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Effect of Electro-Acupuncture on Low Back Pain During Pregnancy

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Abstract : This study was conducted to determine the effect of electro-acupuncture on low back pain during pregnancy. Forty pregnant women in second trimester, suffering from severe low back pain were participated in this study. They were referred from the outpatient clinic of orthopedic and outpatient clinic of obstetrics & gynecology in Kasr El Aini Hospital, Cairo University. Their ages ranged from 25-35 years old with a mean value 28.92±2.65 years, their parity ranged from (2-4) times and their body mass index (BMI) didn't exceed 28kg/m^2 with a mean value 26.26±1.18 kg/m^2. All participants were divided randomly into two equal groups (A&B). patients in group A (study group) were treated by 20 minutes of electro-acupuncture on points (UB 23 and UB25), and 60 minutes of abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises 3 times per week for 4 weeks while, patients in group B (control group) were treated by 60 minutes of abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises 3 times per week for 4 weeks. All patients in both groups (A&B) were evaluated by present pain intensity (PPi) scale and plasma cortisol level before starting and after the end of treatment program.The results showed a highly significant ($P<0.0001$) decrease in PPi as well as plasma cortisol level after the treatment program in both groups, yet this decrease was more pronounced and statistically significant ($P<0.0001$) in the study group when compared to the control group. So, it could be concluded that electro-acupuncture is an effective modality in alleviating low back pain during pregnancy.
Key words: Electro-acupuncture, pregnancy, low back pain, plasma cortisol pevel, abdominal strengthening exercises.

Introduction

Back pain is one of the most common complains of the pregnant women. About from 30% to 45% of women having severe back pain and experience severe discomfort during pregnancy. Back pain is usually described as an axial or parasagittal discomfort in the lumber region[12].

Low back pain is musculoskeletal in nature, and it is usually due to combination of mechanical, hormonal, circulatory and psychosocial factors. Treatment of low back pain that is available usually has a low success rate and consists mainly of lifestyle adjustments and bed rest[4].

During healthy pregnancy, the woman typically gains between 25 to 35 pounds. The spine has to support this weight. This extra weight of the fetus and uterus means more work is added on her back muscles,

more stress on her joints and ligaments. The weight of the growing fetus and uterus not only adds more stress on her back muscles and spinal ligaments but also puts more pressure on the blood vessels and nerves of the back and pelvis. The result is severe back pain[13].

During pregnancy the expanding uterus shifts the mother's center of gravity anteriorly, in the same time the mother starts to shift her upper body backward to avoid falling forward.This increases lumbar curvature and tilts the pelvis anteriorly. This alteration in the body posture adds severe mechanical stress on the back muscles and spinal ligaments. The result is severe back pain or strain[5].

Also, during pregnancy, the body makes a hormone called relaxin that allows ligaments in the pelvic area to relax and the joints to become looser in preparation for the birth process. The same hormone can cause ligaments that support the spine as well as ligaments that attach pelvic bones to the spine to loosen leading to severe pain and instability. The mother may feel less stable when she walks, stands, sits, rolls over in bed, bends or lifts things.So, her back may continue to ache until her muscles regain their strength and her joints become less lax[1].

Additionally, as the uterus expands, all abdominal muscles are stretched to accommodate the expanding uterus and the two parallel sheets of muscle (the rectal abdominis muscles) may be separate along the center seam. This stretching as well as the separation of the two recti muscles weaken the abdominal muscles and may worsen back pain[21].

The emotional stress can cause muscle tension in the back, which may be felt as back pain or back spasms. The mother may find that she experiences an increase in back pain during stressful periods of the pregnancy[23].

Many studies confirmed that, over weight and obesity play an important role in aggravating this pain. Also, increasing parity is a risk factor that increases the incidence of low back pain during pregnancy. This may be due to severe weakness of the abdominal muscles, several alterations in the body posture, increasing lumber lordosis and the absence of post-natal exercises[25].

In fact, the abdominal muscles have many essential functions. Abdominal and back muscles together stabilize our body and help us to stay upright. Abdominal muscles let us do many movements such as lifting the torso from lying position to sitting position, twisting the torso and moving the hips[35].

The abdominal muscles provide a firm wall to retain the abdominal viscera in position and to oppose the action of gravity on them in the erect and sitting postures. Moreover, they have an auxiliary function, when they stretch and shrink, they make it possible for many physiological functions to take place such as respiration and speaking[22].

