Effect of Back Massage and Relaxation Training on The Act of Labor: A Randomized Controlled Clinical Trial

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Abstract : Aim: This study was conducted to examine the effects of back massage and relaxation training on the act of labor.

Background: However, Labor pain is often described as the worst pain in a woman's life many women would like to avoid pharmacological or invasive methods of pain management in labor to stay clear from its adverse effects.

Methods: Fifty eligible full term primigravidae women with cephalic presented normal singleton fetus were participated in this study. They were all complaining from true labor pain and expected to deliver normally within few hours; women were divided randomly into two equal groups. The control group (A) received only traditional maternity ward care while females in the study group (B) received traditional maternity ward care as well as sets of massaging techniques and relaxation training at the active phase of 1st stage of labor. Evaluation was done by measuring labor pain precipitation intensity by using Present Pain intensity scale (Ppi), duration of the first stage of labor, mode of delivery andblood serotonin level. Initial evaluation was done when cervical dilatation became $\geq 3cm \leq 5cm$ then repeated at 7-8 cm of cervical dilatation for both groups.

Results: The two groups did not differ by age, body mass index, gestational age, cervical dilatation at the time of hospital admission. Compared with those in the control group (A), women in the study group (B) showed a statistical significant decrease $p<0.001$ in labor pain, duration of 1st stage of labor by about 12.35% and statistical significant reduction in incidence of caesarian section with great elevation of blood serotonin level by 96%.

Conclusion: It could be concluded that back massage and relaxation training considered as an alternative, safe, affordable and most inexpensive yet effective method of relieving pain in the 1st stage of labor, shorten its duration and reduce the rate of cesarean deliveries in addition to increasing blood serotonin level. Also, it can assist women to have empowered birth experiences, reduce the negative impact of labor on women leading to reduce the likelihood of a woman choosing an elective cesarean delivery in a subsequent pregnancy.

Key word : back massage, relaxation training, labor.

Introduction

Labor pain is the worst pain in woman's life, the severity of pain varies throughout the course of labor and it differed from women to other [1].

The control of labor pain and prevention of suffering are the major concern of clinicians and their clients, the ideal labor pain analgesia does not exit and systemic opioids provide little relief with side effects [2].

Women often report high levels of pain during the first stage of labor. Factors that have been repeatedly linked to the higher levels of pain are nulliparity, request for analgesic treatment and uterine contraction duration and rate. Other factors are more controversial and include position, birth preparation classes and expectation of pain level, feelings of control, history of dysmenorrhea, education level and socioeconomic class[3].

Unrelieved pain during labor may lead to fetal acidosis and hypoxia in the following situations: Prolonged labor causing maternal metabolic acidosis, Maternal hyperventilation leading to increasing maternal oxygen consumption and Hypocapnia, this may cause constriction of the utero-placental vessels and reducing the amount of oxygen available for transfer to the fetus. Also, maternal anxiety leading to increased catecholamine secretion, a reduction in utero-placental flow may follow and uterine contractions may also be inhibited[4].

Labor is divided into three stages. The first stage starts from the beginning of regular uterine contractions until cervical dilatation is completed, the second stage follows the first stage until the delivery of the fetus, and the third stage continues until the placenta and membranes have been discharged. During the first stage, the pain is mainly visceral and mediated by the T_{10} -L_1 segments of the spine, while during the second stage, an additional somatic component is present, mediated by the S_2-S_4 segments of the spine[5].

During the first stage of labor, women usually perceive the visceral pain as diffuse abdominal cramps and uterine contractions. In the second stage of labor, pain is concentrated in the perineumassharper and more continuous somatic pain. Pressure or nerve entrapment caused by the fetus's head descent can cause severe back or leg pain. Nulliparous women generally experience more sensory pain during early labor, while multiparous women may feel more intense pain during the late first stage and the second stage of labor, as a result of rapid fetal head descent[6].

In early period of childbirth education, attention has been placed on learning breathing techniques for use during labor. Breathing patterns are taught primarily as a distraction during uterine contractions. As labor progressed and the contractions became longer, more painful and closer together, women were taught to alter their pattern of breathing[7].

