlled trial; Transcutaneous nerve stimulation

Introduction

Childbirth is one of the most exciting moments in people's lives. In this period, pregnant women usually suffer from high-intensity pain. There are pharmacological and non-pharmacological treatments to relieve pain, and there are also many different factors that can modify pain perception, like psychological factors or previous painful experiences.[1,2]

Patient satisfaction is an indicator of the quality of health care, and patient participation contributes to an improvement in the health care system. Nevertheless, evaluation of patient satisfaction can be complicated because it is a complex concept.[3] Many factors may be involved in the satisfaction of pregnant women for their care during childbirth. Adler *et al.*[4] described the strongest elements: pain management, personal pregnancy expectations, benefits of

Supplemental Digital Content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website (www.maternalfetalmedicine.org).

[1]Aníbal Báez-Suárez, Department of Medical and Surgical Sciences, University of Las Palmas de Gran Canaria, Las Palmas 35001, Spain; [2]Estela Martín-Castillo, Rehabilitation Department, Complejo Hospitalario Universitario Insular Materno-Infantil, Las Palmas 35016, Spain; [3]Josué García-Andújar, Department of Medical and Surgical Sciences, University of Las Palmas de Gran Canaria, Las Palmas 35016, Spain; [4]María P. Quintana-Montesdeoca, Mathematics Department, University of Las Palmas de Gran Canaria, Las Palmas 35017, Spain; [5]Juan Francisco Loro-Ferrer, Department of Medical and Surgical Sciences, University of Las Palmas de Gran Canaria, Las Palmas 35016, Spain.

** Corresponding author: Aníbal Báez-Suárez, Department of Medical and Surgical Sciences, University of Las Palmas de Gran Canaria, Las Palmas 35016, Spain. E-mail: anibal.baez@ulpgc.es*

Maternal-Fetal Medicine (2025) xx:xx

Received: 22 September 2024 / Accepted: 15 July 2025

First online publication: 08 August 2025

http://dx.doi.org/10.1097/FM9.0000000000000305

health care staff, and pregnancy decision making.[5,6] In our clinical experience, receiving forms of pain relief can be viewed as a weakness during childbirth, in such a way that pain management could influence the rating of the rest of the other variables of satisfaction.

In terms of pain modification in the past 20 years, emphasis has been put on non-pharmacological approaches. Specifically, the use of transcutaneous electrical nerve stimulation (TENS) is an effective and safe technique for pregnant woman during childbirth. Its application in this case is based on the gait control theory of Wall and Melzack.[7] It is a non-pharmacological pain-relieving method based on the delivery of pulsed electrical currents through the skin, which reduces pain through both peripheral and central mechanisms. TENS has been studied in most of the painful musculoskeletal conditions, including acute and chronic low back pain,[8] neuropathic pain,[9] cancer pain,[10] colonoscopy,[11] and during hysteroscopy.[12]

Although TENS has been widely studied as a non-pharmacological method for pain relief during labor, evidence regarding its impact on satisfaction in childbirth care remains limited and contradictory. Systematic reviews have found that although TENS may reduce pain perception, its effect on satisfaction in childbirth care is inconclusive and varies depending on the application protocol.[13] Some studies have reported higher satisfaction in women who used TENS compared to those who received pharmacological analgesia or no treatment,[14] whereas others suggest that although TENS offers benefits in terms of mobility and absence of adverse effects, epidural analgesia is perceived as more effective.[15] However, most previous research has focused on pain reduction without thoroughly evaluating the overall satisfaction experience of a patient during childbirth. Therefore, this study represents a novel contribution by specifically exploring the relationship between TENS use and satisfaction in childbirth care, focusing on pain management during labor.

In 2016, the parameters used to evaluate maternity care services were maternal or infant mortality rates, caesarean and instrumental delivery rates, and low Apgar scores. These are very restrictive parameters for assessing quality because they do not describe attitudes or processes.[16]

Currently, there are some specific questionnaires to measure satisfaction during labor; for example, there is "Women's Views of Birth Labor Satisfaction Questionnaire,"[17] "Care in Obstetrics: Measure For Testing Satisfaction Scale,"[18] "Questionnaire Measuring Attitudes About Labor and Delivery,"[19] "Mackey Childbirth Satisfaction Rating Scale,"[3] and "Care in Obstetrics: Measure for Testing Satisfaction (COMFORTS) Scale." The latter is the most complete scale because it includes the most principal factors associated with the relation between the satisfaction of the mother and the childbirth experience, from our point of view. It is a flexible tool that can be used to show the aspects that should be changed to improve satisfaction in childbirth care and, thus, maternal health. It is formed by 6 subscales: physical environment, respect for privacy, provision of choice, postpartum nursing care confidence in newborn care, labor care, and delivery nursing care. It includes 40 parameters where participants used a 5-point Likert scale to answer how much they agreed with each statement, with 1 equaling "strongly disagree" and 5 equaling "strongly agree."[18]

The aim of this research was to analyze factors influencing pregnant women's satisfaction in care during labor and their relationship with pain management using TENS to find which factors could be easily adjusted to improve the patients' satisfaction and, thus, health care indicators.

Materials and methods

A randomized and double-blind controlled trial was conducted. Participants were recruited at the Complejo Hospitalario Universitario Insular-Materno Infantil (Spain) from May 2 to August 30, 2017. All selected participants were invited to complete the satisfaction scale immediately after childbirth. The entire staff in the labor room agreed to participate in the survey, but they did not know at any time what patients were included in the trial.