Also, they play an important role in parturition, help in maintaining a good posture and assist in defecation as well as micturition. Additionally, the abdominal muscles specially the rectus abdominis muscles provide a good stability to the pelvis when a supine subject partially raises his lower limbs off the ground[17].

The abdominal muscles collectively play an important role in maintaining stability of the trunk and relieving pressure on the lumbar intervertebral discs. They also provide a good support to pelvic viscera and help in maintaining the pelvic girdle alignment[32].

This group of muscles play a vital role in activities of daily living such as rolling over, dressing, lifting, transferring, bed mobility and maintenance of a proper static posture[19].

Abdominal muscles in general are very important in positioning of the trunk and the maintenance of equilibrium when arms and legs are moved. They are also the key in gait where truncal position must be controlled[16].

All abdominal muscles (the rectus abdominis, the transversusabdominis, the internal and external obliques) collectively help to stabilize the lower back by increasing pressure within the abdomen[28].

On the other hand, abdominal and back muscles together keep the body stable, balanced and protect the spine. This means that, any weakness in abdominal muscles affects greatly on body posture and back stability, the result is severe back pain[15].

Abdominal and back muscles together make up the core muscles. Poor posture from weakness of the abdominal or back muscles increase risk of back pain. Consequently, developing combined strength in back and abdominal muscles can reduce back pain and improve posture[2].

The pregnant mother shouldurge to strengthen her abdominal and back muscles; do postural correction exercises and posterior pelvic tilting exercises. These exercises will help greatly in relieving back pain[11].

It is so easy to regain strength and formal integrity of the abdominal muscles if the pregnant mother is instructed to perform regular strengthening exercises for her abdominal muscles and make these exercises as a part of her daily routine[18].

Abdominal strengthening exercises assist greatly in correcting faulty posture and maintain a good postural alignment, provide a good stability for the trunk and prevent spinal dysfunction, increase strength and flexibilityin the whole torso, help greatly in treating diastasis recti and prevent further separation between the two recti muscles, prevent anterior pelvic tilting and assist pelvis to retain its neutral position to fulfill its function as a supportive structure, reduce exaggerated lumber lordosis and this in turn helps greatly to relieve back pain[9].

There are many ways to treat low back pain during pregnancy such as, the pregnant mother should decrease her activities and take a rest in bed if necessary. Also, she must stop or avoid any activity causes her discomfort. She can use positioning; this provides a great comfort to her back and helps greatly in relieving backache. She can use massage therapy on the painful area to relax her back muscles. Occasionally, abdominal belt is indicated in some cases[7].

The pregnant mother should start strengthening exercises to her abdominal and back muscles as well as pelvic tilting and postural correction exercises as early as possible and makes these exercises as a part of her daily routine. The mother can learn relaxation techniques; they may help her to cope with discomfort. Also, taking a warm bath may be effective and if heat doesn't help, she can try a cold pack on the painful area to relieve back pain[29].

Using cognitive – behavioral psycho-therapy is useful in relieving back pain. Doing some gentle stretching exercises or yoga may be helpful in relieving backache. Also, the pregnant mother must stay conscious about her posture, choose a comfortable chair with arm rests, and avoid flexing or twisting her body to pick up a heavy object from the floor, she must tighten her stomach, bend her knees with her back straight and lift objects with her leg muscles, because carrying a heavy object increases load on her back the result is severe back pain[14].

In the same time, the mother should avoidoverweight; she must pay attention to her diet. Ahealthy diet with exercises is the ticket to lose any extra pounds that may be causing additional stress on her joints and back. Additionally to this,there are several physical therapy modalities can be used to treat low back pain during pregnancy such as transcutaneous electrical stimulation, interferential currentand acupuncture whatever manual or electrical acupuncture[26].

Acupuncture is a technique in which the practitioners stimulate specific points on the body called acupoints by inserting thin needles through the skin. It is one of the practices used in traditional Chinese medicine. Acupuncture may be an effective tool for treating low back pain. The results of the previous studies showed that, there was greater improvement in pain for people who got acupuncture compared to those who received medical treatment[30].

Several studies have demonstrated that, acupuncture has a great effect on the nervous system, endocrine and immune system, cardio vascular system and digestive system so it improves the body's functions and promotes the natural self-healing process. Acupuncture successfully provides more effective relieve of low back pain for many people than traditional medical treatment do. Acupuncture has beneficial and persistent

effectiveness against low back pain and now it is being recognized as a very effective treatment for low back pain[37].

The practioners believe that, acupuncture helps greatly in relieving pain and improving health. It is thought that, these effects come from stimulating the central nervous system. This may trigger the release of chemicals into the muscles, spinal cord and brain. These chemicals either alter the experience of pain or produce bodily changes that promote a sense of well-being[38].

