

Transcutaneous Electrical Nerve Stimulation Versus Exercise for Treatment of Low Back Pain During Pregnancy

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ABSTRACT

This study was performed to investigate and compare the efficacy of transcutaneous electrical nerve stimulation (TENS) and exercise program for treatment of low back pain (LBP) during pregnancy. Forty pregnant women who were suffering from LBP in the third trimester of pregnancy with ages between 25-34 years old participated in this study. They were divided randomly into 2 equal groups (A&B) 20 each. Women in group "A" received TENS application for 20 minutes/session while group "B" performed exercise program for 30 minutes/ session. Both methods of treatment were given for 3 times/week for four weeks. Assessments were done through present pain intensity (PPi) score, back range of motion (BROM) measurements (before and after treatment) and pain relief (PR) scale (after treatment only). Results: There were significant differences within both groups before and after treatment and between them after treatment as lumber range of motion of flexion and extension increased, pain intensity decreased in group B (exercise group) than in group A (TENS group). Conclusion: Exercise program for 30 minutes/session, 3 times/week for four weeks proved to be more beneficial than TENS application for 20 minutes/session, 3 times/week for four weeks in improving back range of motion and perceived back pain in pregnant women with LBP.

Key words: LBP, TENS, PPi score, PR scale, BROM.

INTRODUCTION

Low back pain (LBP) during pregnancy is a common syndrome which is very often regarded by obstetricians and physical therapists as about half of the interviewed pregnant women reported LBP at the same time during pregnancy^{11,26}.

LBP during pregnancy has a great social impact because of the high frequency of absence from work in pregnant women^{9,18}. Back pain and pregnancy go hand in hand. In approximately 80% of women who are pregnant, back pain is prevalent²⁴. It often presents in third trimester (50%) but appears already in the first³.

Typically the pain is located in the lower back, the sacro-iliac joints and the symphysis

pubis. Relaxin, inducing relaxation of the pelvic and lumbar ligaments is thought to play an etiologic role, together with increasing maternal weight and altered posture due to the enlarging uterus². This may result in instability and misalignment leading to increased load on and possibly micro-trauma to the affected joints and ligaments^{16,22}.

Back pain during pregnancy is a common complaint of most women. If not corrected, it can lead to future complications during delivery and post partum stage^{17,20}.

Physical activities involving the lower back and pelvis as walking and lifting may aggravate the pain and hinder the pregnant woman from doing her work or other daily activities. Pain and disability range from mild to severe and symptoms are often milder in the morning and worse in the evening^{5,19}.

A common treatment of LBP during pregnancy is physiotherapy. It has been shown that exercise, water gymnastics, ice application and transcutaneous electrical nerve stimulation are safely prescribed as good methods for treating such complaint during pregnancy¹⁵.

Transcutaneous electrical nerve stimulation (TENS) a non-invasive electro therapeutic modality was widely applied to treat chronic and acute pain⁸. It is one of the most commonly used forms of electroanalgesia. Hundreds of clinical reports exist concerning the use of TENS for various types of conditions such as LBP, myofascial and arthritic pain, sympathetically mediated pain, bladder incontinence, neurogenic pain, visceral pain and post surgical pain²¹.

TENS is one of the most important electrical modalities in the management of LBP as it reported to decrease pain, reestablish normal range of motion and improve functional performance²⁵.

Exercise today is an integral part of normal life for many women. There are many health benefits for women who exercise regularly then sedentary women. Exercise improves cardiovascular status, increased bone mineral content, decreases pain, relieves stress, elevates mood and improves health.

Exercise increases the release of several neurotransmitters including natural endorphins (the brain natural painkillers), catechol, estrogen, dopamine and endogenous opiate peptides as well as altering the reproduction of hormone secretion and suppressing prostaglandin from being released¹⁷.

Koseoglu et al. (2003)¹⁷ reported that aerobic exercises have a beneficial effect in the treatment of pain during pregnancy through increasing cerebrospinal β -endorphin.

Maintaining a regular exercise routine throughout the pregnancy can help the pregnant woman to stay healthy and feels her

best. Regular exercise during pregnancy can improve posture and decrease some common discomforts as backaches and fatigue. There is an evidence that physical activity may prevent gestational diabetes, relieves stress and gives more confidence needed for labour¹⁴.