Separate from the survey process and before selecting the patients, investigator 1—who was not involved in the selection and inclusion process—assigned a number to each TENS device, defined by a different dose. Investigator 2 generated a random sequence (based on simple randomization) by using a computerized random number generator,[20] and these processes were concealed from the rest of the staff of the study. After enrollment in the study, the 63 participants were randomly assigned to one device to help to relieve the pain. The information about the group assignment was not shown to the participants or nurses who evaluated the results. Fig. 1 shows the progression of the participants throughout the trial.

Finally, a nurse external to the research team collected the data about neonatal and obstetric outcomes. Furthermore, the data were analyzed by a statistician who was not directly involved in the experimental phase.

Population characteristics

The patients were randomized into groups and the TENS power settings randomized to each group. The calculations were based on the detection of the minimum relevant clinical difference of 1.3 units on a numerical scale of 1 to 10 for pain rating at post-data,[21,22] a desired power of 80%, and an alpha level of 0.05. These assumptions generated a sample size of 63 patients. Participants received all other routine obstetric care and were also instructed to choose the most comfortable position. The presence of an accompanying person was allowed during labor and delivery.

Based on the study published by Santana *et al*,[23] the inclusion criteria for patients were: over 18 years of age, cervical dilatation of at least 4 cm, a gestational age between 37 and 42 weeks, a low-risk pregnancy, and a single fetus. Exclusion criteria included: younger than 18 years of age, high-risk pregnancy, previous experience with TENS, inability to understand or refusal to sign the informed consent form, having a pacemaker or automatic implanted cardiac defibrillator, a planned caesarean, and cutaneous damage at the TENS application locations.

Data analysis

The primary outcome was to evaluate the satisfaction of patients during childbirth and that level of satisfaction's relationship with pain relief. This was measured with 2 scales; the satisfaction level was measured with the

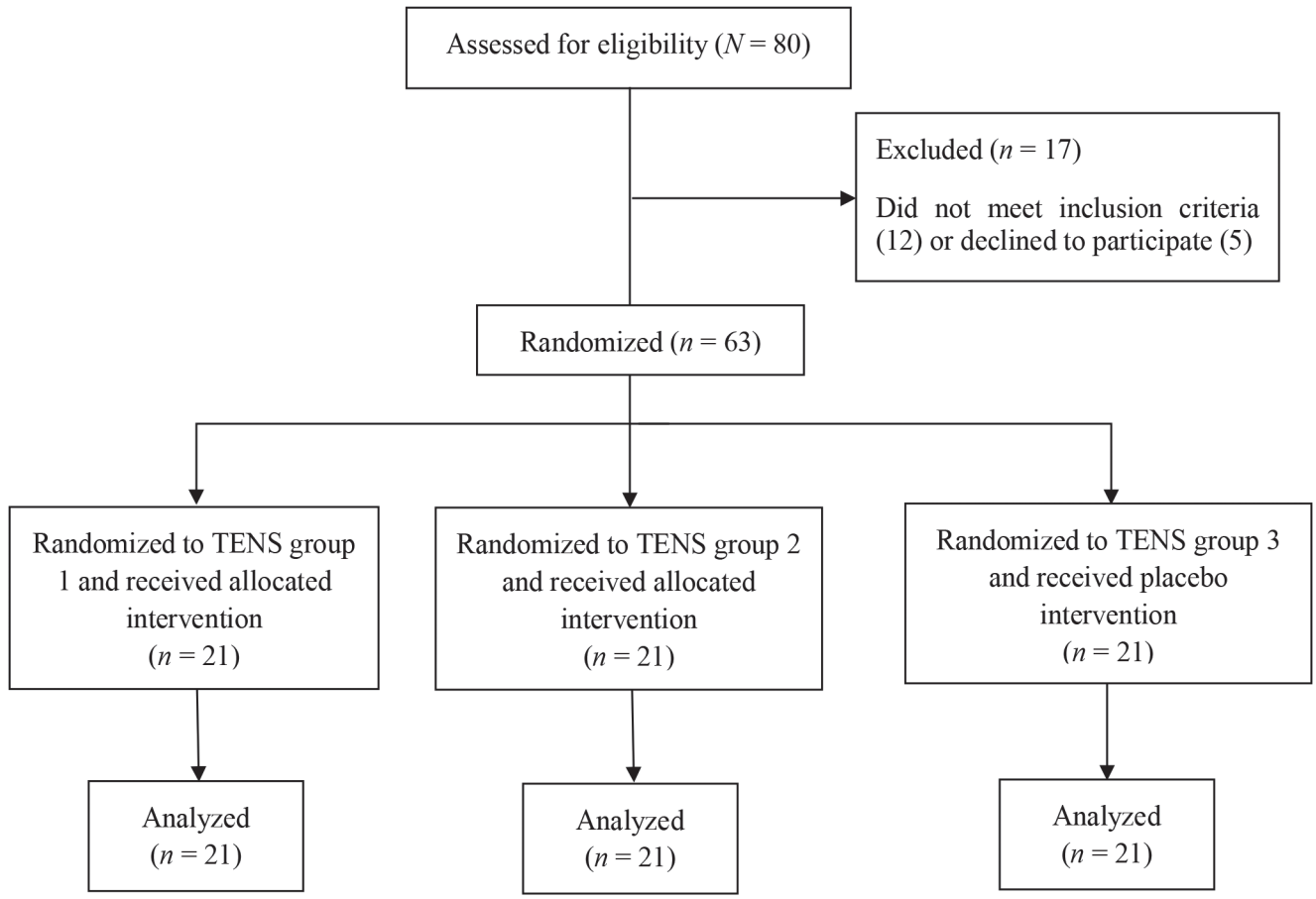

Figure 1. Flow of participants in the trial. TENS: Transcutaneous electrical nerve stimulation.