Other theories suggest that, acupuncture works by the following:

1) Speeding the relay of electromagnetic signals, this may begin with the flow of pain-killing chemicals such as endorphins or it may release immune system cells in the body.

2) Triggering the release of natural opioids. These are chemicals in the brain that may lessen pain or promote sleep.

3) Changing brain chemistry by altering the release of neurotransmitters and neurohormones. Neurotransmitters either stimulate or dampen nerve impulses and neurohormones can affect the function or activity of an organ in the body[10].

Hundreds of clinical studies have been shown that, acupuncture is an effective tool for treating many conditions such as, primary dysmenorrhea, back pain, sciatica, labor pain, cancer pain, abdominal pain, facial pain, neck pain, shoulder, knee and foot pain, headache, rheumatoid arthritis, osteo arthritis, gouty arthritis, tennis elbow, bell's palsy, herpes zoster, sprain, cardiac neurosis, neuralgia, fibromyalgia, insomnia, depression, morning sickness and induction of labor[3].

The recent studies have confirmed that, acupuncture is clearly effective in providing considerable pain relief and it has no side effects like other medications used to treat low back pain.All the studies have supported the involvement of the C.N.S in relieving pain by acupuncture (pain gait theory). The mechanisms of acupuncture analgesia (AA) are brought about by changes in neural activity at different levels of the C.N.S. following certain types of afferent discharges. A complicated phenomenon with many transmitters and modulators is involved. Pain inhibitory systems can be selectively activated depending on the stimulation variables and the location of the chosen acupoints[8.]

Bothopoid and non-opoidanalgesia systems are involved following needle stimulation; the peripheral afferent pathways carrying acupuncture impulses are activated. The impulses are transmitted via the spinal cord through anterolatenal tract to the hypothalamo-pituitary system (HPS), which releases beta-endorphin (BE) into the blood, cerebrospinal fluid and periaqueductal grey matter (PAG) which produces two actions: Firstly, they release met-enkephalin (MEK) and beta-endorphin (BE) to suppress the transmission of nociceptive information and activate the raphe nuclei, leading to the activation of the descending inhibitory system, the result is an inhibition of the dorsal horn cells receiving the mociceptive impulses using the neurotransmitters serotonin (5HT), noradrenaline, the neuro peptide metenkephalin (MEK) and dynorphin. Secondly, meso-limbic loope of analgesia activation of the spinal cord, the periaqueductal grey matter (PAG) and hypothalamo-pituitary system (HPS) inhibiting incoming nociception[34].

Electrical acupuncture (EA) has been Found to be an effective method for reducing pain, and it is thought to give a more intense, effective and better results than manual acupuncture for relieving pain. Electro acupuncture is defined as the application of apulsating electric current to the acupuncture needles. The procedure of EA includes inserting acupuncture needles into the acupoints by hand manipulation, then, the electrodes of the electro-acupuncture device are attached to these needles to provide a continuous stimulation. By this way the electrical stimulating current is delivered to the acupointsvia the inserted needles. Usually the intensity of the electric current is strong enough to excite AB and a part of Aδfibers so; it can induce an analgesic effect. Electro-acupuncture appears to produce long-term benefits in about 25% of patients with chronic painful conditions including musculoskeletal pain[20].

This study was conducted to investigate the effect of electro-acupuncture on low back pain during pregnancy. So that, this might answer a question about the efficacy of electro-acupuncture in treating low back pain during pregnancy.

Subjects, Materials and Methods

Subjects

This study was carried out on fourty pregnant women, in second trimester, suffering fromsevere low back pain. They were referred from the outpatient clinic of orthopedic and outpatient clinic of obstetrics & gynecology in Kasr El AiniHospital, Cairo University. Patients with skin diseases, back deformity, any gynecological disease (genital prolapse or chronic pelvic pain), neurological diseases (Lumber disc prolapse, lumbar spondylosis or spondylolisthesis), sacroiliac pain, pelvic girdle pain or any other diseases causes' low back pain were excluded. The age of the participants ranged from 25 to 35 years old, parity ranged from (2-4) times and their body mass index not exceed 28kg/m^2 (as shown in table 1).The patients were divided randomly into two equal groups (A&B).

Group A (study group): 20 patients who were treated by 20 minutes of electro-acupuncture on the points (UB 23 and UB25), and 60 minutes of abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises, three times per week for 4 weeks.