It was reported that exercise does not cause a change in fetal heart rate pattern or a change in fetal behavioral pattern²³.

According to subsequent studies, the incidence of LBP during pregnancy has been in the range of 80% and can result in permanent disability if left untreated. So, the purpose of this study was to investigate and compare the efficacy of TENS and exercise program for treatment of LBP during pregnancy.

SUBJECTS, MATERIALS AND METHODS

Subjects

Subjects for this study were selected from antenatal clinic at Kasr-Aini Hospital. Forty pregnant women who were suffering from LBP in the third trimester of pregnancy and their parity were between 1 to 3 times. Their age ranged from 25 to 34 years (30.17 ± 3.089) with localized lumbar back pain without radiation into lower limbs.

Exclusions criteria were lack of normal skin sensation under the area where the electrodes were to be placed, previous LBP, spinal surgery or fractures of the vertebrae.

All participated women were asked to refrain from consumption of drugs and caffeine for 24 hours before participating in the study.

They were randomly assigned into two equal treatment groups, group "A" received TENS for 20 minutes/session, three times per week for 4 weeks and group "B" performed

exercise program for 30 minutes/session, three times per week for 4 weeks.

Informed consent form were signed by each subject before starting the treatment.

Instrumentation

- 1- Back range of motion devise (BROM) which is modified protractor goniometer for measuring trunk motion. It is a valid and reliable instrument for measuring lumbar range of motion. It uses a unique combination of inclinometer and goniometer technology with a standardized protocol to easily provide objective repeatable measurement.
- 2- TENS apparatus: Phyaction 787 made in Netherlands 230 v~/ 300 MA/50-60 HZ.
- 3- Present pain intensity (PPI) scale and pain relief (PR) scale were used for quantitative assessment of pain intensity in both groups (A and B).
- 4- Plinth for the application of TENS and exercise program.

Procedures

Evaluation procedure:

A detailed medical and obstetrical history were taken from each woman in both groups (A and B). Then

- 1- Assessment of low back pain intensity for each subject in both groups (A & B) was done through:
 - Present pain intensity (PPI) scale (0-4) in which pain intensity was recorded as being ; no pain = 0, mild pain =1, moderate pain =2, severe pain =3 and unbearable pain =4. this was done before and after treatment for both groups.
 - Pain relief (PR) scale (0-4) was recorded as being; no relief = 0, slight relief = 1, good relief =2, excellent relief =3 and complete relief = 4. This was done after the end of treatment program.

- 2- Range of motion measurements by BROM measuring active lumbar flexion and extension to determine lumbar spine mobility. The data was recorded before and after treatment. The pregnant woman was standing with feet apart, the outline of her feet were traced on a piece of paper attached to ground so subsequent measurements taken in same position with her hands beside her body.

I palpated the back of the pregnant woman to locate S₁, and marked this point with adhesive dots. This was done by standing behind the pregnant woman and placing my fingers on the top of iliac crests and the thumbs on the midline of the back at L₄-L₅ junction. L₄ and L₅ spinous processes were reference points from which other vertebrae were identified, then I palpated inferiorly the spinous process of S₁, and above to T₁₂ and marked the points.

The pregnant woman was instructed to move slowly into full flexion as far as she can trying to reach the floor with her finger tips. As she move, the arm slide along the upper measurement point T₁₂.

The difference between this reading and the starting position was the true flexion of the back. Then she was instructed to return to the starting position and to move slowly into full extension backward as far as she can with keeping her hands a cross the chest. The difference between this reading and initial protractor reading was the true extension of the back between the sacrum and T₁₂.

Treatment procedure:

The pregnant women were divided randomly into 2 equal groups each one consisted of 20 woman. Group "A" received TENS for 20 minutes from relaxed comfortable side lying position three times per week for 4 weeks with the following parameters:

- Frequency: 100-120 Hz high frequency pulses modulated at rate of 1-2 Hz.
- Pulse duration: 200 – 300 μ sec.
- Intensity: according to the woman's tolerance.

The two electrodes were placed on each side of the back area, each one on each paravertebral area.