Labor pain may be severe enough to cause body tension, anxiety and fear which exaggerating its perception. Many women would like to go through labor without using drugs, or invasive methods such as an epidural analgesia, and turn to complementary therapies as acupuncture, mind-body techniques, massage, reflexology, herbal medicines or homoeopathy, hypnosis, music, aromatherapy to reduce labor pain and improve its management[8].

The adverse effects of maternal stress have been well documented mainly in terms of the fetus or birth outcomes; however, not many studies have focused on the mother's psychological well-being. Mothers with greater maternal stress had a less positive attitude and lower levels of maternal-fetal attachment[9]. So, this study was conducted to examine the effect of back massage and relaxation training on the act of labor.

1- Subjects

This study was carried out on a sample of fifty full term primigravid a women during the first stage of labor with regular painful and palpable uterine contraction; women were selected from the department of obstetrics and gynecology, Kasr El Aini Teaching Hospital. The study was carried out from April to august 2015 and was approved by ethical committee of Faculty of Physical Therapy Cairo University No: P.T.REC/012/001118, 1/1/2015, Permission to conduct the study and access the subjects was obtained from the director of OBS-GYN and the head nurse of the unit.

Inclusion criteria:

All participated women had a cephalic presented normal singleton fetus, ≥ 37 weeks' gestation with spontaneous onset of labor, a cervical dilatation was ranged between 3-5 cm at the beginning of the treatment procedure, anticipated normal labor, normal fetal heart rate and they all had the same socioeconomic standard (Housewives with middle and high level of education).

Woman with the one or more of the following criteria was excluded; diabetes, severe anemia or dehydration, pre-eclampsia, heart or chest diseases, hemorrhage, fever higher than 38°c, rupture of membrane, breach presentation, cephalopelvic disproportion, uterine inertia, multiple pregnancies, fetal growth retardation, placenta previa, skin diseases and cognitive or psychiatric problems.

None of the women had neither attended antenatal classes nor instructions about labor as well as had not received any type of analgesics prior to participation in the study to reduce labor pain, or receive oxytocin as augmentation of labor during 1st stage of labor.

Women eligible for inclusion were sequentially recruited into the study, females and her relatives were given a full explanation of the treatment protocol and informed consent form had been signed then women randomly allocated into 2 groups, the controlgroup(A)received only traditional maternity ward care and study group (B) received traditional maternity ward care as well as sets of massaging techniques and relaxation training at the active phase of 1st stage of labor.

2-   Procedures*:*

Evaluation procedure:

Act of labor was evaluated by measuring *Labor pain precipitation intensity* by using Present Pain intensity scale (Ppi) on which pain intensity was scored as being: No pain = 0, Mild pain = 1, Moderate pain = 2, Severe pain = 3 and Unbearable pain = 4.*duration of the first stage of labor* which defined as the time interval between $\geq$ 3cm $\leq$ 5cm of cervical dilatation and complete cervical dilatation (Active phase of labor),*mode of delivery* and *blood serotonin level.*

Initial evaluation of Ppi, and blood serotonin level in a blood was done pre- treatment when cervical dilatation became $\geq$ 3cm $\leq$ 5cmthen repeated post-treatment at 7-8 cm of cervical dilatation for both groups, also, duration of 1st stage of labor and mode of delivery were recorded.

Treatment procedure:

 Each woman in both groups (A&B) had the same routine maternity ward care as following:

General management

Rectum was evacuated by enema and woman was advised to evacuate the bladder every two hours to avoid uterine atony, then the woman was advised to stop eating solid food. However, water and fluids intake were allowed. Also, maternal pulse rate, blood pressure and temperature were recorded every two also, fetal heart sound was recorded every 30 minutes to detect fetal distress. Degree of cervical dilatation was assessed by vaginal examination every 1-2 hours by the same obstetrician for all cases. Glucose saline solution was given intravenously if needed (120 ml per hour).