Group B(control group):20 patients who were treated by 60 minutes of abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises, three times per week for 4 weeks.

Table (1) : physical characteristics of patients in both groups (A&B).

Variables	Study group (A)	Control group (B)	t-value	p-value	Significance
Age (yrs)	29.15±2.96	28.7±2.34	0.53	0.59	NS
BMI (yrs)	26.64±1.04	26.29±1.32	0.93	0.35	NS
Panity	2.93±0.41	2.91±0.43	1.34	0.19	NS

Materials

I. For evaluation:

A. Universal weight and height scale: it was used to calculate BMI for all patients in both groups (A&B) before starting the treatment program through this equation, BMI= weight (kg) /height (m^2)**=** kg/m^2**.**

B. Present pain intensity (PPi) scale: graphic rating scale with numerical values placed equidistantly along a line of 10 cm long.The descriptors and numbers help the subject to place her estimate of pain on the line ranged from (0-4). It was used to assess pain for all cases in both groups (A&B) before starting and after the end of the treatment program.

C. Blood sample analysis: a sample of blood from each woman participated in this study was analyzed to estimate plasma cortisol level for all cases in both groups (A&B) before starting and after the end of the treatment program.

II. For treatment:

A. Electro-acupuncture device (model KWD-808): it was used to deliver an electric current through electrodes attached to the device.

B. Acupuncture needles: they were used to conduct the electric current of the electro-acupuncture device through its electrodes to the acupoints. These needles were sterilized, made of stainless steel, each one was 3 cm in length and its tip was 0.3 cm width.

C. Stop watch: it was used to detect the time of each treatment session.

D. Stand mirror: it was used during postural correction exercises.

Procedures

I. Evaluative procedure

Before engagement to the study, each patient in both groups (A&B) was subjected to carful history taking. Then, the height and weight of each patient in both groups (A&B) were measured and the body mass index was calculated before starting the treatment course. Then, by using present pain intensity scale (ppi), each patient was asked to score her intensity of pain as being, no pain = 0, mild pain = 1, moderate pain = 2, severe pain = 3, unbearable pain = 4. Also, a morning (fasting) blood sample of about $3cm^3$ was drawn from the anticubital vein and analyzed to estimate plasma cortisol level. The evaluative procedures were done before starting and after the end of the treatment program for all patients in both groups (A&B).

II. Treatment procedures

For group (A): 20 patients were treated by 20 minutes of electro-acupuncture on the points(UB23, UB25), and 60 minutes of abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises, three times per week for 4 weeks.

- The treatment session of electro-acupuncture was done by asking the patient to lie in modified side lying position (head was turned to one side and rested on a pillow, upper hand was rested on a pillow with flexed elbow and lower hand was extended behind her back, while lower leg was flexed hip& knee and upper leg was extended and rested on a pillow).

The patient was covered with a white sheet except the treated area (the painful area), and the acupuncture points for LBP (UB23, UB 25) were detected (UB 23 was located one and half cun lateral to the spinous process of the second lumbar vertebra at the level of the lower border of the rib cage in the renal angle, while UB25 was located one and half cun lateral to the spinous process of the fourth lumber vertebra, at the level of the upper border of the iliac crest). The skin of these points was cleaned with alcohol and 4 sterilized disposable acupuncture needles were inserted manually in these points, so needle sensation of heaviness, numbness or parathesia was usually felt by the patient. Then, the electrical stimulation device was connected to the acupuncture needles via 4 electrodes and adjusted with the following parameters: frequency ofthe electric current was 2 Hz with biphasic square wave form, the pulse duration was 0.5 ms, and intensity of the electric current was determined according to the tolerance of the patient.

After that, the electrical stimulation device was switched on and the intensity of the electric current was increased gradually until it reached to tolerable non painful sensation level. After 20 minutes, the electric device was switched off and the acupuncture needles were removed and thrown away to avoid their usage again. After that, the patient started to do abdominal strengthening exercises which included (static abdominal exercise, hip shrugging exercise, lateral flexion of the trunk, pelvic rotation exercise, trunk rotation exercise, and antro – posterior flexion of the trunk) as follow:

a) **Static abdominal exercise**: the therapist was stride standing beside the mother asking her to lie in crock lying position, his inner hand was placed above her abdomen and his outer hand was placed under her lumbar region. The mother was asked to tighten her abdominal muscles firmly and press her lumbar region down on the therapist's hand, hold for few seconds then relax. This exercise was repeated 3 times.