Group "B" performed exercise program for 30 minutes/session, 3 times/ week for 4 weeks.

The pregnant woman was instructed to do the following:

Warming up exercise:

Take at least a five minute walk at a moderate – pace to loosen the muscles of whole body.

Strengthening exercise:

Posterior pelvic tilting to strengthen the abdominal muscles and hip extensors. From ideal cat position, the pregnant woman was instructed to tilt her pelvis backwards through contracting gluti, abdominal muscles and flattening her back. Avoid rounding the upper back. This also could be performed from standing against wall or from sitting position. This was performed for 10 repetitions.

Pelvic floor contraction to exercise the pelvic floor muscles. From modified sidelying or standing position, the pregnant woman was instructed to pull the muscles of the vaginal area up and in towards her baby, with maintaining buttocks and thighs relaxed. This was performed for 10 repetitions. Also, she was asked to contract the pelvic floor through stopping the urine flow while she was on the toilet as a training.

Stretching exercise:

Back stretch form ideal kneeling position, instruct the pregnant woman to elevate her arms upwards as she can to stretch the whole spine for 10 repetitions.

Hamstring stretch from standing in front of chair, one leg was elevated on the chair with maintaining its knee extended. Then, stretch the hamstring with leaning of the back anteriorly. This was done for 10 repetitions.

Postural correcting exercise:

This was performed form ideal standing against wall in front of mirror with feet slightly a part, about 1-2 feet form the wall. Then she was instructed to do:

- Chin in with maintaining her eyes looking forwards.
- Retract her shoulders backwards against the wall.
- Open out ribs through lateral costal breathing.
- Contract abdominal muscles and press lumber region backwards against the wall.
- Contract gluti.
- Press knees backwards against the wall.
- Transmit the body weight from knees to hells, lateral aspects of the feet and ball of the toes.
- Hold for a few seconds then relax. This was repeated for 10 repetitions.

Data Analysis

The obtained results from both groups (A&B) were analyzed using mean, standard deviation. T test used to examine the differences between the amount of change in pain intensity, BROM in response to TENS & exercise program in both groups and for comparing between them at level of significance ($P < 0.05$).

RESULTS

The results of this study revealed that:

- There were significant decrease in pain intensity within each group when comparing between before and after treatment. While there was highly significant decrease ($P < 0.001$) in group

(B) than group (A) after treatment when comparing both groups together (Table 1 & Figure 1).

- The degree of pain relief after treatment showed a highly significant relief ($P < 0.001$) in group (B) than group (A) (Table 2).
- The mean values of lumbar flexion and extension showed significant increase ($P < 0.02$ & $P < 0.01$) respectively in group (A).

While, they showed highly significant increase ($P < 0.001$ and $P < 0.002$) respectively in group (B) when comparing between before and after treatment within each group. When comparing both groups together there were highly significant increase ($P < 0.008$ and $P < 0.005$) respectively in lumbar flexion and extension in group (B) than group (A) after treatment (Table 3 & Figure 2).

Table (1): Present Pain Intensity (PPI) scores of LBP in both groups (A&B) before and after Treatment.

Pain scores	Group (A)				Group (B)			
	Before treatment		After treatment		Before treatment		After treatment	
	No.	%	No.	%	No.	%	No.	%
No pain	-	-	2	10	-	-	10	50
Mild pain	-	-	15	75	-	-	10	50
Moderate pain	4	20	3	15	6	30	-	-
Severe pain	8	40	-	-	6	30	-	-
Unbearable pain	8	40	-	-	8	40	-	-
Mean \pm SD	3.20 \pm 0.78		1.05 \pm 0.4		3.10 \pm 0.69		0.050 \pm 0.2	
Mean difference	2.15				2.60			
t-value	20.35				22.45			
P-value	0.01				0.02			