COMFORTS scale and pain was measured with the visual analogue scale. Using the COMFORTS scale, at 24 hours postpartum the second investigator asked participants to answer questions regarding their satisfaction with the care provided. This survey is a valid and reliable scale to measure the patient's satisfaction with care during the labor and postpartum period. Authorization for using the Spanish version of the COMFORTS scale was obtained.[24]

Severity of pain was measured before and after the TENS intervention with the visual analogue scale (VAS). On the VAS, pain severity is marked by the participant on a scale ranging from 0 to 10 cm, in which 0 represents no pain and 10 represents the most painful situation experienced. Evaluations were completed at 3 different stages during the procedure: at the beginning of the active phase of labor, 10 minutes after labor, and 30 minutes after labor. 1.3 cm was considered the minimal clinically important difference in pain relief.

The calculation of the results were applied to the satisfaction scale, which consisted of 40 items; each of them had ratings from 1 to 5 (1 equaled "strongly disagree" and 5 equaled" strongly agree"). Consequently, the maximum final value was 200 and the minimum value was 40; a level above 171 was considered a high satisfaction level.[18] In addition, the Spanish version of the COMFORTS scale was divided into 4 subscales, which had different total values: newborn care (10 to 50), postpartum nursing care (11 to 55), confidence in newborn care (13 to 65), and logistics and environment (6 to 30).

This was the system used to classify patients according to pain level experienced: VAS ratings from 0 to 3 cm were considered mild pain, 4 to 7 cm were moderate pain, and 8 to 10 cm were severe pain. These were the number systems used to evaluate the relationship between severe pain and lower degree of satisfaction.

Intervention

Every patient received midwifery care during labor and birth, according to the hospital's protocols. The only difference in care was the possibility of pain relief with a portable TENS device (a Cefar Rehab 2 Pro®) (Fig. 2). TENS therapy was applied during the first 30 minutes of the active phase of labor. This application was longer in some cases, although pain relief was only recorded during the first 30 minutes. Two pairs of electrodes measuring 5 x 9 cm were fixed on the paravertebral regions of the participants at the T10–L1 and S2–S4 levels. The device intensity (amplitude) was individually adjusted to each participant's maximum sensory level. Thus, the TENS output intensity was increased during the treatment every time the patient adjusted to the TENS stimulus.

The TENS intervention in group 1 (TENS 1) consisted of a constant frequency of 100 Hz pulsing every 100 microseconds,[25] and group 2 (TENS 2) consisted of a varying high frequency (80–100 Hz) pulsing at 350 microseconds[25]; participants in group 3 (placebo) were connected to the TENS unit but no electrical stimulation was delivered.

Figure 2. Cefar Rehab 2 Pro® TENS device used for the intervention phase.

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics, version 21.0 for Windows. Data distribution was assessed using the Shapiro–Wilk test. Variables were categorized based on their scale and distribution: continuous (maternal age, body mass index (BMI), number of pregnancies), ordinal (pain intensity measured by VAS and satisfaction assessed via the COMFORTS scale), and categorical—either nominal (e.g., labor companion, civil status, occupation, fetal presentation, delivery position, TENS group) or ordinal (e.g., education level, parity: 0, 1, or ≥ 2 previous deliveries). Ordinal variables were treated as such due to their skewed distributions.

Descriptive statistics were used to summarize demographic and clinical characteristics. Categorical variables were presented as counts and percentages. Given the non-normal distribution of most ordinal and some continuous variables, quantitative data were primarily reported as medians with interquartile ranges. For interpretability, means, standard deviations, and 95% confidence intervals (*CIs*) were also reported where appropriate. CIs were estimated using non-parametric methods—specifically, the bias-corrected and accelerated bootstrap with 1,000 resamples—unless otherwise specified, as parametric *CI* estimation (mean ± 1.96 × SE) is inappropriate for non-normally distributed data.

Inferential analyses were performed using non-parametric tests. The Mann–Whitney *U* test was applied to compare COMFORTS total and subscale scores between two independent groups (e.g., pain severity, parity, provider type, TENS group). The Kruskal–Wallis test was used for comparisons across three or more groups (e.g., parity categories, delivery position, education level, employment status, childbirth class attendance), with Bonferroni-adjusted post hoc tests conducted when appropriate. To assess changes in pain intensity over time, a repeated-measures ANOVA was conducted at three time points (baseline, 10 minutes, and 30 minutes post-TENS), with TENS group (active *vs.* placebo) as the between-subjects factor. Assumptions of normality and sphericity were met.

Multiple linear regression was used to identify predictors of maternal satisfaction (COMFORTS total score), including maternal age, BMI, fetal presentation, number of pregnancies, delivery mode and position, civil and employment status, childbirth preparation, and TENS group. Model assumptions were satisfied, and no significant predictors were identified. Internal consistency of the COMFORTS scale was assessed using Cronbach's alpha, with $\alpha = 0.891$ for the total score and 0.661–0.893 for subscales, indicating acceptable to excellent reliability. A two-tailed $P < 0.05$ was considered statistically significant.

Ethical approval

This study (ClinicalTrials.gov ID: NCT03137251) was approved by the hospital's human ethics committee (ID: CEIm-CHUIMI-2016/875) on October 28, 2016., and it followed the ethical guidelines set out in the *Declaration of Helsinki*. The participants were informed that they could withdraw from the study whenever they desired without negative consequences. They were also assured their personal information would remain confidential. All patients signed an informed consent statement before starting the study.