At 5-6 cm of cervical dilatation artificial membrane rupture was done if it didn'toccurre naturally. When the mothers cannot tolerate pain, intramuscular injection of nalbuphine (trade name Nubain)) (20 mg) were used in both groups (A & B).

General Relaxation: that obtained through *positioning* in a fully supported comfortable position that chosen by each woman according to her comfort which was either:

- Sitting on bed with cushion behind the back or sitting on bed with leaning forward on cushions

- Side lying or back lying position when the woman lying in bed, she was advised to lie on her side to avoid supine lying position.

The woman was encouraged to change her positions to gain the more comfortable position.

Females in the study group (B) received the same interventions as in control group (A) in addition to relaxation technique and massaging techniques as the following:

I- Relaxation technique:

A) Breathing exercise:

The woman was asked to breathe deeply through diaphragmatic breathing exercises to gain relaxation, conserve the energy and to allow good oxygenation for her tissues.

-   Diaphragmatic breathing:

The woman was asked to choose the preferred position and relaxed completely, then the therapist asked her to inhale slowly through the nose, feeling the air flow in, and raising her abdomen upward as a balloon, then she let the air slowly go out through her mouth with a sigh and then she felt the tension going with the expired air, repeat the previous breathing exercise 3-5 times and relax, relaxes a period of rest equal to the period of breathing ex's to avoid hyperventilation..

-   Costal breathing exercise:

However, when the uterine contractions became more strong and frequent and the cervical dilatation was increased the woman was asked to assume any comfortable position, the therapist asked the female to inspire from her nose, fill her chest with air, open out her ribs laterally and then expire the air from her mouth with a sigh, repeat the previous breathing exercise 3-5 times and relaxes a period of rest equal to the period of breathing ex's to avoid hyperventilation [10]**.**

Specific relaxation technique:

Relaxation training in form of tens-relax technique as the woman was asked to flex her fingers, feel the tension and its site, and then she relaxed and felt the absence of tension. This was done for all movements (flexion, extension, abduction, adduction of the finger joints and also flexion, extension, ulnar and radial deviations as well as circumduction of the wrist joints) of both right and left hands.

This procedure was then repeated with breathing control as the woman was asked to flex her fingers with inspiration and feel the tension and its site after that felt the tension go away with expiration, this was done for all movements (flexion, extension, abduction and adduction of the finger joints, and also flexion, extension, ulnar and radial deviations as well as circumduction of the wrist joints) of both right and left hands[11]**.**

II-   Massaging techniques:

The study group (B) received massagingtechnique as the participants were instructed to choose their preferred position for receiving back massage, i.e., sitting, lateral decubitus, or standing with the trunk bending forward. Intensity of the massage was determined by the mother, who was instructed to request greater or lesser force during execution of the massage according to her comfort.

The massage technique was applied over the area between T10 and S4, which corresponds to the path of the hypogastric plexus and the pudendal nerve, responsible for innervation of the paravertebral ganglia, labor canal, and perineum.

During uterine contractions, women were encouraged to close their eyes and to take two deep breaths in order to concentrate on the massage. A directional, reasonably firm and rhythmic massage lasting 30 minutes, was applied comprising ascending abdominal effleurage, shoulder and back kneading by applying counter pressure to painful areas of the lower back(sacral pressure), as the therapist fold the fingers flat against the palm of the hand, keeping the wrist straight and use the knuckles to press into painful area [12]**.**

Statistical analysis:

Results are expressed as mean ± standard deviation (SD) and median (minimum-maximum), Comparison between values of different variables in the two studied groups was performed using unpaired t-test and Mann-Whitney U whenever it was appropriate while comparison between pre- and post-treatments within

the same group was performed using paired t-test and Wilcoxon Signed Ranks Test. Statistical Package for Social Sciences (SPSS) computer program (version 19 windows) was used for data analysis. P value ≤ 0.05 was considered significant.

Results:

Interpretation of demographic variables among females in both groups is represented in the table (1) that shows homogeneity of the studied population.

