ORIGINAL ARTICLE

The Difference Level of IL-6 and PGE2 in Mothers during the 1st Stage of Labor with Regio sacralis Counter-Pressure Therapy

Sri Rejeki[1], Achmad Sulichan[1], Machmudah[1], Dwi Nur Rahmantika PS[2], Arief Yanto[3], Sandeep Poddar[4]

[1] Maternity Nursing Department, Faculty of Nursing and Health Sciences, University of Muhammadiyah Semarang, Central Java, Indonesia
[2] Critical and Emergency Department, Health, and Nursing Faculty, University of Muhammadiyah Semarang, Indonesia
[3] University Muhammadiyah Semarang
[4] Lincoln University College, Wisma Lincoln, No. 12-18, SS6/12, Off Jalan Perbandaran, 47301 Petaling Jaya, Selangor D. E. Malaysia

ABSTRACT

Introduction: Labour pain is a physiological condition generally experienced by almost all women who give birth. Pain causes tachycardia in the mothers, increased oxygen consumption, lactic acid production (lactic), hyperventilation with the risk of respiratory alkalosis, and increased skeletal muscle tension. Counter Pressure Regio Sacralis is an effective therapy to reduce labour pain, especially in the first stage. Based on the previous research, Counter-Pressure Regio Sacralis therapy, in addition to reducing the pain scale, was also proven to reduce prostaglandin levels (PGE-2) in slightly insignificant amount. Changes in PGE-2 are also suspected of having an impact on the stimulant hormone, the hormone Interleukin-6 (IL-6). This study aimed to see Regio Sacralis Counter Pressure therapy's effect on IL-6 and prostaglandin levels at the first stage of labour. **Methods:** The research method used a Quasi Experiment with the inclusion criteria for mothers of stage 1 labour. There was no pelvic neglect and other abnormalities that hindered vaginal, primipara, single pregnancy, where the head was not receiving painkillers. **Results:** The results showed 25 respondents with an average age of 23.72 (±2.89) years old, the mean IL-6 concentration before therapy was 185.159 (±3.76) pg/ml and after therapy was 180.782 (±22.05) pg/ml, the mean PGE2 concentration before therapy was 223.521 (±72.73) pg/ml and after therapy was 179.873 (± 110.61) pg/ml. **Conclusion:** Regio Sacralis counter-pressure therapy did not significantly reduce IL-6 and prostaglandin hormone levels in mothers of the first stage labour.

Keywords: Regio Sacralis Counter-pressure, Interleukin 6, Prostaglandin E 2, First Stage of Labour

Corresponding Author:
Sri Rejeki, MPH
Email: srirejeki@unimus.ac.id
Tel: +628122800206

INTRODUCTION

Labour pain is a physiological condition that is generally experienced by almost all women who gave birth. About 90% of mothers have satisfactory experience after three months of labour because the labour pain is short lived. There is a relation between positive outcome and short-term memory which are often found in end of the labour(1). Several studies have shown that the first stage of pain scale with the assessment using the Numeric Rating Scale reaches the 8(2) intensity scale 9(3) intensity scale even reaches the highest intensity scale, namely 10(4). The high pain intensity scale on the first stage is caused by the process of uterine contractions, cervical dilation, and nearing stage II. There was a stretching of the vagina and pelvic floor to accommodate the progressive part of the presentation to expel the product of conception (5). Chemical mediators like prostaglandins, leukotrienes, thromboxane, histamine, bradykinin, substance P, and serotonin are realised through stimulation of labour pain.As a result, some hormones secretion starts as catecholamines and steroids and finally vasoconstriction of blood vessels with intestinal contractions occurred, this can cause foetal hypoxia. Pain causes tachycardia in the mother, increased oxygen consumption, lactic acid (lactic) production, hyperventilation (3) with the risk of respiratory alkalosis, and increased skeletal muscle tension. The pain will increase if accompanied by anxiety, will cause the muscles to become stiff, resulting in the stiff and narrow birth canal and fatigue, which can reduce uterine contractions, thus prolonging the labour process (6).