Results

Participants and baseline characteristics

A total of 80 women were recruited for this randomized clinical trial. Seventeen participants were excluded prior to randomization due to declining participation or failure to meet eligibility criteria. The remaining 63 patients were randomly assigned in a 1:1:1 ratio to one of three groups: active TENS 1, active TENS 2, or placebo TENS. Fig. 1 outlines the CONSORT flow of participants through the study. Baseline characteristics, including maternal age, weight, BMI, gestational age, education, occupation, and labor-related parameters, were similar among the three groups (Table 1), with no statistically significant differences (all $P > 0.05$).

Effect of TENS on maternal satisfaction

Multiple linear regression analysis using the COMFORTS total satisfaction score as the dependent variable indicated that TENS type was the only statistically significant predictor (B = –5.155; 95% *CI*: –8.827 to –1.480; $P = 0.007$), suggesting that women receiving active TENS reported higher satisfaction compared to placebo. The overall model approached statistical significance ($F(9,53) = 1.799$, $P = 0.090$), with an adjusted R^2 of 0.106 (Supplementary Table 1, http://links.lww.com/MFM/A96).

Other variables, such as BMI, delivery type, number of pregnancies, and attendance at childbirth preparation courses, were not significantly associated with satisfaction (all $P > 0.05$), though marital status showed borderline significance ($P = 0.062$).

Table 1

Participants and obstetric baseline characteristics.

Characteristics	TENS 1 ($n = 21$)	TENS 2 ($n = 21$)	Placebo ($n = 21$)	Statistical values	*P*
Maternal age (years)	28.38 ± 5.31	28.95 ± 6.01	27.10 ± 5.35	1.00*	0.607
Maternal weight (kg)	72.95 ± 10.92	75.95 ± 12.63	71.57 ± 7.73	1.05*	0.592
Body mass index (kg/m^2)	26.71 ± 2.93	28.77 ± 5.42	26.86 ± 1.67	0.74*	0.689
Gestational age (weeks)	39.57 ± 1.50	39.67 ± 1.53	39.33 ± 1.35	1.35*	0.508
Childbirth preparation course	13 (61.9)	11 (52.4)	15 (71.4)	0†	1.000
Pushing methods for the second stage of labor				0.51†	0.774
Valsalva pushing	12 (57.1)	10 (47.6)	12 (57.1)		
Spontaneous pushing	9 (42.9)	11 (52.4)	9 (42.9)		
Perineal laceration				5.60†	0.469
None	1 (4.8)	1 (4.8)	0		
Grade I	15 (71.4)	19 (90.5)	19 (90.5)		
Grade II	4 (19.0)	1 (4.8)	2 (9.5)		
Grade III	1 (4.8)	0	0		
Marital status				0.83†	0.659
Married	11 (52.4)	12 (57.1)	8 (38.1)		
Single	4 (19.0)	2 (9.5)	3 (14.3)		
Education				4.15†	0.657
Elementary school	3 (14.3)	2 (9.5)	2 (9.5)		
Middle school	4 (19.0)	6 (28.6)	2 (9.5)		
Professional school	2 (9.5)	4 (19.0)	3 (14.3)		
High school	3 (14.3)	6 (28.6)	8 (38.1)		
University degree	5 (23.8)	6 (28.6)	7 (33.3)		
Occupation				0.11†	0.947
Actively employed	14 (66.7)	14 (66.7)	16 (76.2)		
Student	2 (9.5)	2 (9.5)	3 (14.3)		
Unemployed	6 (28.6)	4 (19.0)	2 (9.5)		
Accompanying person during labor				3.77†	0.152
Father	13 (61.9)	18 (85.7)	13 (61.9)		
Other family	8 (38.1)	3 (14.3)	8 (38.1)		
Other	0	1 (4.8)	0		
Accompanying person after labor				5.23†	0.264
Father	12 (57.1)	15 (71.4)	12 (57.1)		
Other family	6 (28.6)	5 (23.8)	4 (19.0)		
Other	1 (4.8)	1 (4.8)	5 (23.8)		
No	1 (4.8)	0	1 (4.8)		

Data were presented as either mean ± standard deviation or *n* (%).

*Kruskal-Wallis test statistics.

†χ^2 values.

Effect of TENS on pain

At baseline, pain scores did not differ significantly between groups ($P > 0.05$). However, 10 minutes after TENS application, both active groups (TENS 1 and TENS 2) reported significantly lower pain scores compared to the placebo group ($P < 0.001$). This effect was further enhanced at 30 minutes, with pain scores of 6.3 ± 1.7 in the TENS 1 group, 5.9 ± 1.9 in TENS 2, and 8.8 ± 1.1 in the placebo group ($P < 0.001$), as shown in Supplementary Table 2, http://links.lww.com/MFM/A96.

Pairwise comparisons at 30 minutes confirmed significantly greater reductions in pain in both TENS 1 (mean difference: –2.4; 95% *CI*: –3.7 to –1.5; $P < 0.001$) and TENS 2 (–2.9; 95% *CI*: –4.1 to –1.6; $P < 0.001$) compared with placebo. No significant difference was observed between the two active TENS groups ($P = 0.646$).

A repeated-measures ANOVA revealed no significant main effect of time on pain scores ($F(2,59) = 1.911$, $P = 0.152$), but a significant interaction between time and group was detected ($F(4,120) = 36.444$, $P < 0.001$), indicating differential pain trajectories among groups. Significant linear and quadratic contrast effects ($P < 0.001$) further supported group differences over time. A main effect of group on pain was also confirmed ($F(2,60) = 5.749$, $P = 0.005$).