b) **Hip shrugging exercise**: The therapist was stride standing beside the mother asking her to lie in half crock lying position, his inner hand was placed under her ankle joint and his outer hand was placed on the antero-lateral aspect of her knee joint. The mother was asked to tighten her abdominal muscles firmly and draw her straight leg upward towards her ribs to seem shorter then push it down to seem longer, return to the starting position and relax. This exercise also was done from standing position.

c) **Lateral flexion of the trunk**: the therapist was stride standing beside the mother asking her to lie in supine lying position. The mother was asked to tighten her abdominal muscles firmly and try with tips of her fingers to touch the farthest point on her leg and let her head follow the movement and her eyes looking behind her shoulder, hold for few seconds then relax. By this way, the mother bent her trunk to one side, so this exercise was repeated again to the other side and also it was done from standing position.

d) **Pelvic rotation exercises**: the therapist was stride standing beside the mother asking her to lie in crock lying position, his inner hand was placed above her ankle joints and his outer hand was placed on the lateral aspect of her knee.The mother was asked to tighten her abdominal muscles and try to touch the plinth with her flexed knees, hold for few seconds then relax. This exercise was repeated again to touch the other side of the plinth.

e) **Trunk rotation exercise**: the mother was asked to sit on a stool putting her hands around her waist while the therapist was stride standing in front of her. The mother was asked to tighten her abdominal muscles firmly and turn her trunk to the right side as much as she can while her head follow the movement and her eyes looking behindher shoulder, hold for few seconds, then return to the starting position and relax. This exercise was repeated again to the left side and also was done from standing position and from crock lying position.

f) **Antro-posterior flexion of the trunk**: the mother was asked to lie in supine lying position while the therapist was stride standing beside her. The mother was asked to tighten her abdominal muscles and raise her head and look at her feet, hold then relax. The exercise was repeated again by raising head and shoulders and looking at her feet then relax. After that she was asked to raise her head, shoulders and her upper trunk and come to sitting position then relax. Also, the mother was asked to tighten her abdominal muscles and raise one leg up, then hold and relax.The same exercise was repeated to the other leg, then to both legs together and relaxes.

- **Postural correction exercises were done as follow:**

a) **From crock lying**: the mother was asked to lie in crock lying position, the therapist was stride standing beside her, asking her to chin in , take deep breath from the nose, open the chest out, contract abdominal muscles, contract the gluteal muscles hold for few seconds then relax.

b) **From supine**: the mother was asked to lie in supine lying position, the therapist was stride standing beside her, asking her to chin in, take deep breath from the nose and open the chest out, contract abdominal muscles, contract gluteal muscles, extend both knees and doris flex both ankles, hold for few seconds then relax.

c) **From standing**: the mother was asked to stand in errect position in front of the mirror, the therapist was stride standing beside her, asking her to chin in, take deep breath from the nose and open the chest out, contract abdominal muscles, contract gluteal muscles, extend both knees, feel the body weight is transmitted from the knee to the lateral border of the foot then to the big toe, hold for few seconds then relax.

- Posterior pelvic tilting exercises were done as follow:

a) **From crock lying**:the mother was asked to lie in crock lying position, the therapist was stride standing beside her, both thumbs of the therapist were placed on the anterior superior iliac spines of the mother while other fingers of the therapist

were fanning on the lateral aspect of the pelvis of the mother, the therapist asked the mother tocontract gluteal muscles, contract abdominal muscles and press her back down on the plinth, hold for few seconds then relax.

b) **From standing** : the mother was asked to stand against the wall, putting both thumbs of her hands on the anterior superior ileac spines of her pelvis while other fingers of her hands were fanning on the lateral aspect of her pelvis. The therapist was stride starting beside the mother, asking her to contract gluteal muscles, contract abdominal muscles and press her lumbar region against the wall. Hold for few seconds then relax.

For group (B): 20 patient were treated by 60 minutes of abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises, three times per week for 4 weeks. All the exercises were done by the same technique as in group (A).

Statistical analysis

- Data were summarized using the arithmetic mean, standard deviation (SD) and percentage of change.
- The student's t-test used for comparison of data collected from both groups before starting and after the end of the treatment program.

Results

The mean value scores of the present pain intensity (PPi) scale in patients of the study group (A) before starting the treatment was 3.9±0.64; it was decreased to 1.1±0.71 after the treatment, with a percentage of improvement (decrease) in pain sensation equal 71.79%. in patients of the control group (B), the mean value of (ppi) before treatment was 3.6±0.68, it was decreased to 2.05±0.82 after the treatment, with a percentage of improvement (decrease) in pain sensation equal 43.05% .