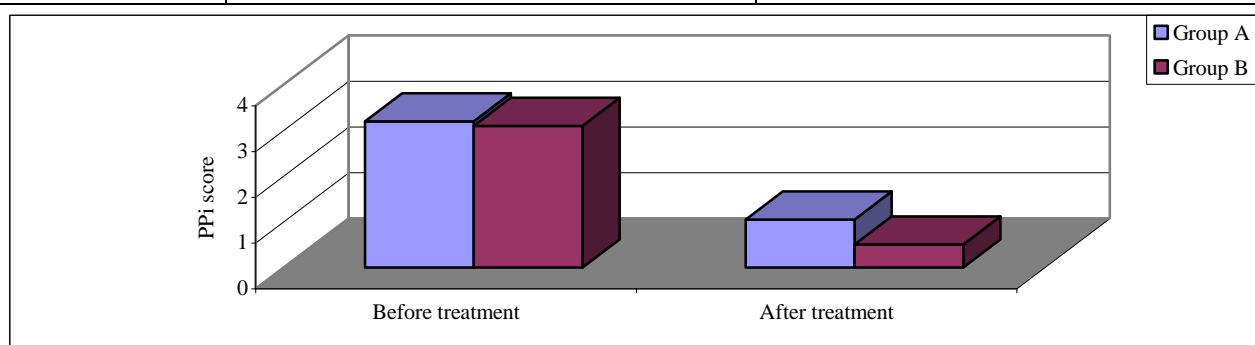


Fig. (1): Mean values of PPI scores of LBP in both groups (A&B) before and after treatment.

Table (2): Pain relief after treatment in both groups (A&B).

PR scale	Group (A)		Group (B)	
	No.	%	No.	%
Complete	2	10	10	50
Excellent	15	75	10	50
Good	3	15	-	-
Slight	-	-	-	-
Mean \pm SD	2.95 \pm 0.35		3.50 \pm 0.59	
t-value	18.42			
P-value	P< 0.001			

Table (3): Mean Values of Lumbar Flexion and extension in both groups (A&B) before and after treatment.

		Group (A)		Group (B)	
		Before treatment	After treatment	Before treatment	After treatment
Flexion	Mean \pm SD	20.9 \pm 4.77	22.8 \pm 4.96	23.8 \pm 4.93	35.7 \pm 2.45
	t-value	2.70		10.02	
	P-value	0.02		0.001	
Extension	Mean \pm SD	10.1 \pm 2.33	12 \pm 2.21	10.9 \pm 1.96	17 \pm 1.33
	t-Value	4.67		10.08	
	P-Value	0.01		0.002	

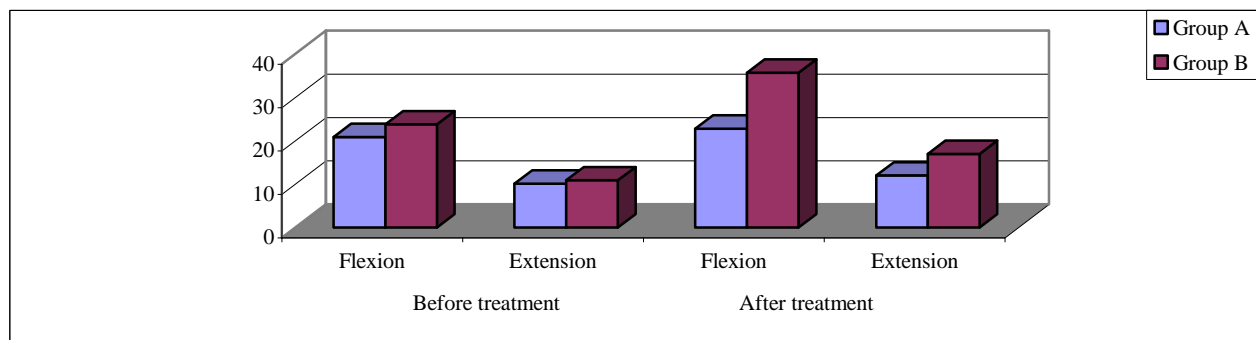


Fig. (2): Mean values of lumbar flexion and extension in both groups (A&B) before and after treatment.

DISCUSSION

All through the history of the humanity attempts to combat pain have not stopped and will never stop as long as, there is life on earth¹.

Although, it may seem logical that if any one is in pain he must rest and not undertake an exercise, gentle stretching and movement will often decrease muscle spasm and improve posture resulting in decreased pain¹².

The main purpose of this study was to investigate and compare the efficacy of TENS and exercise program for treatment of LBP during pregnancy. PPi score, PR scale and lumbar R.O.M of flexion and extension were assessed and analyzed.