An intervention is needed that can deal with pain for the first stage that does not cause side effects to both the mother and the baby. Current therapies to treat stage 1 pain include aromatherapy (4), music therapy (7), massage, warm compresses (8), and Regio Sacralis Counter Pressure (9). Regio Sacralis Counter Pressure

was a therapy that has been developed for a long time but has not been widely used in the management of labour pain. Counter Pressure on Sacral Region consists of a steady push applied to a point on the lower back during a contraction, using a fist, the base of the palm, or a strong object or pressure applied to the sides of the thighs using the hand-carried out by the birth attendant or the health workers (10). This therapy has been shown to be effective in reducing stage 1 labour pain from severe to mild (11-13).

Based on the previous research, the Regio Sacralis Counter-Pressure therapy, in addition to reducing the pain scale, has also been shown to slightly reduce prostaglandin levels (PGE-2), although in an insignificant amount (14). Prostaglandins, especially Prostaglandin E 2 (PGE-2), are hormones having an important role in the labour process because they mediate the process of rupture of membranes and stimulate uterine contractions (15) which indirectly increase the ability of uterine contractions through up-regulation of gap junctions, oxytocin (16), and arginine receptors(17). The stability of prostaglandin levels needs to be considered during the delivery process so that stage 1 lengthening does not occur due to decreased uterine contractions. The increase in PGE-2 can be done by increasing the stimulating hormone for prostaglandin production, namely Interleukin-6 (IL-6). In in-vitro trials, giving IL-6 to human amniotic and decidua cell cultures would increase the formation of prostaglandins (18). IL-6 is a cytokine that is needed to increase prostaglandin levels, so it means that there should be no decrease or difference in IL-6 levels so that cervical contractions and dilation continue to run normally, in the order they do not interfere with the labor process. PGHF, together with estrogen, would increase the formation of gap junctions and oxytocin receptors, causing shortening of muscle fibers resulting in myometrial contraction.

The study focused on the effect of Regio Sacralis Counter Pressure therapy on IL-6 and prostaglandin levels, especially at stage 1. This research has not been widely conducted both in Indonesia and abroad. Based on this background, the researchers were interested in looking at the profile picture of IL-6 and PGE-2 hormones in the beginning of labour after receiving Regio Sacralis Counter Pressure therapy.

MATERIALS AND METHODS

The research method used a Quasi Experiment, as the population was mothers in the early stage of labour at Roemani Hospital, Semarang. Twenty-five mothers in the early stage of labour were selected as samples with the purposive sampling technique. Simultaneously, the inclusion criteria were mothers in normal labor, without any pelvic negligence and other abnormalities that hindered vaginal delivery, primipara, single pregnancy and did not receive the painkillers.

The research flow started with the selection of respondents based on inclusion criteria. Each respondent was treated with counter-pressure action for three treatments when the pain occurred. Counter-pressure therapy was done by pressing the sacral area for 45-50 seconds for each treatment. The level of pain was measured before and after the action using the Numeric Rating Scale. IL6 and PGE2 materials were taken from the discharge from the uterovaginal after opening more than 3 cm, before and after treatment.

This study received ethical approval from the Bioethics Commission for Medical/Health Research, Faculty of Medicine, Universitas Islam Sultan Agung Semarang, No.193/V/2017/Bioethical Commission, 29 May 2017.

RESULTS

The results showed that the research respondents were dominated by women who had senior high school education (SLTA) with a mean age of 23.72 (± 2.89) years old, with the youngest 19 years old and the oldest 31 years old. Based on the 95% confidence interval, it can be predicted that the age of the mother who underwent primipara labour in the population was in the range of 22.53 - 24.91 years old.

The results showed that the Interleukin-6 concentration of respondents before the Regio Sacralis counter-pressure therapy had a mean of 185.159 (± 3.76) pg/ml, with a minimum value of 172.792 pg/ml and a maximum value of 191.273 pg/ml (Figure 1). Based on the 95% confidence interval, it can be predicted that the Interleukin-6 concentration before the Regio Sacralis counter-pressure therapy in the population was in the range 183.605-186.713 pg/ml. Meanwhile, the Interleukin-6 concentration of respondents after the Regio Sacralis counter-pressure therapy had a mean of 180.782 (± 22.05) pg/ml, with a minimum value of 95.017 pg/ml and a maximum value of 198.890 pg/ml. Based on the 95% confidence interval, it can be predicted that the Interleukin-6 concentration after Regio Sacralis counter-pressure therapy in the population was in the range 171.679-189.884 pg/ml.