Table (1): General characteristic of women at time of admission to the hospital

	Group (A) (n=25) Mean±SD	Group (B) (n=25) Mean±SD	t-value	p-value
Age (Yrs)	23.70±2.38	22.17±4.01	0.29	0.77 (N.S.)
BMI (Kg/m^2)	37.41±1.6	37.34±1.15	0.06	0.95 (N.S.)
Gestational age (Weeks)	38.55±0.88	38.12±1.01	0.23	0.60 (N.S.)
Cervical dilatation (Cm)	3.83±0.44	3.79±0.42	0.24	0.79 (N.S.)

** P: probability, N.S.: non-Significant

Labor pain precipitation intensity as a factor affecting the act of labor was evaluated by using Present Pain intensity scale (Ppi) results show a statistically significant difference (p<0.001) post-treatment in both groups.

On comparing the two groups, there was a non-statistical significant difference between the median values in the two studied groups measured pre- treatment while in post-treatment there was a statistically significant difference (p<0.001) between the two groups favoring group (B), table (2).

Table (2): Inter and intra-group comparison between median values of intensity of labor pain in the two studied groups measured before and after treatment.

	Group A (n= 25)	Group B (n= 25)	Z value	P value
Pre-treatment	1.0 (1.0-4.0)	1.0 (1.0-4.0)	-0.641	0.521(NS)
Post-treatment	4.0 (2.0-4.0)	2.0 (1.0-4.0)	-3.798	0.001 (S)
Z value	-3.714	-4.491		
p value	0.001 (S)	0.001 (S)		

Data are expressed as median (minimum-maximum), NS= p> 0.05= not significant.S= p< 0.05= significant.

Progress of labor was evaluated by measuring the duration of the 1st stage of labor (Active phase) results showed that there was a statistical significant difference between the two groups as the duration of the 1st stage in study group(B) is about 12.35 % less than control group(A).

Regarding the mode of delivery, In group (A)the numbers of mothers who delivered normally were (20) mothers with a percentage 80% and who made cesarean section after recording post-treatment evaluation were(5) mothers with a percent of 20%, while in group (B) the numbers of mothers who delivered normally were (23) mothers with a percentage of 92% and who made cesarean section after recording post-treatment evaluation were(2) mothers with a percent of 8%, table (3).

Table (3): Statistical analysis of the mean values of duration of the 1st stage of labor and Mode of delivery for both groups (A& B).

Duration of the 1st stage of labor (hours)		Group (A)	Group (B)
	Mean±SD	6±0.72	5.34±0.99
	t-value	2.42	
	p- value	0.019	
Mode of delivery	Cesarean section	5 (20%)	2 (8%)
	Normal delivery	20 (80%)	23 (92%)
	Total Chi- square	1.49	
	p- value	0.41	

Table (4) represents the blood serotonin level in both groups (A & B). There was a non-statistical significant difference (P>0.05) between groups pre- treatment, while, there was a highly statistically significant difference (P<0.001) after treatment in favor of group (B).

When comparing pre and post-treatment mean values of blood serotonin level in group (A),there was non-statistical significant difference (p > 0.05) with a percent of change equals 0.8 %, while there was a highly statistically significant increase (p<0.001) in group (B) with percent of 96% .

Table (4): Statistical analysis of mean values of blood serotonin level(ng/ml).

	Group (A) (n= 25)	Group (B) (n= 25)	t-value	p-value
Pre-treatment	138.14 ± 16.8	131.17± 19.48	1.3	0.18 (N.S)
Post-treatment	136.99± 72.22	258.26± 52.53	6.79	0.0001(H.S)
Mean difference	1.15	127.09		
% improvement	0.8%	96.9%		
t-value	0.087	11.26		
p-value	0.93(N.S)	0.0001(H.S)		

* P: probability, N.S: non-significance, H.S: highly-significant.

Also, it was observed that the participants in the study group (B) were more likely to adopt sitting position during the period of treatment than those in the control group (A).

Discussion

Giving birth is often associated with severe pain, and many women need some kind of analgesic treatment. Conventional analgesic treatment may have adverse effects for both the mother and the newborn. Many women ask for alternatives to the pharmacological and invasive methods commonly used in childbirth [13].

