

Efficacy of Transcutaneous Electrical Nerve Stimulation on Maternal Satisfaction from Labor Pain Sensation

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Abstract: Background: Most of the pregnant women are not aware of the coping strategies for labour pain, they tend to be restless and stress themselves by shouting or screaming due to pain. By using TENS, women in labour can save their energy without stressing themselves and make use of the saved energy for pushing the fetus during the second stage of labour. The aim of this study was to examine the efficacy of Transcutaneous Electrical Nerve Stimulation on maternal satisfaction from labor pain sensation. Design: Quasi-experimental study utilized in this study. Setting: This study conducted at Prince Hussein Bin Abdullah Hospital. Sample: A simple random sample of 360 nulliparous women was selected and divided into three equally divided groups; first group receiving TENS for pain relieving, 2nd receive analgesic and the 3rd not receiving any intervention (Control group). Instruments: 1- Interviewing questionnaire, to collect data about nulliparous woman; Socio demographic and medical data; which contains questions about complete medical, obstetric history and present pregnancy history. 2- Visual Analog Pain Assessment Scale for initial assessment of pain threshold during the first stage of delivery before the using of TENS. 3. Post-partum Mothers Satisfaction Questionnaire: -to assess women satisfaction regarding using TENS, immediately after delivery to examine the effectiveness of TENS on relieving normal labor pain. Results: a positive correlation was found between degree of mother's satisfaction with their reported subjective pain and orientation from neonates rooming in for TENS cases, rather than control and anesthesia groups, while there was a negative correlation for subjective pain among control group between mothers used TENS and control group regarding their satisfaction from rooming in. Conclusions: TENS had good effect in satisfaction of the labour pain and could use it during the first and second stage of labour. TENS application reduce negative effects of severe pain on the labour experience of women and promote normal outcome. Recommendations: -1. Continuous educational instruction about uses of TENS and its benefits should be provided to increase their knowledge and skills about technological methods of pain relieving rather than the pharmacological methods. 2. Generalize the experience of TENS in all hospitals.

Keywords: Transcutaneous Electrical Nerve Stimulation, Painsensation, Maternal Satisfaction

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I. Introduction

Transcutaneous electrical nerve stimulation (TENS) is a non-pharmacological, noninvasive method that relieves pain and currently is one of the most commonly used forms of electro-analgesia. TENS is a method of pain relief in which a special device transmits low-voltage electrical impulses through electrodes on the skin to an area of the body that is in pain. It is an effective method for relieving acute and chronic pain caused by surgery, childbirth, migraine headaches, tension headaches, injuries, arthritis, tendonitis, bursitis, chronic wounds, cancer and other pain sensation situations. As well as TENS is more useful to help nerve (neuropathic) pain, which is typically tingling numbness or burning pain, some practitioners believe that TENS stimulates the production of endorphins, which is the body's natural painkillers during labor^[1].

Management of labor pain is a major goal of intra-partum care. There are two general approaches: pharmacologic and non-pharmacologic. Pharmacologic approaches are directed at eliminating or decreasing the physical sensation of labor pain as anesthesia. In contrast, non-pharmacologic approaches are largely directed at increasing comfort, enabling the laboring woman to cope with the pain, and preventing suffering^[2].

Transcutaneous electrical nerve stimulation (TENS) applies controlled mild electrical stimulation to the skin by means of electrodes. Stimulating peripheral nerve endings in this way seems to inhibit the transmission of painful impulses at the dorsal horn of the spinal column, and/or activate some of the descending pain-inhibitory systems above the spine. TENS may also stimulate the body to produce natural endorphins and enkephalins, morphine-like substances which have an analgesic effect^[3].

Various models of TENS equipment are available. The TENS unit consists of a hand-held device connected to electrodes which are attached to the skin. During labour the electrodes are usually positioned on the lower back on both sides of the spine at vertebral positions corresponding to the nerve pathways through which painful impulses from the contracting uterus are thought to enter the spinal cord. The TENS unit emits low-voltage impulses, the frequency and intensity of which can be controlled by the woman in labour. When using TENS, women experience a tingling or buzzing feeling at the site of the electrodes at low voltages these sensations are not painful^[4].

When the electrical current is delivered, some people experience less pain. This may be because the electricity from the electrodes stimulates the nerves in an affected area and sends signals to the brain that block or "scramble" normal pain signals. Another theory is that the electrical stimulation of the nerves may help the body to produce natural painkillers called endorphins, which may block the perception of pain. Several different hypotheses have been proposed regarding TENS mechanism including the gate control, the endorphin-mediated pain relief, and the diffuse noxious. In addition, TENS machines are frequently operated by women, which may increase a sense of control in labour^[5].

There is evidence that women's satisfaction with the experience of childbirth affected by their sense of control during labour, and in particular, their sense of control during painful contractions^[6]. The intervention does not seem to have serious adverse effects on women or their babies, although there has been only limited research in this area. Serious side effects are rare, but the electrodes may cause some local skin irritation. The use of TENS has cost implications, not only in terms of the purchase or hire of the TENS units but also in terms of staff time setting up the equipment and demonstrating its use to women. There is some, limited, evidence that TENS can interfere with the operation of other electrical equipment^[7].