By comparing mean values of (ppi) before starting and after the end of the treatment program for both groups (A&B), a highly statistical significant ($p<0.0001$) decrease was observed in both groups following treatment, but this decrease in mean values of (PPi) as well as percentage of decrease in pain sensation was more pronounced and statistically significant ($p<0.0001$) in the study group (A) when compared to the control group (B) as shown in table (2) and figs. (1&2).

Table (2): present pain intensity scores before starting and after the end of treatment program for both groups (A&B).

Variables	Study group (A)		Control group (B)	
	Before treatment	After treatment	Before treatment	After treatment
Mean ± SD	3.9± 0.64	1.1±0.71	3.6±0.68	2.05±0.82
Mean difference	2.8		1.55	
t-value	16.31		7.33	
p-value	0.0001		0.0001	
% of improvement	71.79%		43.05%	

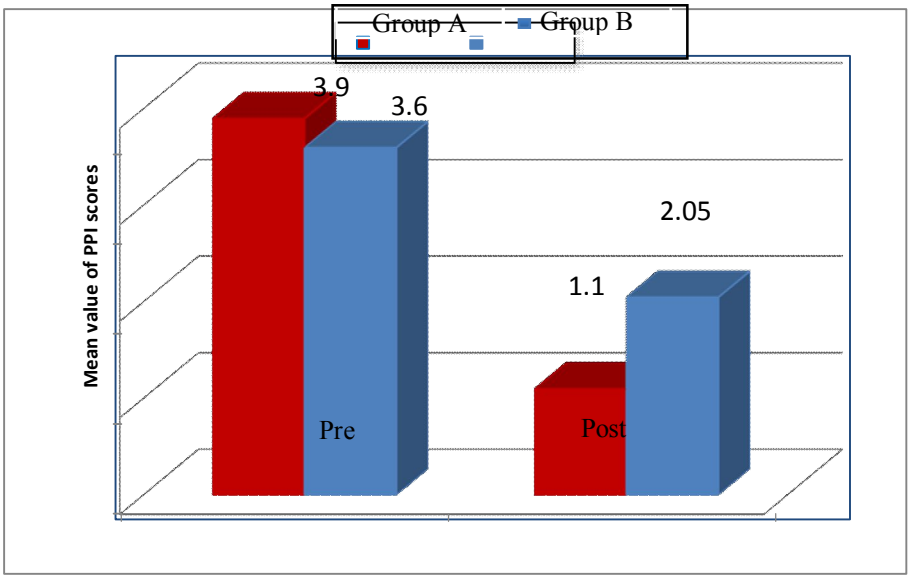

Fig. (1): Present pain intensity scores before starting and after the end of treatment program for both groups (A&B).

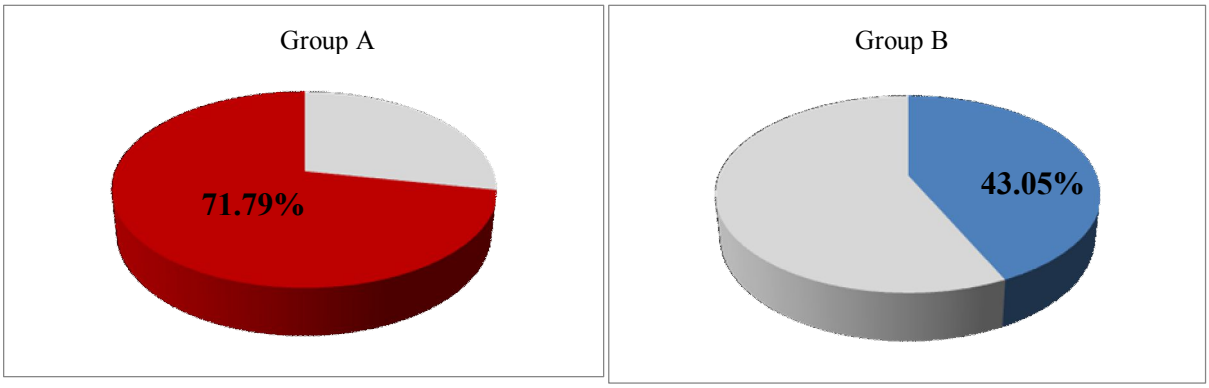

Fig. (2):The percentage of decrease in pain sensation after treatment in study and control groups (A&B).

Plasma cortisol level before starting and after the end of treatment program for both groups (A&B) were compared and a statistical significant ($p<0.0001$) decrease was observed in both groups following the treatment yet, this decrease was more pronounced and statistically significant ($p<0.0001$) in the study group (A) when compared to the control group(B) as observed in table (3) and Figs. (3&4).