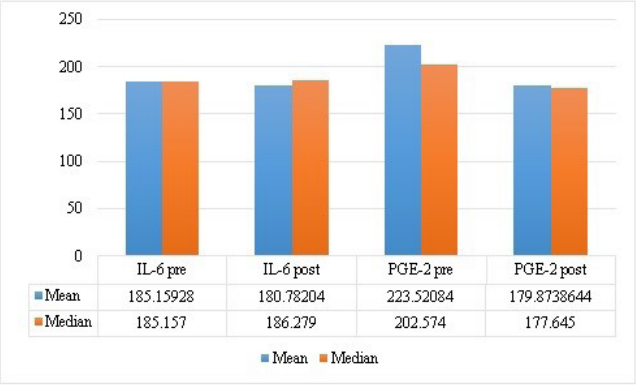

Figure 1: Mean of Interleukin-6 and Prostaglandin E-2 concentrations

The results showed that the concentration of Prostaglandin E-2 respondents before the Regio Sacralis counter-pressure therapy had a mean of 223.521 (±72.73) pg/ml, with a minimum value of 124.467 pg/ml and a maximum value of 357.469 pg/ml. Based on the 95% confidence interval, it can be predicted that the concentration of Prostaglandin E-2 before the Regio Sacralis counter-pressure therapy in the population was in the range of 193.498-253.543 pg/ml. Meanwhile, the concentration of Prostaglandin E-2 of respondents after the Regio Sacralis counter-pressure therapy had a mean of 179.873 (±110.61) pg/ml, with a minimum value of 3.424 pg/ml and a maximum value of 352.492 pg/ml. Based on the 95% confidence interval, it can be predicted that the concentration of Prostaglandin E-2 after Regio Sacralis counter-pressure in the population was in the range 134.217-225.531 pg/ml.

The results of the Interleukin-6 mean difference analysis (Table I) showed that there was a non-significant decrease in the mean concentration of Interleukin-6 (p> 0.05) with an average decrease of 4.377240 pg/ml. From the research authors found the difference in the mean concentration of Prostaglandin E-2 which showed that there was an insignificant decrease in the concentration of Prostaglandin E-2 (p>0.05) with an average decrease of 43.646976 pg/ml.

Table I: Concentration profile of Interleukin-6 and Prostaglandin E-2 of respondents before and after regio sacralis counter-pressure action

Indicator	pre-test		post-test		p
	f	%	f	%	
IL-6 Concentration Level					
High	12	48.0	19	76.0	0.775[a]
Low	13	52.0	6	24.0	
PGE-2 Concentration Level					
High	12	48.0	12	48.0	0.090[b]
Low	13	52.0	13	52.0	

[a] *Wilcoxon test*
[b] *Paired t-test*

DISCUSSION

Based on the study results, the description IL-6 hormone's could be seen that the IL- 6 level has an insignificant decrease (p>0.05) with an average decrease of 4.377240 pg/ml. Changes in the mean IL-6 concentration were manifested by 40% of respondents who experienced a decrease in IL-6 concentrations and 56% of respondents who experienced an increase in IL-6 concentrations. According to the result analysis, it could be proved that the Regio Sacralis counter-pressure action does not provide a significant decrease in the Interleukin-6 concentration. Present research study is consistent with previous studies where the changes in IL-6 were not significant (19). This insignificant change can conclude that there is no difference in IL-6 levels before and after Regio Sacralis counter-pressure therapy.

Maternal IL-6 normal values have different values , such as at the time of pregnancy and delivery. At the stage of pregnancy (prenatal), IL-6 values act as biomarkers of inflammation for early detection of inflammation where high values indicate an inflammatory process because IL-6 will attract neutrophils to the area of inflammation. Secretion of some cytokines depends on IL-6 which acts as an inflammation and immune regulatorthat also helps in T cell activation and B cell differentiation, and obstruct the growth of various monocyte cell lines, macrophages, fibroblasts, endothelial cells, vascular smooth muscle cells, endometrial epithelium, stromal cells and several endocrine glands including the pituitary and pancreas (20).