Most of the pregnant women are not aware of the coping strategies for labour pain. As a result, they tend to be restless and stress themselves by shouting or screaming due to pain. It would be better to make them understand about the labour pain beforehand, usually at their final review at obstetrics and gynecology (OG) outpatient department (OPD) and also teach them the method of operating the obstetric TENS equipment to cope up with the labour pain. This would help the women in labour to save their energy without stressing themselves and make use of the saved energy for pushing the fetus during the second stage of labour^[8].

Therefore, the women need a person who can help her and provide support and care. Non-pharmacological measures of pain relief are safe, inexpensive, and easily applied. Mothers should explain about TENS as a natural method for relieving labor pain; the nurse without medical prescription can easily apply it. The primary role of the nurse in the delivery room is to provide care to the laboring women. She should help in reducing her anxiety, fear, tension and pain by providing the available measures of comfort^[9].

Significance of the study

No researchers examined the differences between Transcutaneous Electrical Nerve Stimulation and pharmacological methods on relieving labor pain approaches among first stage of labor at Jordan Therefore, this study conducted to investigate the efficacy of Transcutaneous Electrical Nerve Stimulation on relieving labor pain. There was no evidence from previous studies with larger sample size and usage of TENS throughout the first and second stage of labour. Therefore, this study conducted to help the laboring women to have easier and comfortable delivery by using the most up dated devices for relieving pain.

Operational Definition

TENS is a non-invasive, inexpensive, safe, and easily applicable method, which can be use in women control mode. In this method, electricity delivered through the skin causing stimulation of peripheral nerves and yielding a rapid relief in pain. It is used in both acute and chronic painful conditions^[1, 10].

Transcutaneous electrical nerve stimulation is a pain control treatment. It is a portable, pocket-sized, battery-powered device. It uses mild, safe electrical signals to help control pain. A TENS unit treats many kinds of pain. It can help lessen acute (short-term) pain, like after surgery or an accident. Chronic (long-term) pain, like arthritis, back or muscle pain, or cancer pain may also lessen with TENS. Some people have trouble taking pain medicine. TENS is a safe, drug-free way to help control pain for these people as well. TENS produce lessens pain by sending painless electrical impulses through electrodes (sticky patches) placed on the skin. The electrical signals travel from the TENS unit through wires to the electrodes, then passes to the nerves under the skin. These nerves take messages to the brain about what they feel, such as touch, warmth, pressure, and pain. TENS signals can replace the message of pain on these nerves with a tingling sensation^[11].

Aim of the Study

The aim of this study was to examining the efficacy of Transcutaneous Electrical Nerve Stimulation on maternal satisfaction from labor pain sensation.

Hypotheses

- 1- Women who will use TENS are more likely to have less labor pain than control group
- 2- Women who will receive analgesic according to the line of hospital care are more likely to face little pain sensation during labor with unsatisfied neonatal outcomes.
- 3- Women who will use TENS for management of labor pain are more likely to satisfy during labour stages than women who receive analgesic and control group.

II. Methodology

Design: Quasi- experimental, comparative study was used

Setting:-The study was conducted at Prince Hussein Bin Abdullah Hospital.

Sample:-A simple random sample of 360 nullipara women were selected and divide into three equal groups (120 in each group):

Study group (A): It was included 120 women received application of TENS,

Study group (B) included 120 women received analgesia, according to the standard analgesic management in the hospital setting

Control group (C). It has included 120 women who not received neither application of TENS nor analgesia, They received the routine care during first stage of labor according to standard of the hospital.

Sample size :

The sample size was estimated to be 360 students using Epi-Info computer software program With a 95% level of confidence, significance level of 0.05 and a power of 80% (error=20%).

Criteria of sample selection:-

* **Inclusion criteria:** nulliparous, normal pregnancy without medical and obstetrical complications, normal fetal position, full term, single fetus, vaginal delivery, first stage of labor, cervical dilatation 3 cm, cephalic presentation.

*** The exclusion criteria:**

- Advanced labor on admission (greater than 4 cm cervical dilatation)
- Mal-presentation, multiple pregnancy, premature labor.
- Women with skin allergy.

Instruments for Data collection

I. Interviewing questionnaire:-This questionnaire developed by the researcher, to collect data about nulliparous woman. It consisted of three main parts:-

The First part: Socio demographic and medical data which contains questions about; complete medical, obstetric history and present pregnancy history.

The second part:-It was used to assess mothers opinion, and agreement of using TENS. It contains questions to the mother about pain (intensity, degree, frequency).

2. Visual Analog Scale for Pain Assessment:- It was adopted from Crichton, (2001)^[12]

- **Initial assessment** of pain threshold during the first stage of delivery before the using of TENS.

The scoring system made prior to institution of TENS stimulation:-

- No physical or emotional reaction =1.
- Tightening of hand without gripping = 2
- Wincing and gripping of observer's hand = 3
- Withdrawal or tight gripping of the observer's hand =4

Second Pain Relief Visual Analog Scale: that adopted from **Bodian (2001)^[13]**

It assessed by using both: the subject (mothers herself) and by the observer through: using VAS pain intensity was measured. Subjective assessment (by the women): This variable standardized by visual analog scale. The distance marked will be calculated as a percentage of line length (from 0 - 100%).