Several studies were performed to investigate the effect of TENS to decrease pain but fewer were investigate the effect of exercise to relieve pain during pregnancy¹³.

In the present study, there were improvements in PPi score, PR scale and

BROM in both groups (A and B) when comparing between before and after treatment in each group. But, the results revealed that there was statistically highly significant improvement in group B (exercise group) than group A (TENS group) in PPi, PR, BROM when comparing between them after treatment.

These results about the effect of TENS in reducing pain and increasing back range of motion were in agreement with Johnson and Martinson, 2007¹⁸ who proved that there was evidence that TENS reduces pain and improve range of motion in LBP patients at least in the short term. Also, Cheing and Hui-Chn 2004⁶ stated that TENS therapy significantly reduced pain and improved performance on the majority of standardized tests of physical capacity.

In respect to exercise group which showed more improvement in pain and lumbar range of motion better than TENS group.

Stuge et al., 2004 concluded that exercise program for pregnant women with

LBP was effective in reducing pain, improving functional status and quality of life.

Also, Haugland et al., 2006¹¹ had studied the effect of an education program (information, ergonomics, exercises, pain management, advices for daily life movement & pelvic belt) on pain and daily function for pregnant women. They were reported improvement in pain scores with time.

Finally, it could be concluded that TENS and exercise program could reduce LBP and increase BROM during pregnancy effectively. But, exercise program seemed to have the upper hand than TENS and this was considered as an excellent result as exercise during pregnancy has no harmful effects on the mothers or the fetuses and all women without contraindications should be encouraged to participate in aerobic and strengthening exercises as part of a healthy life style during pregnancy. The pregnant women should be advised that adverse pregnancy or neonatal outcomes are not increased for exercising woman.

The American College of Obstetrics and Gynecology recommended 30 minutes or more of moderate exercise per day on most if not all days of the week, unless the pregnant woman has a medical or pregnancy complications⁴.

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المخلص العربي

التيار المنبه للعصب عبر الجلد مقابل التمرينات لعلاج آلام أسفل الظهر أثناء الحمل

الهدف من هذه الدراسة هو فحص ومقارنة الوسيلة الأكثر فاعلية ، التيار المنبه للعصب عبر الجلد أو برنامج التمرينات لعلاج آلام أسفل الظهر أثناء الحمل . شاركت في هذه الدراسة أربعون سيدة حامل في الثلث الأخير من الحمل وقد كن يعانين من آلام أسفل الظهر وتراوحت أعمارهن بين 25-34 سنة . وقد تم تقسيم هؤلاء السيدات عشوائيا ألي مجموعتين (أ،ب) متساويتين في العدد. المجموعة (أ) تحتوي علي 20 سيدة حامل قد عولجن باستعمال التيار المنبه للعصب عبر الجلد لمدة 20 دقيقة للجلسة الواحدة أما المجموعة (ب) تحتوي علي 20 سيدة حامل وقد تم علاجهن عن طريق أداء برنامج تمرينات لمدة 30 دقيقة/ جلسة وقد كان العلاج للمجموعتين 3 مرات/ أسبوع لمدة أربعة أسابيع وتم لتقييم عن طريق قياس مدي الحركة لل فقرات القطنية وقياس شدة الألم (قبل وبعد الانتهاء من العلاج) وكذلك معدل تخفيف الألم (بعد العلاج) وقد أظهرت النتائج الاختلافات جوهرية في كل مجموعة بعد العلاج عما قبله وبمقارنة المجموعتين معاً بعد العلاج أظهرت النتائج أن هناك زيادة في المدى الحركي لل فقرات القطنية وكذلك انخفاض في شدة الألم في المجموعة (ب) عن المجموعة (أ) وبذلك يمكن أن نستنتج أن برنامج التمرينات كان أكثر فاعلية عن التيار المنبه للعصب عبر الجلد حيث إنه أدى ألي زيادة في مدي الحركة للظهر وانخفاض في الألم في السيدات الحوامل .

الكلمات الدالة : ألم أسفل الظهر ، التيار المنبه للعصب عبر الجلد، مقياس شدة الألم، مقياس تخفيف الألم، المدى الحركي للظهر .