The entry of microorganisms into the maternal body causes the release of inflammatory mediators such as pro-inflammatory cytokines (IL-6, IL-8, IL-1β, and TNF-α). These cytokines will stimulate the release of Corticotropin-Releasing Hormone (CRH), which will stimulate the fetal HPA axis and produce cortisol and dehydroepiandrosterone sulfate (DHEAS). This hormone is responsible for uterotonic (prostaglandin and endothelin) synthesis, which will cause contraction and increase the release of matrix metalloproteinase (MMP) protease, which causes rupture of the amniotic skin (21). High IL-6 in pregnancy can be used as a biomarker of uterine activity and can be used as an indicator to predict preterm or term labour (22), where an increase in IL-6 increases the risk of preterm delivery by 9 fold (23). The increase in IL-6 will also cause a decrease in the supply of oxygen to the placental tissue, thereby increasing the area of infarction and apoptosis (24). In different conditions, an increase in IL-6 occurs near the time of delivery, where an increase in IL-6 will increase the prostaglandin hormone, which will later be used to release normal conception through the process of uterine contractions.

The prostaglandin hormone, in this case, PGE 2, was found to have an insignificant decrease (p>0.05) with an average decrease of 43.646976 pg/ml. Changes in the mean concentration of Prostaglandin E-2 were manifested by 60% of respondents who experienced a decrease, and 40% of respondents experienced an increase. This is consistent with previous studies, where changes in hormone levels were not significant between before and after counter-pressure Regio Sacralis therapy. Based on these results, it can be showed that Regio Sacralis counter-pressure therapy did not significantly reduce IL-6 and also PGE-2 levels during labor, so that it did not have an impact on lengthening the duration of the first stage of labor.

Similar to IL-6 levels, prostaglandin production during pregnancy and childbirth has a different effect. The production of excess levels of prostaglandins in preterm pregnancy is one of the factors causing preterm labour

(25) where this condition spurs the work of the uterine muscles to contract, thus causing the risk of preterm birth (26). In comparison, inadequate levels of this hormone during pregnancy can expire pregnancy and cause damage to the placental labyrinth, possibly through the destruction of the extracellular matrix(27). Increased prostaglandin hormone is needed in the labour phase.

During early pregnancy, the uterus tends to be in a state of relaxation, and strong contractions will appear near the time of delivery under the influence of the hormones oxytocin and prostaglandins. Prostaglandin hormone is a hormone that has an important role in the labour process because it stimulates uterine contractions and an increase in intra-uterine pressure (28), which is physiologically produced and increases in levels prior to delivery (trimester 3). Uterine contractions may occur due to spontaneous activity in the uterine smooth muscle caused by these action potentials and are highly dependent on the increase in intracellular calcium ions, contraction elements, and the conduction system between uterine cells (29). Apart from the mechanism of the action potential, uterine contractions are also influenced by prostaglandin hormones.

The age factor of women during pregnancy and childbirth is often relatedto women's mental readiness to become a mother (30). The present study revealed that women with senior high school education (SLTA) with a mean age of 23.72 (±2.89) years old, with the youngest 19 years old and the oldest were 31 years old. Based on the 95% confidence interval, it was seen that the age of the mother who underwent primipara labour in the population was in the range of 22.53 - 24.91 years.

A prostaglandin hormone is a form of prostanoid formed from arachidonic acid from the phospholipid membrane, with the help of phospholipase-A2 Cyclooxygenase-2 (COX-2), which has a role in converting arachidonic acid to prostaglandin H, which is then converted into specific prostanoid species, for example, prostaglandin E2. Prostaglandins, especially PGE2 and PG2, are found in amniotic fluid at all stages of labour, which function to soften the cervix by increasing proteoglycans and changing the biophysical properties of collagen. Prostaglandins and increased myometrial sensitivity create intra-uterine pressures of up to 400 mmHg and cause severe myometrial contractions (myometrial hyperactivity) (31). PGE-2 influenced a spontaneous increase in uterine contractility, but in another study, it was found that PGE-1 levels increased uterine contractility faster than PGE-2 (32). However, it should compulsory to increase the awareness to the use of PGE-1 in the process of uterine induction, which can cause tachysystole and uterine rupture (33).Moreover, it has also been found that counter-pressure region sacralis is effective to decrease menstrual pain (34).

CONCLUSION

Giving Regio Sacralis counter-pressure therapy is proven to reduce pain, but at the same time, this therapy also reduces the levels of the hormone IL-6 and prostaglandins in stage 1 labor of mothers. Suggestions for future researchers are to look for the effect of counter-pressure Regio Sacralis on the duration of stage 1 and the process of stage 2.

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