Scores was given according to the percentage of pain relief:

(0 - 25 %)= 1 (26 - 50 %)= 2 (51 - 75 %)= 3 (76 -100 %)= 4.

b. Observer assessment; was done by the researcher grading the degree and scoring;

- i) Moaning or shouting during contraction (0-25% relief)=1
- ii) Wincing during contraction (26 - 50% relief)= 2
- iii) Restless with discomfort (51 - 75% relief)= 3
- iv) Comfortable and sleeping (76 - 100% relief)=4.

C. Total calculation of Pain index scale: It was calculated by multiplying the pain relief scores assessed both by; the subject and observer. The degree of pain relief will have graded accordingly

1 - 4 No relief 5 - 8 Fair relief 9 - 12 Good relief 13 - 16 Excellent relief

3. Post partum Mothers Satisfaction Questionnaire: It was developed by the researcher to assess women satisfaction regarding using TENS. It was used immediately after delivery, the women were asked for their comments regarding: the efficacy of the TENS on relieving of pain, willingness to accept TENS again in future for less labor pain (outcome measures), local skin irritation and sensitivity from electrodes, as well as their preference to use TENS next delivery.

- **Validity;** Instruments were reviewed and tested for validity by 5 experts in obstetrical nursing, modification were done accordingly to ascertain relevance and completeness.

- **Reliability:** A reliability test was used to establish the internal consistency of the perspective /by the administration of the same tool to the same subjects under similar conditions on one or more occasions. The answers obtained from the repeated testing were then compared to establish the level of test-retest was $r=0.88$ for Visual Analog Scale for Pain Assessment, and ($r=0.78$) for post-partum Mothers Satisfaction Questionnaire.
- **A pilot study;** was performed which involved 30 women. It done to evaluate the test practicability, legibility, understandability and feasibility of the tools, in order to find potential obstacles and problems that might be faced during data collection. The pilot study also served to estimate the time needed to fill in each form. Based on the findings of the pilot study, necessary modifications made, and some items related to the ethical issues of TENS were added. The 30 women's in the pilot study excluded from the main study.

Procedure for data collection:

- **Approval:-** Before conducting the study the researcher obtained approval from Ministry of Health, Jordan. The researcher obtained written consent from the directors of Prince Hussein Bin Abdullah hospital. The researcher reviewed the past and current available local and international related literature, practical and theoretical aspects about TENS and its uses during management of labor, advantages and disadvantages through using articles, periodic, journals and textbooks to be acquainted with various aspects of the device.
- **Time period:-** The actual work of this study was carried out over 8 months' period beginning from September 2017 to June 2018
- **Ethical considerations:-** Informed consent was obtained from the participants after explaining the aim of the study. Emphasis placed on each participant's right to withdraw from the research at any time with no negative repercussions. The mothers assured that any information obtained during the study would remain confidential and used for research purposes only.
- **For All Studied Groups:-**
 - Assessment of labour pain using visual pain scale: it was done after explanation of the scale to the women to ensure the correct way of reporting according to the severity of pain felt.
 - It administered to all women in the three groups upon admission. This process took on average fifteen minutes per subject. stayed with every woman from the beginning of first stage of labor until after labor beginning with introducing herself to pregnant women and asking her about biosocial and taking medical as well as obstetric history.
- **For the study group A:-**
 - The researcher assess woman through, vital signs (pulse –blood pressure-temperature) upon admission, abdominal examination done to determine fundal level, lie, presentation and attitude of the fetus. Vaginal examination performed to identify cervical dilatation, effacement, station, and presenting part.
 - Introduce TENS device to woman after explaining its uses, advantages and how it relief pain The TENS unit consists of a hand-held device connected to electrodes which are attached to the skin. During labor the electrodes are usually positioned on the lower back on both sides of the spine at vertebral positions T10 and S2 corresponding to the nerve pathways through which painful impulses from the contracting uterus are thought to enter the spinal cord.
 - The skin under the electrodes checked to see if it is red or tender. The skin should be cleaned, dried while the electrodes are off. This will help prevent the skin from becoming red or sore. New gel put on the bottom of the electrode before putting it back on the skin. Also mothers instructed to not get into soiled with water or sleep with the electrodes on her skin and the TENS unit turned on.
 - These electrodes were attached to an active TENS stimulator, of indigenous make (viz Jaipur Electricals Ltd., multi probe model) powered by a 9 volts battery, producing biphasic pulses of varying frequency and amplitude.
 - The stimulation initiated at a cervical dilation of 2-3cms. The pulses delivered were 5-10 Armstrong with a frequency of 100 Hz.