Table (3): plasma cortisol level before starting and after the end of treatment program for both groups (A&B).

Variables	Study group (A)		Control group (B)	
	Before treatment	After treatment	Before treatment	After treatment
Mean ± SD	30.72±6.57	14.87±4.23	30.39±5.39	21.91±4.18
Mean difference	15.85		8.48	
t-value	10.22		7.8	
p-value	0.0001		0.0001	
% of improvement	51.59%		27.9%	

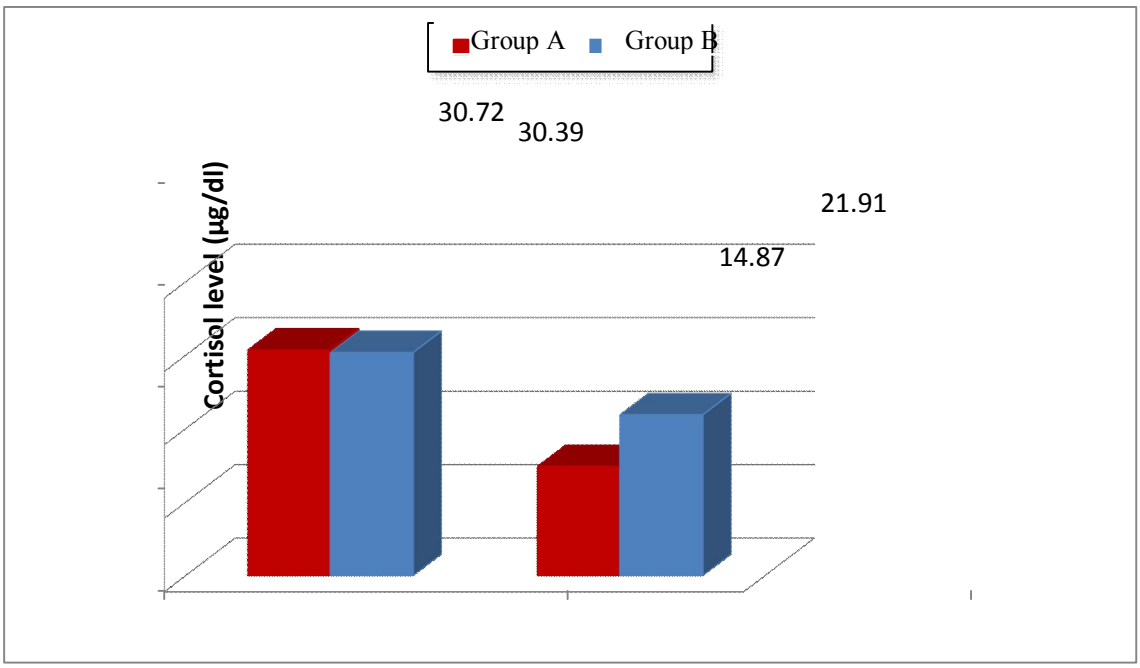

Fig. (3): The plasma cortisol level pre and post treatment for study and control group (A&B).

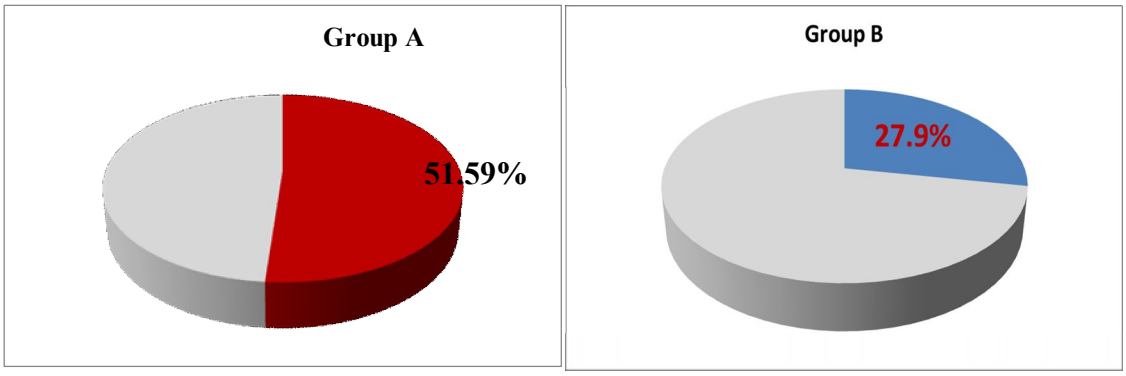

Fig.(4): The percentage of decrease in plasma cortisol level after treatment in study and control groups (A&B).