COMFORTS subscale scores by demographic and birth-related factors

Satisfaction measured by COMFORTS scale

The overall mean COMFORTS score was 172.61 ± 11.90, with individual item means ranging from 3.56 to 4.70. Stratified analysis by parity showed that women with more than one prior delivery reported higher satisfaction (181.75 ± 14.14) than nulliparous women (172.54 ± 11.77) and those with one prior delivery (170.33 ± 11.53), though these differences were not statistically significant ($P = 0.285$; Table 2).

A separate regression model including maternal and obstetric characteristics (e.g., age, parity, education, labor duration, pain intensity) failed to identify any significant predictors of satisfaction (Supplementary Table 3, http://links.lww.com/MFM/A96). The model explained only 10.2% of the variance (adjusted $R^2 = -0.114$; $F(12,50) = 0.471$; $P = 0.922$).

Confidence in newborn care

No statistically significant differences in satisfaction were found based on education level or childbirth class attendance ($P > 0.05$). Nulliparous women scored below average. Women accompanied by their husbands during labor reported higher scores (57.79 ± 5.47) than those accompanied by other family members (54.94 ± 5.01).

Postpartum nursing care and newborn care

Lower satisfaction was reported among women with university degrees, those unemployed, and those who had not attended childbirth classes However, no statistically significant results were found ($P > 0.05$). Women accompanied by their mothers expressed the highest satisfaction (48.86 ± 3.73), and those with prior births reported higher satisfaction compared to nulliparous women. The mean newborn care satisfaction score was 42.34 ± 5.11. Women with only elementary education and those who were unemployed tended to report lower satisfaction scores, although these differences were not statistically significant ($P > 0.05$).

Logistics and environment and person attending the labor

The mean satisfaction score for logistics and environment was 25.81 ± 2.43. Women with middle school education, those who were employed or students, and those who had not attended childbirth preparation classes appeared to report lower satisfaction scores, but no statistically significant differences were found ($P > 0.05$). Midwives attended the majority of deliveries ($n = 54$), while gynecologists attended 9. Women attended by midwives reported slightly higher satisfaction in newborn care (25.98 ± 2.39) than those attended by gynecologists (24.55 ± 2.55).

Relationship between pain and satisfaction

One participant with mild pain (VAS 0–3) was excluded from analysis. As shown in Table 3, women with severe pain reported lower satisfaction on all COMFORTS subscales, particularly in relation to pain control (COMFORTS item 6), where they scored significantly lower (3.03 ± 1.19) than those with moderate pain (4.53 ± 0.73) ($U = 748.00$, $P < 0.001$) (Supplementary Table 4, http://links.lww.com/MFM/A96). However, no statistically significant differences in total or subscale scores were observed (all $P > 0.05$).

Discussion

This research supports the effectiveness and safety of TENS as a non-pharmacological alternative for pain management during labor, with the added benefit of preserving maternal mobility and the physiological birth process. The findings indicate that TENS use was associated with high levels of satisfaction in childbirth care, particularly among women who experienced effective pain control. Patient satisfaction is a key factor in the childbirth experience and may influence future decisions regarding vaginal delivery. These results reinforce the potential role of TENS as a standard strategy in obstetric care, especially for patients seeking non-pharmacological pain relief.

We found the results on pain relief during labor to be favorable, similar to Smith *et al.*[26] because the study also

Table 2

Total and subscale COMFORTS scores related to parity.

COMFORTS dimension (40-200)	Nulliparous ($n = 44$)	1 pregnancy ($n = 15$)	2 pregnancies ($n = 4$)	Overall ($n = 63$)	Statistical value	*P*
Total scale (40-200)	172.54 ± 11.77	170.33 ± 11.53	181.75 ± 14.14	172.61 ± 11.90	2.51	0.285
Confidence in newborn care (13-65)	56.71 ± 5.69	57.46 ± 5.37	57.50 ± 3.87	56.93 ± 5.41	0.30	0.863
Postpartum nursing care (11-55)	47.63 ± 4.86	46.33 ± 4.39	51.01 ± 5.23	47.53 ± 4.80	2.86	0.239
Newborn care (10-50)	42.51 ± 5.11	40.86 ± 5.19	46.25 ± 4.35	42.34 ± 5.11	4.58	0.101
Logistics and environment (6-30)	25.71 ± 2.57	25.67 ± 2.23	27.01 ± 2.16	25.81 ± 2.43	1.50	0.472

Data were presented as mean ± *SD*. The Kruskal–Wallis *H* test was used to compare subscale scores across parity groups (0, 1, or 2 previous deliveries). COMFORTS: Care in Obstetrics: Measure for Testing Satisfaction; *SD*: Standard deviation.

Table 3

COMFORTS scores in women with moderate or severe pain.