- The intensity of the stimulus to the thoracic-lumbar electrodes was gradually increased until a pleasant tingling sensation was felt by the mothers
- Evaluate mother's pain after applying TENS during first stage of labor using visual pain scale.
- Assess women satisfaction regarding using TENS immediately after delivery, the women asked for their comments about the efficacy of the TENS on relieving of her pain, willingness to accept TENS again in future for less labor pain as well as her satisfaction from the natural responses of their neonates (outcome measures).
- **For anesthesia group (group B)** assessed at the beginning of the first stage of labor for their biosocial, medical and obstetric history then, they assessed for their pain intensity through Visual Analog Pain Scale and asking women to report their pain after receiving anesthesia for pain relieving according to routine hospital as well as their neonates' outcome
- **For control group (C):** It assessed during labor and not managed by TENS or receiving any analgesic to relief pain, assessed by different research tools used for the purpose of the study.

Statistical Analysis:

Up on completion of data collection, the data collected were coded, tabulated and statistically analyzed by personal computer and statistical package SPSS version 16. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables. Variables were compared using chi-square test. Correlation analysis was used for assessment of the inter-relationships among quantitative variables. Statistical significance was considered at p-value <0.05 and $P < 0.001$.

III. Results

Table (1): represented that about forty percent or more (39.2 & 40.8) of mother's age were ranged between 26-30 years old (cases, and control group), while, thirty percent of anesthesia group were ranged between age 20-30 yrs. Also, thirty or more than thirty percent of mothers have secondary education among the three studied groups, more than forty percent of mothers were employee and majority of the three groups were didn't complain from any diseases (81.7, 86.7, and 95.0 respectively). or have sensitivity for using adhesive tape from using electrodes group A.

Table (2): showed comparison between mother's abdominal, back and subjective pain sensation during labor represented that there was a significance difference between cases and control regarding their pain sensation during labor with using TENS. In addition, cases group were having higher degree of satisfaction during labor with high statistical difference between the two groups.

Table (3): represented a statistical significance differences ($P < 0.001$) for the mean score of pain intensity on before than during using TENS, While, there were in significance difference ($P > 0.005$) regarding the mean score for length of pain pre using TENS

Figure (1): represented subjective pain assessment for mother's cases during using TENS (GA) compared with control group (GB) represented higher level of no pain sensation above the confidence level compared with no restless and discomfort from pain sensation for control group exceeded than the lower confidence level.

Table (4): Distribution of pain relief for cases, control and anesthesia mother's groups. The majority (65%) of mothers in control group express their pain sensation through; mowing or shouting with (0-26%) pain relief during contraction and the same percentage of mothers in case group representing their pain sensation through restless with discomfort (51-75%) of pain relief, On the other hand nearly all of mothers (96%) among anesthesia groups were comfortable and sleeping. For those there were statistical significance differences for pain sensations among mothers using TENS group and mothers in control group, while there is no computed statistical difference for anesthesia group due to their consistency of pain relief during labor.

Table (5): This table discussed the relationship between degree of satisfaction with their orientation from fetal outcomes for TENS (GA), control (GB) and anesthesia group (GC). It represented that there were highly statistical difference ($P < 0.000$) for study group (TENS) regarding their degree of satisfaction with their fetal outcomes, while there were insignificant difference ($P > 0.05$) regarding their satisfaction for control and anesthesia groups with their orientation from their fetal outcomes.

Figure (2): illustrated degree of satisfaction from using TENS among cases mothers represented highly coefficient satisfaction from Using TENS.

Figure (3): illustrated degree of satisfaction among control group mothers represented limited numbers of mothers were satisfied from routine hospital care, while majority not satisfied from this care.

Table (6): Correlation between mean and stander deviation for TENS (GA), (GB) and anesthesia group (GC) regarding their pain intensity, child birth experience and satisfaction. It represented that there were a significant difference ($P < 0.001$) between TENS cases and control group regarding their length, strengths, responses to pain, first stage back and abdominal pain, subjective pain, degree of pain for cases mothers regarding their using

TENS and degree of satisfaction for mothers cases than control group regarding their satisfaction from their birth experience. While there was an insignificance difference ($P>0.001$) were found between mothers used TENS and control group regarding their fetal outcomes

Table (7): Distribution of degree of satisfaction from orientation of rooming in for cases, control and anesthesia groups results showed degree of satisfaction from routine care among control group represented limited numbers of mothers were satisfied from routine hospital care, while majority not satisfied from this care. Also, the degree of satisfaction from orientation of rooming in for cases, illustrated that majority of them were completely satisfied, while majority (68.3%) of control group and (67.5%) of mothers under anesthesia were unsatisfied. On the other hand majority of mothers in study group were satisfied from their birth experience by using TENS, so, there were a statistically significance difference $P<0.000$ were found between the two group regarding their birth experience which is vice versa for anesthesia group.

Table (8): Correlation between degree of mothers satisfaction with their subjective pain and orientation from neonates rooming in for cases, control and anesthesia groups representing a positive correlation for cases and anesthesia groups $P<0.000$, while there was a negative correlation for subjective pain among control group.