Childbirth is a complex process requiring both physical and mental resources. The experience of the birth process is influenced by various factors, including the duration of labor, pain, medical interventions, anxiety, loss of control, support from partner and caregivers, and the woman's own expectations concerning the upcoming childbirth. Labor process may cause negative and traumatic birth that increase the risk of post-traumatic stress syndrome, postpartum depression, bonding problems between mother and child, future cesarean section or refraining from being pregnant again[14].

Inhaled nitrous oxide and oxygen (Entonox) relieved pain, but it has many side effects as some women felt drowsy, nauseous or were sick. Non-opioid drugs (e.g. sedatives) relieved pain and some gave greater satisfaction with pain relief than placebo or no treatment, but this satisfaction with pain relief was less than with opioids. Epidurals relieved pain, but increased the numbers of aided births by forceps or ventouse and the risk of fall of blood pressure, motor blocks (hindering leg movement) in addition tofever and urine retention. Local

anesthetic nerve blocks gave satisfaction but caused side effects of giddiness, sweating, tingling, and more babies had low heart rates [15].

So, this study was conducted to evaluate the effect of back massage and relaxation training as safe, cost-effective, noninvasive procedures on the act of labor determined by measuring labor pain precipitation intensity,duration of the first stage of labor, mode of delivery and blood serotonin level.

For that fifty full term primigravidae women selected from Obstetrics and Gynecology Department, kasr Al Aini Hospital. Their age ranged from 20 to 30 years. All cases were in 1st stage of labor, complaining from true labor pain and expected to deliver normally within few hours. They divided randomly into two equalgroups (A&B).Control group(A)received only traditional maternity ward careand females in the study group (B) received traditional maternity ward care as well as sets of massaging techniques and relaxation training at the active phase of 1st stage of labor.

Concerning changes in the intensity of labor pain, results of this study revealing a statistically significant difference in median value of Ppi scale post-treatment between groups favoring study group (B).

This study is in agreement with **Gallo et al.,** [12] who conducted a study to examine the effect of lumbar massage during the active phase of labor in multigravidae women and results revealed that massage reduced the severity of pain in labor, despite not changing its characteristics and location.

Also, **Taghinejad,** [16]stated that the ideal labor pain relief should be safe for both the mother and baby, easy to administer, predictable and constant in its effects. Labor pain relievers should not interfere with uterine contractions or with mobility. Recommended nonpharmacological options for pain relief in labor are hypnosis, transcutaneous electric nerve stimulation, hydrotherapy, music and massage therapies. The advantages of massage therapy for childbearing women, either physically (i.e., direct physical manipulation of soft body tissues) orpsychologically (i.e., positive healing energy that is generated during this manipulation).

Massage therapy helping in pain relief, provides direct physical contact with the parturient, potentiating the effect of relaxation and greatly reducing emotional stress. Several theories explain the mechanism by which massage might relieve pain, such as reduction in cortisol and norepinephrine levels, increasing serotonin levels, stimulation of endorphin release in addition to enhancing circulation with a consequent increase in oxygen transmission to the tissues, and the facilitation of toxin excretion through the lymphatic system [12].

Chang et al., [17]conducted a study on massage throughout the active phase of labor and detected a gradual increase in pain and anxiety in the control and experimental groups, but in experimental groupthere were lower pain scores during the three phases, and a lower anxiety score only in the first phase.

This study is supported by **Simkin and Bolding,** [7] who stated that relaxation and breathing may contribute more to a woman's ability to cope with labor pain than to actually reduce that pain. High satisfaction rate expressed by large majorities of surveyed women justifies their continued inclusion in childbirth classes and encouragement of their use by maternity staff.

In this study Adding back massage to relaxation training significantly reduce the duration of active phase of the 1st stage of labor by 12.35 % in study group (A) than control group (B).