COMFORTS dimension	Moderate pain ($n = 32$)	Severe pain ($n = 30$)	Overall ($n = 62$)	Statistical value	*P*
Total scale (40–200)	175.51 ± 12.14	168.61 ± 9.81	172.19 ± 11.26	465.0	0.881
Confidence in newborn care (13–65)	58.43 ± 4.65	55.06 ± 5.73	56.82 ± 5.36	340.5	0.055
Postpartum nursing care (11–55)	48.37 ± 4.23	46.41 ± 5.10	47.42 ± 4.69	483.0	0.926
Newborn care (10–50)	42.71 ± 4.81	41.70 ± 5.31	42.22 ± 5.06	598.5	0.083
Logistics and environment (6–30)	25.96 ± 2.56	25.43 ± 2.28	25.71 ± 2.44	470.5	0.942

Data were presented as mean ± *SD*. The Mann–Whitney *U* test was used to compare satisfaction subscale scores between women reporting moderate pain (VAS 4–7) and those with severe pain (VAS 8–10). Participants reporting mild pain (VAS 0–3) were excluded. No statistically significant differences were observed. To classify the study participants according to their level of perceived pain, they were divided into (1) mild pain (0 to 3 cm), (2) moderate pain (4 to 7 cm), and (3) severe pain (8 to 10 cm). In this case, only 1 woman expressed mild pain, so she was not included in these data.
COMFORTS: Care in Obstetrics: Measure for Testing Satisfaction; VAS: Visual analogue scale; *SD*: Standard deviation.

obtained data that showed patients were more satisfied with their childbirth care after using other pain management techniques; however, they also obtained data around the patients' expectations about labor pain. They found that women held realistic expectations about labor pain, but a substantial number of women in labor recognized that they could not describe the overall experience of labor, whether they had gone through multiple pregnancies or just the one. From this, we found that the TENS device is an ideal solution for the perception of pain variability between different patients and for a single patient between various stages. Hamlacı and Yazici[27] stated in their study that the teaching or application of non-pharmacological methods would decrease pharmacological interventions.

The results align with previous research evaluating the efficacy of TENS for obstetric pain management. Although TENS has been shown to reduce pain perception during labor, its impact on patient satisfaction in childbirth care has varied across studies.[13] Some studies, such as Razek and Altorfan,[14] reported a positive correlation between TENS use and patient satisfaction in childbirth care, emphasizing its role in enhancing women's autonomy during childbirth. However, Gupta *et al.*[15] found that although TENS is a valid alternative, epidural analgesia remains the most effective option for pain reduction. Unlike these studies, our research not only assessed pain relief but also explored the relationship between TENS and patient satisfaction, representing a novel contribution to this field.

As in previous research,[28] which identified pain as a variable effecting satisfaction in childbirth care, women in our study with low labor pain had higher total satisfaction in their childbirth care than those with high labor pain. Additionally, as well as in the Santana *et al.* study,[23] we found higher results in total satisfaction in childbirth care when factoring in more than just labor pain. Specifically, we found worse satisfaction results in patients who suffered from high intensity pain as well as those who reported negative evaluations of things like the labor room environment, such as lighting. Therefore, we conclude that even though pain is an important factor in satisfaction levels, the rest of the factors play a key role in overall satisfaction.

The COMFORTS scale does not evaluate satisfaction in connection with the mother's expectations. Gönenç and Terzioğlu[29] evaluated the mother's expectations on the length of labor and about holding their babies as soon as they would have liked. Satisfaction levels may vary depending on when these things are assessed, but we consider these expectations as factors that could still influence overall satisfaction; however, the fact that the evaluation was carried out in the immediate postpartum period could be less influential, especially with measurements related to pain.

There are some scales for measuring a mother's satisfaction in care during labor, but only 2 of them have been translated and validated into Spanish. Although enthusiasm for measuring patient satisfaction has been growing, the data collected are not always used effectively to improve service. We consider the COMFORTS scale a great method to improve service because it collects data about a patient's perception of services, the hospital facilities, and the treatment from staff (doctors, nurses, midwives, clinical assistance, cleaning staff, chefs, etc).

In relation to this, we identified that multiparous women were more satisfied with the childbirth experience and care than nulliparous women. The latter often have idealistic expectations because they have no previous experience to compare with. Data demonstrated that women were more satisfied during labor if they were with their partner, but they preferred being with their mother after childbirth. This could be because the women preferred to go through the labor experience with the father of their child, and after the labor they needed help with childcare and so preferred someone experienced in it, which would typically be their mother.

Similar to Buglione *et al.*,[30] our results on satisfaction levels about logistics and environment, confidence, newborn care, and information for patients showed lower scores in patients with lower educational levels or economic statuses than with those who had higher levels of education and economic status. We saw also that women were more appreciative of attention from nursery staff than doctors. This also reveals a problem with the hospital staff in adjusting adapted information to the patient's level of education. On the other hand, Khumalo and Rwakaikara[31] did not find these differences, even though they also obtained socio-demographic data similar to our own.

Opposite to our results, Khumalo and Rwakaikara[31] reported low satisfaction with overall care and dimensions of care. Their study was conducted in Jordan, so the different results could be related to the significantly different cultural norms that dominate the medical model of maternity care and the lower status of the women. For example, family members are not permitted to be present for the labor; there is a strong patriarchal medical culture that impacts women's autonomy over their bodies, especially during childbirth; and physicians are perceived as having a higher social status than midwives, which may impact the preferences and expectations on the care the women receive during childbirth. Therefore, we can conclude that the reason for the differences were that our sample is not comparable with the Khumalo and Rwakaikara study[31] and our general results are similar to the rest of previous studies discussed.

One of the study's strengths is its randomized double-blind design, which minimizes bias and enhances the internal validity of the findings. Additionally, satisfaction in childbirth care was assessed using the COMFORTS scale, a validated and widely used tool, further strengthening the methodological rigor.

However, there are also some limitations. The sample size was relatively small, which may restrict the ability to generalize the findings to broader populations. Additionally, although efforts were made to maintain randomization across TENS protocols, the individually adjusted stimulation intensity may have introduced variability in pain relief perception.