Table (1): Biosocial characteristics of studied mothers (TENS GA, control GB and anesthesia GC)

Biosocial characteristics	Mothers TENS (GA) N= 120		Mothers control GB N= 120		anesthesia GC N= 120	
	No	%	No	%	No	%
Age of mothers						
>19 yrs.	36	30.0	31	25.8	39	32.5
20-25 yrs.	30	25.0	25	20.8	36	30.0
26-30 yrs.	47	39.2	49	40.8	34	28.3
<31	7	5.8	15	12.5	11	9.2
Mean and SD	23.20±.94		23.40±1.00		24.308±.92	
Levels of education						
Read and write	14	11.7	13	10.8	15	12.5
Preparatory school	25	20.8	26	21.7	29	24.2
Secondary school	46	38.3	37	30.8	45	37.6
University	28	23.3	21	17.5	20	16.7
Others	7	5.8	23	19.2	11	9.1
Mothers occupation						
House wives	15	12.5	17	14.2	19	15.7
Worker	43	35.8	45	37.5	45	37.5
Employs	56	46.7	58	48.3	51	42.5
Others	6	5.0	0	0.0	4	7.3
Presence of diseases						
Yes	22	18.3	16	13.3	6	5.0
No	98	81.7	104	86.7	114	95.0
Sensitivity for adhesive tape						
Yes	110	91.7	0	0.0	0	0.0
No	10	8.3	0	0.0	0	0.0

Table (2): Comparison between mother’s pain sensation during first stage of labor for TENS and control groups

Pain assessment during labor	Cases		Control		X ²	P. Value
	No	%	No	%		
Back pain						
(1-4) No Pain	58	48.4	10	8.3	48.00	.000
(5-8) Fair pain	34	28.3	14	11.6		
(9-12) Severe Pain	22	18.3	30	25.0		
(13-16) Very Severe Pain	6	5.0	76	63.3		
Abdominal pain						
(1-4) No Pain	59	49.2	8	.06	41.400	.000
(5-8) Fair pain	29	24.2	11	9.1		
(9-12) Severe Pain	18	15.0	22	18.3		
(13-16) Very Severe Pain	14	11.7	79	65.8		
Subjective pain						
Mowing or shouting during contraction (0-25% Relief)	95	79.2	10	8.3	40.83	.000
Wincing during contraction (26% -50%Relief)	20	16.7	32	26.7		
Restless with discomfort (51% -75%Relief)	5	4.1	78	65.0		

Table (3): Mean and stander deviation for Pain assessment pre and during using TENS

Pain assessment (intensity)	Mean and stander deviation	R	P. Value
Frequency of pain pre using TENS	1.300+.815	.348	.000
Length of pain pre using TENS	1.825+1.75	.147	.108
Strength of pain before using TENS	1.133+.428	-.254	.005
Length of pain during using TENS	1.0500+.2188		
Length of pain after using TENS	1.1000+.3012	.688	.000
Prefer to use TENS	1.0417+.2006	.628	.000

Table (4): Distribution of pain relief for cases, control and anesthesia mother’s groups

Pain assessment (pain intensity)	Mothers cases N= 120 (GA)		Mothers control N= 120 (GB)		Mothers under anesthesia(GC) N= 120		X ² X ² (1)=104.291 P1=.000
	No	%	No	%	No	%	
Mowing or shouting during contraction (0-25% Relief)	7	5.8	78	65.0	3	2.5	X ² (2)=32.65 P1=.000
Winching during contraction (26% -50%Relief)	35	29.2	32	26.6	1	0.83	
Restless with discomfort (51% -75%Relief)	78	65.0	10	8.3	0	0.0	X ² (3)=0
Comfortable and sleeping (76-100%)	0	0.0	0	0.0	116	96.6	No computed statistics

Correlation is significant at 0.001 levels of statistical significance
 X²(1) = study cases, X²(2)= control cases, X²(3) 3 women under anesthesia

Table (5): Degree of satisfaction with orientation for fetal outcomes for TENS cases (GA), control(GB) and anesthesia(GC) groups

Degree of satisfaction	Satisfaction from fetal outcomes for (GA)				X ² P.	Satisfaction from fetal outcomes for control group(GB)				X ² P.	Satisfaction from Fetal outcomes for anesthesia group (GC)				X ² P.
	Appropriate		Inappropriate			Appropriate		Inappropriate			Appropriate		Inappropriate		
	No	%	No	%		No	%	No	%		No	%	No	%	
1- Completely satisfied	107	89.2	10	8.3	25.32	44	36.6	0	0.0	4.30	0	0.0	44	36.6	8.42 .000
2- Incompletely satisfied	0	0.0	3	2.5	.000	69	57.5	7	5.8	.038	13	10.8	63	52.5	

Table (6): Correlation between mean of pain responses and satisfaction from birth experience of three studied groups