This result is in agreement with **Field et al.,** [18] who conducted a study on twenty-eight multiparous women were recruited from prenatal classes and randomly assigned to receive massage in addition to coaching breathing training during labor process, or to receive coaching breathing training alone. Mothers in massage group reported decrease in depressed mood, anxiety and pain as well as showed less irritability, anxiety and more positive behavior following the first massage session during labor. In addition, the massaged mothers had significantly shorter labors duration, a shorter hospital stay period and lower postpartum depression.

Also, **Adams et al.,** [19] conducted a prospective study to assess the association between fear of childbirth and duration of labor revealing that duration of labor was longer in women with fear of childbirth than in women without fear of childbirth.

In this study changing the route of delivery from being normal delivery to caesarian section was observed in 20 %of females in control group (A) comparing to 8 % in study group (B).

This result is supported by **Kashanian et al.,** [20] who stated that supporting behavior including physical, emotional, instructional, informative, and advocacy may improve the outcome and birth experience of women by reducing the duration of labor and the number of cesarean deliveries.

This finding was consistent with **Laursen et al.,** [21] who conducted a study to examine the associations between fear of childbirth and emergency caesarean section and cervical dystocia. The results showed that fear of childbirth was associated with increased the need for emergency caesarean section and increased risk for cervical dystocia.

Concerning changes in serotonin level in blood, results of this study showed that there was a non-statistical significant difference (P>0.05) between groups pre- treatment, While, there was a highly statistical significant difference (P<0.001) after treatment in favor of group (B).

When comparing pre and post-treatment mean values of blood serotonin level in group (A), there was a non-statistical significant difference (p > 0.05) with a percent of change equals 0.8 %, while there was a highly statistical significant increase (p<0.001) in group (B) with the highest percent of 96% .

The result is in agreement with **Berger et al.,** [22] who stated that serotonin mediates several important CNS behaviors including the stress response, immune strength. Thus, it is central to the production and treatment of several stress disorders including depression, pre-menstrual syndrome, and anorexia-obesity.

Relaxation training is one of the most effective strategies for boosting serotonin levels; relaxation in association with deep breathing exercises may increase the rate at which serotonin neurons in the brain fire, which may stimulate the production of this mood-elevating chemical [23].

Several theories have been used to explain effects of body massaging such as decrease in cortisol and norepinephrine level, elevate serotonin levels, increase blood circulation with a consequent increasing oxygen supply to the tissues and facilitating toxin excretion via lymphatic system. In addition, a mechanism whereby the noxious stimuli evoked by lesions are regulated in the spinal cord by nerves that act as gates, blocking or facilitating the passage of impulses to the higher center [12].

Also**, Chuang et al.,** [9] relaxation techniques improve acute stress responses and decrease the level of anxiety, this relaxation intervention is cost-effective, non-invasive and easily applicable non-pharmacological intervention used into clinical practice related to pregnancy.

This study is in agreement with **Field et al.,** [24] who conducted a study on prenatal maternal mood states and biochemistry, fetal activity, and neonatal outcomes and the effects of massage therapy on these factors, results showed that massage therapy leads to increased serotonin and dopamine, serotonin was expected to decrease depression and cortisol level, which in turn, would be expected to decrease the incidence of premature delivery.

Massage therapy is most traditionally used in management of pain syndromes. The common mechanisms used to explain the massage therapy on pain syndromes is gate control theory. In that theory, pain stimulates shorter and less myelinated nerve fibers so that the pain message takes longer to reach the brain than the pressure message, which is transmitted by nerve fibers that are more myelinated and longer and therefore able to transfer the pressure faster. The message from the pressure stimulation reaches the brain prior to the pain message and, so, "closes the gate" to the pain stimulus [24].

So, it could be concluded that back massage and relaxation training considered as an alternative, safe, affordable and most inexpensive yet effective method of relieving pain in 1st stage of labor, shorten its duration and reduce the rate of cesarean deliveries in addition to increase blood serotonin level. Also, it can assist women to have empowered birth experiences, reduce the negative impact of labor on women leading to reduce the likelihood of a woman choosing an elective cesarean delivery in a subsequent pregnancy as a result of a previous negative experience.

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