One important limitation of this study concerns the relatively small size of certain subgroups analyzed, particularly the group of women with two previous deliveries ($n = 4$) and the moderate vs. severe pain comparison ($n = 32$ vs. 30). While these sample sizes are common in pilot and exploratory research, they may limit the statistical power and generalizability of our findings. In addition, we did not perform a formal test for homogeneity of variances due to the small sample size and ordinal nature of the variables; instead, we opted for nonparametric tests (Kruskal–Wallis and Mann–Whitney U) based on distribution inspection and measurement level. This methodological decision was

made to avoid assumptions of normality or variance homogeneity that could compromise the validity of the results. Future studies should consider larger, more balanced samples to confirm the trends observed and strengthen the robustness of subgroup comparisons.

Although univariate analyses revealed differences in satisfaction based on variables such as educational level and course attendance, a multivariable linear regression model found no significant predictors of maternal satisfaction when adjusting for potential confounders. The lack of statistical significance may be explained by the sample size and the modest variability in satisfaction scores. Furthermore, the low R^2 value indicates that other unmeasured factors—such as individual expectations or interpersonal aspects of care—may play a larger role in shaping satisfaction. Future research with larger, more diverse samples is needed to explore these complex interactions.

Given that satisfaction in childbirth care is a multifactorial construct, future research should focus on comparing different TENS stimulation protocols to determine the most effective approach for pain reduction and maternal experience. Moreover, further research should explore the role of psychosocial factors—such as emotional support during labor, perception of control, and prior expectations—in shaping the relationship between TENS use and patient satisfaction in childbirth care.

Conclusion

Non-pharmacological pain management strategies have been shown to achieve high levels of satisfaction during labor. Based on our findings, we recommend the use of TENS, particularly with time-modulated frequency and high pulse width, as an effective method for pain relief during labor. Furthermore, the quantity and quality of information provided to patients emerged as a key determinant of overall satisfaction. Tailoring information to the individual characteristics of each patient is essential to enhance satisfaction and, consequently, health outcomes. To this end, adapting communication to match the patient's educational level is fundamental to ensuring clarity and comprehension. Creating a supportive environment also contributed significantly to increased satisfaction levels. This finding underscores the need for institutional policies that prioritize supportive care settings as a means to improve the quality of maternity care services.

Acknowledgments

The authors thank all the women who took part in the study, as well as their families and the entire team of midwives of the Department of Obstetrics and Gynecology.

Funding

None.

Author Contributions

ABS: Conceptualization, methodology, investigation, and writing the original draft.
EMC: Conceptualization, methodology, writing the original draft, and supervision.
JGA: Methodology, formal analysis, and writing the original draft.
MQM: Data analysis and interpretation.
JLF: Methodology, investigation, writing the original draft, reviewing and editing the writing, and supervision.

Conflicts of Interest

None.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

[1] Carquillat P, Boulvain M, Guittier MJ. How does delivery method influence factors that contribute to women's childbirth experiences? Midwifery 2016;43:21–28. doi: 10.1016/j.midw.2016.10.002.
[2] Karlström A, Nystedt A, Hildingsson I. The meaning of a very positive birth experience: focus groups discussions with women. BMC Pregnancy Childbirth 2015;15(1):251. doi: 10.1186/s12884-015-0683-0.
[3] Lopes F, Júnior NC, Nakamura MU, et al. Psychometric properties of the Mackey Childbirth Satisfaction Rating Scale cross-culturally adapted to Brazilian Portuguese. J Matern Fetal Neonatal Med 2021;34(13):2173–2179. doi: 10.1080/14767058.2019.1660763.
[4] Adler K, Rahkonen L, Kruit H. Maternal childbirth experience in induced and spontaneous labour measured in a visual analog scale and the factors influencing it; a two-year cohort study. BMC Pregnancy Childbirth 2020;20(1):415. doi: 10.1186/s12884-020-03106-4.
[5] Karaduman S, Akköz Çevik S. The effect of sacral massage on labor pain and anxiety: a randomized controlled trial. Jpn J Nurs Sci 2020;17(1):e12272. doi: 10.1111/jjns.12272.
[6] Yılar Erkek Z, Aktas S. The effect of foot reflexology on the anxiety levels of women in labor. J Altern Complement Med 2018;24(4):352–360. doi: 10.1089/acm.2017.0263.
[7] Melzack R. Evolution of the neuromatrix theory of pain. The Prithvi Raj Lecture: presented at the third World Congress of World Institute of Pain, Barcelona 2004. Pain Pract 2005;5(2):85–94. doi: 10.1111/j.1533-2500.2005.05203.x.
[8] Tousignant-Laflamme Y, Laroche C, Beaulieu C, et al. A randomized trial to determine the duration of analgesia following a 15- and a 30-minute application of acupuncture-like TENS on patients with chronic low back pain. Physiother Theory Pract 2017;33(5):361–369. doi: 10.1080/09593985.2017.1302540.
[9] Gibson W, Wand BM, O'Connell NE. Transcutaneous electrical nerve stimulation (TENS) for neuropathic pain in adults. Cochrane Database Syst Rev 2017;9:CD011976. doi: 10.1002/14651858.CD011976.pub2.
[10] Vira P, Samuel SR, Amaravadi SK, et al. Role of physiotherapy in hospice care of patients with advanced cancer: a systematic review. Am J Hosp Palliat Care 2020;38(5):503–511. doi: 10.1177/1049909120951163.
[11] Shannon MB, Gupta N, Eberhardt J, et al. Broken sacral neuromodulation lead migration into the sigmoid colon: a case report. Female Pelvic Med Reconstr Surg 2018;24(6):e49–e50. doi: 10.1097/SPV.0000000000000601.
[12] Lisón JF, Amer-Cuenca JJ, Piquer-Martí S, et al. Transcutaneous nerve stimulation for pain relief during office hysteroscopy: a randomized controlled trial. Obstet Gynecol 2017;129(2):363–370. doi: 10.1097/AOG.0000000000001842.
[13] Bedwell C, Dowswell T, Neilson JP, et al. The use of transcutaneous electrical nerve stimulation (TENS) for pain relief in labour: a review of the evidence. Midwifery 2011;27(5):e141–e148. doi: 10.1016/j.midw.2009.12.004.
[14] Aalrazek A. Efficacy of transcutaneous electrical nerve stimulation on maternal satisfaction from labor pain sensation. ResearchGate. Preprint posted online October 2018. doi: 10.9790/1959-0705118495.
[15] Gupta R, Kaur G, Kaur J, et al. Evaluating the effectiveness of TENS for maternal satisfaction in laboring parturients-comparison with epidural analgesia. J Anaesthesiol Clin Pharmacol 2020;36(4):500–505. doi: 10.4103/joacp.JOACP_286_19.