Discussion

Low back pain is a common complain of pregnant women. It is musculoskeletal in nature and it may be due to combination of mechanical, hormonal, circulatory and psychosocial factors. Treatments that are available usually have a low success rate and consist mainly of lifestyle adjustment and bed rest[31].

Low back pain can be disabling and can limit function during pregnancy. The pregnant mother usually suffers from severe pain and great discomfort in her lower back, also she may feel less stable when she walks, stands, sits, rolls over in bed, bends or lefts things, low back pain affects greatly on daily living activities of the pregnant woman[6].

Women who had back pain during pregnancy are more likely to have persistent low back pain after pregnancy, this may be attributed to postural changes and weakness of the abdominal muscles.The pregnant woman usually advised to strengthen her abdominal muscles and perform postural correction exercises to relieve back ache[22].

Electro-acupuncture helps greatly in relieving pain and improving health. It is clearly effective in providing considerable pain relief and it has no side effects like other medications used to treat low back pain[33].

Combination of electro acupuncture and abdominal strengthening exercises as well as posterior pelvic tilting and postural correction exercises may be an effective method for reducing low back pain and it is thought to give better results for relieving pain[36].

The results of this study showed a highly significant ($p<0.0001$) decrease in present pain intensity (PPi) scale as well as plasma cortisol level after the treatment program for patients in both groups (study & control). This decrease was more pronounced and statistically significant ($p<0.0001$) in patients who treated by electro-acupuncture combined with strengthening exercises for abdominal muscles, posterior pelvic tilting and postural correction exercises (study group) than those who treated by strengthening exercises for abdominal muscles, posterior pelvic tilting and postural correction exercises only (control group).

The results of this study came in agreement with the results of An et al., [3] who studied the effect of electro-acupuncture (EA) on post-operative incisional pain after cesarean section. The results of his study showed that, "electro-acupuncture gave marvelous results indicating that electro-acupuncture can relief pain within 20 minutes after application".

The results of this study came in agreement with Xing et al., [37] who stated that "strengthening exercises program for the abdominal musculature can increase vertebral stability and decrease low back pain during pregnancy".

The results of this study were supported by Peggy et al., [24] who reported that "if you have low back pain during pregnancy, you may have been advised to strengthen your abdominal muscles because this increases lumbar stability also, you can receive electro-acupuncture to relieve backache.

The results of this study came in agreement with Faris et al., [9] who demonstrated that "strengthening exercises for all muscles of the abdominal wall combined with electro-acupuncture is the best method to relieve low back pain during pregnancy".

The results of this study were also documented by Thomas et al., [30] who stated that "Now, electro-acupuncture is being recognized as a very effective treatment for low back pain. The results showed that electro-acupuncture is clearly effective in providing considerable pain relieve".

The results of this study were in consistent with the results of Inoune et al., [12] who used electro-acupuncture to relieve incisional pain after abdominal hysterectomy, he found that "pain sensation was markedly decreased after 1st session and completely disappeared after four sessions of application, this means that, electro-acupuncture is a marvelous intervention to relieve pain".

The results of this study agreed with Marques et al., [18] who demonstrated that "electro-acupuncture is an effective for treating low back pain, the results showed there was greater improvement in pain for people who got electro-acupuncture combined with abdominal strengthening exercises compared to those who received abdominal exercises only".

These results were also consistent with Tsukayama et al.,[33] who studied the effect of EA versus TENS on low back pain during pregnancy, he concluded that "there was a significant reduction in pain sensation in both groups, but the percentage of change in (EA) group was greater than (TENS) group".

Schwria et al.,[28] demonstrated that "the strengthening exercises specially for those the rectus abdominis muscles help to reapproximate the two bellies from each other and prevent further separation between the two recti. Also, they assist pelvis to retain its neutral position and prevent anterior pelvic tilting as well as the exaggerated lumbar lordosis, this in turn helps greatly to relieve back pain". This came in agreement with the results of the present study".

In summary, this study concluded that electro-acupuncture is an excellent non pharmacologic, noninvasive method for relieving back pain during pregnancy and it has no side effects like other medications used to treat low back pain. Also, using electro-acupuncture combined with abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises gives much better results and greater improvement in pain sensation than using abdominal strengthening exercises, posterior pelvic tilting and postural correction exercises alone, so it is the best method to relieve low back pain during pregnancy.

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