Pain responses and satisfaction from birth experience	Mean and Std. Deviation	Paired T Test	Correlation	P. Values
Length of Pain for case and control	1.86879±.69167	4.054	-.147	.000
Responses to Pain for TENS cases and control group	1.81667±.91655	21.713	.826	.000
Strength of Pain for TENS cases and control group.	-1.81667±.51829	-38.396	-.197	.000
Time for Second Stage for TENS cases and control group.	.40833±.61488	7.275	-.254	.000
Time For Third Stage for TENS cases and control group.	-.81667±.53426	-16.745	-.735	.000
First stage back pain for TENS cases and control group.	2.20000±.91302	26.396	-.721	.000
First stage abdominal for TENS cases and control group.	1.85833±.91941	22.141	-.182	.000
Subjective Pain Assessment for TENS cases and control group.	1.19167±1.41002	9.258	-.125	.000
Prefer to used Tens Next Time - Like the Tense Device available at hospital	3.57500±.51306	76.330	.215	.000
Degree of satisfaction for TENS cases before and after using TENS	-1.60833±.49017	-35.944	.122	.000
Fetal outcomes orientation for TENS cases and control group.	-.05000±.21886	-2.503	.714	.014
Degree of satisfaction cases - Degree of satisfaction control	-1.60833±.49017	-35.944	.122	.000
Degree of satisfaction cases for their birth experience - Degree of satisfaction control	1.258±.493	-8.797	5.75	.000
Degree of satisfaction cases for their birth experience - Degree of satisfaction anesthesia group	1.541±.5003	-8.565	3.964	.000

Table (7): Distribution of degree of satisfaction from orientation of rooming in and birth experience for three studied groups

Degree of satisfaction from rooming in	Cases		X ² P.	Control group		X ² P. Value	Anesthesia group		X ² P.
	No	%		No	%		No	%	
Completely satisfied	108	90.0	108,3 0.000	14	11.7	8.53 0.003	35	29.2	-.052 .202
In completely satisfied	9	7.5		24	20.0		4	3.3	
Unsatisfied	3	2.5		82	68.3		81	67.5	
Degree of satisfaction from child birth experience									
Completely satisfied	89	74.2	28.3 0.000	21	17.5	103.8 0.000	55	45.8	.833 .361
In completely satisfied	31	25.8		7	5.8		65	54.2	
Unsatisfied	0	0.0		92	67.7		0	0.0	

Table (8): Correlation between degrees of mother’s satisfaction with their subjective Pain and neonates rooming in outcomes for cases, control and anesthesia groups

Degree of mothers satisfaction	Rooming in	Subjective pain
degree of mothers satisfaction case	.0643** 0.000	-337** 0.000
degree of mothers satisfaction control	-.256** 0.000	-141 ^{bs} 0.000
degree of mothers satisfaction anesthesia groups	.391** 0.000	-862** 0.000

Figure (1) represented subjective pain assessment for mother's cases during using TENS and control group

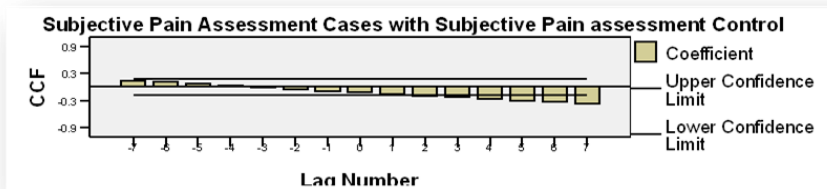


Figure (2): Degree of satisfaction from using TENS during labor (Cases group)

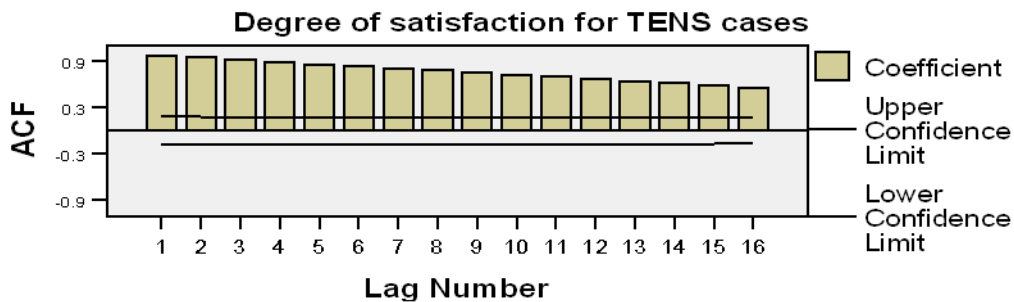
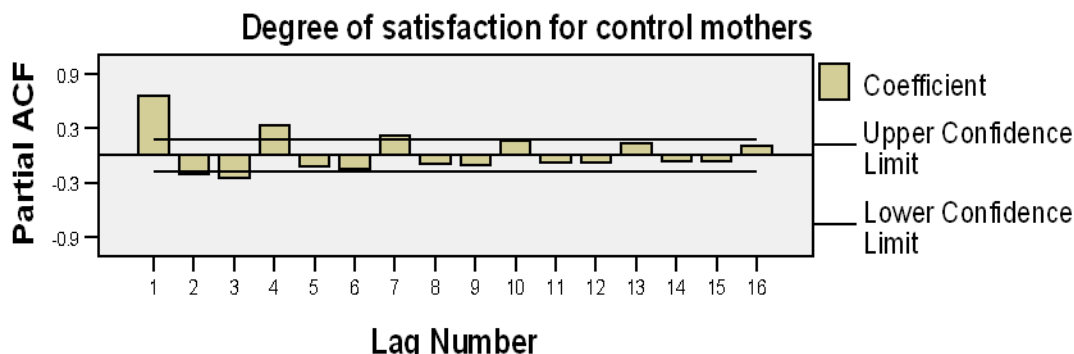


Figure (3) Illustrated degree of satisfaction among control group



IV. Discussion

Transcutaneous electrical nerve stimulation (TENS) machine is a theoretical framework for the study designs, this new approach non-pharmacological TENS is natural method for relieving labor pain. It can be easily applied by the nurse without medical prescription to provide knowledge regarding TENS as a method of non-pharmacologic strategies for labor pain management and improving women satisfaction during labor [14]. The aim of this study was to examining the efficacy of Transcutaneous Electrical Nerve Stimulation on maternal satisfaction from labor pain sensation.