[16] Caballero P, Delgado-García BE, Orts-Cortes I, et al. Validation of the Spanish version of Mackey childbirth satisfaction rating scale. BMC Pregnancy Childbirth 2016;16(1):78. doi: 10.1186/s12884-016-0862-7.
[17] Pozo-Cano MD, Martín-Salvador A, Pérez-Morente MÁ, et al. Validation of the Women's Views of Birth Labor Satisfaction Questionnaire (WOMBLSQ4) in the Spanish population. Int J Environ Res Public Health 2020;17(15):5582. doi: 10.3390/ijerph17155582.
[18] Janssen PA, Dennis CL, Reime B. Development and psychometric testing of the Care in Obstetrics: Measure for Testing Satisfaction (COMFORTS) scale. Res Nurs Health 2006;29(1):51–60. doi: 10.1002/nur.20112.
[19] Furuta M, Sandall J, Cooper D, et al. Predictors of birth-related post-traumatic stress symptoms: secondary analysis of a cohort study. Arch Womens Ment Health 2016;19(6):987–999. doi: 10.1007/s00737-016-0639-z.
[20] RANDOM.ORG. True Random Number Service. Available from: https://www.random.org/. Accessed July 08, 2025.
[21] Todd KH, Funk KG, Funk JP, et al. Clinical significance of reported changes in pain severity. Ann Emerg Med 1996;27(4):485–489. doi: 10.1016/s0196-0644(96)70238-x.
[22] Gallagher EJ, Liebman M, Bijur PE. Prospective validation of clinically important changes in pain severity measured on a visual analog scale. Ann Emerg Med 2001;38(6):633–638. doi: 10.1067/mem.2001.118863.
[23] Santana LS, Gallo RBS, Ferreira CHJ, et al. Transcutaneous electrical nerve stimulation (TENS) reduces pain and postpones the need for pharmacological analgesia during labour: a randomised trial. J Physiother 2016;62(1):29–34. doi: 10.1016/j.jphys.2015.11.002.
[24] Vivanco Montes ML, Solís-Muñoz M, Magdaleno-Del-Rey G, et al. Cultural adaptation and validation of the Spanish version of theCOMFORTS scale of women's satisfaction in delivery and thepostnatal period (in Spanish). Metas Enfermería 2012;15(2):18–26.
[25] Amer-Cuenca JJ, Goicoechea C, Girona-López A, et al. Pain relief by applying transcutaneous electrical nerve stimulation (TENS) during unsedated colonoscopy: a randomized double-blind placebo-controlled trial. Eur J Pain 2011;15(1):29–35. doi: 10.1016/j.ejpain.2010.05.006.
[26] Smith CA, Levett KM, Collins CT, et al. Relaxation techniques for pain management in labour. Cochrane Database Syst Rev 2018;3:CD009514. doi: 10.1002/14651858.CD009514.pub2.
[27] Hamlacı Y, Yazici S. The effect of acupressure applied to point LI4 on perceived labor pains. Holist Nurs Pract 2017;31(3):167–176. doi: 10.1097/HNP.0000000000000205.
[28] Unalmis Erdogan S, Yanikkerem E, Goker A. Effects of low back massage on perceived birth pain and satisfaction. Complement Ther Clin Pract 2017;28:169–175. doi: 10.1016/j.ctcp.2017.05.016.
[29] Gönenç IM, Terzioğlu F. Effects of massage and acupressure on relieving labor pain, reducing labor time, and increasing delivery satisfaction. J Nurs Res 2020;28(1):e68. doi: 10.1097/jnr.0000000000000344.
[30] Buglione A, Saccone G, Mas M, et al. Effect of music on labor and delivery in nulliparous singleton pregnancies: a randomized clinical trial. Arch Gynecol Obstet 2020;301(3):693–698. doi: 10.1007/s00404-020-05475-9.
[31] Khumalo N, Rwakaikara E. Patient satisfaction with peri-partum care at Bertha Gxowa district hospital, South Africa. Afr J Prim Health Care Fam Med 2020;12(1):e1–e8. doi: 10.4102/phcfm.v12i1.2409.

Edited By Jue Li

How to cite this article: Báez-Suárez A, Martín-Castillo E, García-Andújar J, Quintana-Montesdeoca MP, Loro-Ferrer JF. Patient-Reported Levels of Satisfaction in Pain Management With Non-pharmacological Measures During Pregnancy: A Randomized Double-Blind Controlled Trial. Maternal Fetal Med 2025;XX(XX):1–9. doi: 10.1097/FM9.0000000000000305.