In relation to biosocial data results of the current study represented that about or more than forty percent of mother’s age were ranged between 26-30 years old for TENS, and control group. While, thirty percentage of anesthesia group ranged between; age 20-30 yrs. Thirty or more percent of mothers have secondary education among the three studied groups. More than forty percent of mothers were employee and majority of the three groups didn’t complain from any diseases or sensitivity from using adhesive tape for TENS cases. This results were supported by [11, 15] who conduct a study for “Comparison of Entonox and Transcutaneous Electrical Nerve Stimulation (TENS) in Labor pain” composed of 120 women in the age range of 20-40 years, selected randomly and divided into three groups including TENS, Entonox and combination group. They revealed that there were no significant differences regarding to age, parity, and BMI between the three groups. From the researcher point of view this is reflect the homogeneity of the sample regarding to the three studied groups.

Regarding answer Research hypothesis number one

Women who will use TENS for management of labor pain are more likely to have less labor pain than control group. The present study revealed mother’s abdominal, back and subjective pain sensation during labor were have a significance difference between cases and control regarding their pain sensation during labor with using TENS. In cases group they have higher degree of satisfaction during labor with high statistical difference between the two groups. This result was in-line with Nese and Aygül 2015 [16]. Who, conduct study about "Assessment of Efficiency of the Use of Transcutaneous Electrical Nerve Stimulation in Labor Pain Relief". They stated that, the low level electrical stimulation TENS unit reduces the Visual Analog Scale scores relating to labor pain, shortens the period of delivery, has no adverse effects, and its efficiency is independent from other variables. With these features, TENS application may reduce negative effects of severe labor pain on from the reports of mother and help pregnant women to pass satisfactory birth experience. On the other hand, this result was incongruent with Therese, et.al 2015 [17] they conducting study about; "Transcutaneous electrical nerve stimulation (TENS) for pain management in labour For Seventeen trials with 1466 women". They contribute data to the review. Thirteen examined TENS applied to the back, two to acupuncture points, and two to the cranium. Overall, there was little difference in pain ratings between TENS and control groups, although women receiving TENS to acupuncture points were less likely to report severe pain. The majority of women using TENS said they would be willing to use it again in a future labour.

Moreover study conducted by Ramamoorthy et al., 2017 [18]: entitled "Effect of transcutaneous electrical nerve stimulation on labour pain relief among primi-gravida and multigravida mothers" and concluded that More than fifty percent of both primi-parous and multiparous women who had normal and vacuum assisted vaginal delivery experienced excellent pain relief using TENS. Almost 40 % of both primi-parous and multiparous women who had forceps delivery and lower segment cesarean section experienced excellent pain relief. So, TENS had a very good effect in coping up the labour pain and could be used during the first and second stages of labour. In addition, study results revealed that subjective abdominal pain assessment during labor for cases and anesthesia groups showed that Women in TENS have good relief, while mothers in anesthesia groups have an excellent relief. It revealed soothing effect of electrical impulses in reducing labour

pain congruent with pharmacological actions of analgesics. This discrepancy and the challenge is often due to a lack of high quality studies or a lack of consistency between high-quality studies included in the systematic reviews with respect to clinical population homogeneity, dose of TENS (i.e., location of TENS electrodes, frequency and intensity of TENS stimulation, frequency and duration of TENS delivery)^[19].

Women who will be treated with routine hospital care without using any methods of pain relief are more likely to suffer from severe pain and bad outcome than mothers who were using TENS device. The results revealed that majority of mothers in control group express their pain sensation through moaning or shouting with (0-26%) pain relief during contraction and the same percentage of mothers in TENS group representing their pain sensation through restless with discomfort (51-75%) of pain relief. On the other hand nearly all of mothers among anesthesia groups were comfortable and sleeping. For those there were statistical significance differences for pain sensations among mothers using TENS group and mothers in control group, while there is no computed statistical difference for anesthesia group due to their inconsistency of pain during labor. Also, subjective pain assessment for mothers during using TENS compared with control group represented higher level of no pain sensation below the confidence level compared with no restless and discomfort from pain sensation for control group exceeded than the lower confidence level. This results were consistent with ^[18, 20] in which they evaluated the relief of pain by the mothers who had used TENS for labour. They observed that 50.3 % of the mothers had experienced excellent pain relief and 47.4% of the mothers had experienced good pain relief by using TENS. So, the knowledge about effectiveness of TENS for labour pain given was effective. As well Dunn et al., (2015)^[21] who studies: "Comparative Study, Clinical Trial, Randomized Controlled Trial, in Transcutaneous electrical nerve stimulation at acupuncture points in the induction of uterine contractions". The effectiveness of transcutaneous electrical stimulation at acupuncture points for increasing uterine contractions in 20 post-dates pregnant women assessed in a controlled study. A significant increase in frequency and strength of uterine contractions was found in the electrically stimulated women compared with the placebo-group of women.

Regarding to the 3rd Hypothesis; Women who will use TENS for management of labor pain are more likely to satisfy during labour stages than women who receive analgesic and control group. The present study results illustrated degree of satisfaction from routine care among control group represented limited numbers of mothers were satisfied from routine hospital care, while majority not satisfied from this care. Also, the degree of satisfaction from orientation of rooming in for cases, representing that majority of them were completely satisfied, while majority (68.3%) of control group and (67.5%) of mothers under anesthesia were unsatisfied from their neonatal outcomes due to their drowsiness after labor and they were not able to see their immediate post labour reaction.

On the other hand majority of mothers in study group were satisfied from their birth experience by using TENS, So, there were a statistically significance difference $P < 0.000$ between the two group regarding their birth experience which is vice versa for anesthesia group. This results were in congruent with ^[22,23] in study entitled "Analgesia in labour: a review of the TENS method". One study compared TENS with Entonox, pethidine and epidural anesthesia. Results showed that TENS and Entonox were both effective and popular methods with women who had short labour and needed no other form of analgesia.

In contrast ^[24] who studied "Comparison of Entonox and Transcutaneous Electrical Nerve Stimulation (TENS) in Labor pain". One of the concerns among mothers for delivery is labor pain. There are various methods to decrease labor pain, of which epidural anesthesia is an effective one, but not all mothers agree to receive this invasive intervention ^[25]. Because Transcutaneous Electrical Nerve Stimulation (TENS) is an inexpensive, safe, and easily applicable method which can be used in patient control mode. So, to find proper non-invasive methods to pain relief during labor mothers choose (TENS) as a method to relief pain as stated also by Santana et al 2016⁽¹⁵⁾. From the researcher point of view mothers were unsatisfied from their experience of anesthesia due to their adverse effects like nausea, vomiting, dysphoria, respiratory depression^[26]. In addition, all opioids cross the placenta which effect on newborn consciousness make him draws 'Aswell, in utero opioid exposure results in respiratory depressions stated by Pillitteri (2013)^[27].

Moreover, mother used TENS cases satisfied from their experience due to their newborn appraisal which in become responded from the first moment according to his primitive reflexes, reduces the demands on staff on the labor floor and gives many feeling of empowerment. Further benefits (as in the current practice in many obstetric anesthesia centers) mothers used TENS helps them to practice rooming in for their babies from the first hour after delivery and their practice of breast feeding not affected where they shows conscious baby which were supported by Wang B, Xiong X, Li W. (2007)^[28].

Moreover, the relationship between the degrees of satisfaction with fetal outcomes for TENS cases control and anesthesia groups. It represented that there was highly statistical difference ($P < 0.000$) for study group (A) regarding their degree of satisfaction with their fetal outcomes, while there was insignificant difference ($P > 0.05$) regarding their satisfaction for control and anesthesia groups (B&C) with their orientation from their outcomes. From the researcher point of view for many women, TENS is an attractive first option for pain relief in labor. Women who use TENS reported that they have a feeling of control over their pain and that they can

actively participate in their labour that is not always possible with other forms of pain relief. Many women who have used TENS will keen to use it again for subsequent labors as also stated by HoLF, et al., (2011)^[29].

Furthermore, women who will receive analgesic according to the line of hospital care are more likely to face little pain sensation during labor with unsatisfied outcomes. This result was not congruent with Carroll et al., 1997^[30]. Who studied "the transcutaneous electrical nerve stimulation in labour pain: a systematic review". To review the effectiveness and safety of transcutaneous electrical nerve stimulation (TENS) for labour pain and its outcomes, for eight reports involving 712 women were included; 352 women received active TENS and 360 acted as controls for Analgesic and adverse effect outcomes. Evidence for reduced pain using TENS in labour was weak. Additional analgesic interventions may be less likely with TENS (odds ratio 0.57; 95% CI 0.34-0.96), number-needed-to-treat 14 (95% CI 7.3-119). They randomized controlled trials provide weak positive effects in secondary (analgesic sparing) and tertiary (choosing TENS for future labor's) outcomes may be due to inadequate blinding causing overestimation of treatment effects^[4,31]. Finally the findings of this study reflect that mothers in labour have the right to be involved in decision making and expressing their needs for their appropriate methods in their pain relief

V. Conclusion/Implications for Nursing Practice

TENS had good effect in satisfaction of the labour pain relief sensation and could be used during the first and second stage of labour. TENS application reduces negative effects of severe pain on the labour experience of women and produces satisfactory outcomes.

Recommendations

1. Continuous educational instruction about uses of TENS and its benefits provided to increase mother's knowledge and skills about technological methods of pain relieving rather than the pharmacological methods.
2. Generalize the experience of TENS in all hospitals.
3. For further researches; high quality randomized controlled trials applied to support the evidence of usage of TENS for management of labour pain.

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