A Model for Hypogalactia Treatment Using *Electrical Acupoint* to Increase Breast Milk Volume and Improve Prolactin Content

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Abstract. *Hypogalactia* is one of the problems for breastfeeding mothers that accounts for 63%. Nowadays, efforts have been done to prevent hypogalactia pharmacologically. However, this approach often comes with side effects for the mothers. This research proposes the implementation of non-pharmacological *electrical acupoint* method via activation of neurological, bio-mechanical, and psychological systems. It is aimed at proving the method's efficacy in improving breast milk volume and prolactin level. The model of *electrical acupoint* is carried out at 0. 5 watt frequency of scale 3 for 10 minutes at *acupoints* SI_1, ST_{36} and SP_6. Paired t-test statistical test was then conducted to differentiate the effects of *electrical acupoint* treatment on breastfeeding mothers. Results show significant differences ($p<0. 05$) after implementation of *electrical acupoint*. This significant difference is proven from the unpaired t-test which indicated different results of pre-and post-treatment. This means that *electrical acupoint* improves breast milk volume by an average of 70. 915 mL and prolactin level by around 313. 47 ng/Ml. It can then be inferred that the use of *electrical acupoint* readily handles the problem of *hypogalactia*.

Keywords: *Electrical Acupoint*; *Hypogalactia*; breast milk volume; and prolactin level.

1 INTRODUCTION

Breastfeeding is a post-natal critical period. Any delay in administering breastfeeding may cause problems in lactation processes correlated to the conditions of anxiety that is detrimental to both mothers and their babies[1]. Breastfeeding problems such as *hypogalactia* is due to a late phase of *lactogenesis*II caused by stress, *congenital dysplasia,* dietary issues, and lack of zinc[2]. *Hypogalactia* is marks by minimum breast milk production that requires intervention on the meridian point with stimuli.

Breast milk production with the help of electric pump without any stimuli results in low satisfaction level and effectiveness, along with insignificant increase in breast milk volume[3]. Pharmacological methods have been attempted to deal with hypogalactia like in the use of metoclopramide, carbamazepine and domperidone that have proven to be effective. However, their use often come with side effect that non-pharmacological methods are sought after as probable alternatives to minimize side effects[4, 5].

On the other hand, traditional Chinese medication views *hypogalactia* as due to the presence of *qi* blood cloths. *Electrical acupoint* is one of the latest technologies in health. This technology is not yet widely used in stimulating breast milk production. *Acupoint* is implemented based on the principle of activating specific points in the meridian that in turn serve as stimuli in the body to smoothen the flow of *qi* and blood, and hence, improve breast milk production[6]. Body meridian itself is thought of as oscillating systems that interact with one another. When stimuli are positioned in the meridian line, they naturally activate the body system mechanism[7].

Electrotherapy using *electrical acupoint* can effectively increase the volume of breast milk compared to the other methods available. This is possible as the technique used in *acupoint* stimuli is flowing low frequency electricity along the meridian line directly connected to targeted organs and the hypothalamus in the brain. This low frequency electricity improves body response as there is a balancing of *qi* as the meridian line, and hence, harmony among body organs is activated[8].

Bio-chemistry mechanism stimuli are injected via *electrical acupoint* into meridian points and they have four times faster response with the help of activated impulses to the brain, especially the neuro-hormonal pituitary-adrenocortical axis complex. The feedback of this mechanism is relaxation response and lower cortisol production, which is one of the causes of *hypogalactia.* Relaxation is the result of physiological response of the body against *acupoint* stimuli, by improving endorphin and serotonin transmittance to the brain and the other organs via the nerves and the meridian[9].

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Response against low frequency electrical stimuli on acupoint points not only affects the body's hormonal mechanism, but also the nearest local tissues around the acupoint, along the meridian. Those stimuli trigger the secretion of neurotransmitters and opioids that release neuropeptide hormones to serve as stimuli for the hypothalamus and the pituitary gland. The feedback of this mechanism maintains the consistence of nitrite oxide (NO) and cyclic guanosine monophosphate (cGMP) in the local mechanism and the hormonal mechanism, with increase prolactin secretion for improvement of breast milk secretion[7]. The human body has an inherent ability to naturally maximize physical processes without requiring the use of drugs which otherwise come with side effects. In low carbon building, the use of electronic instrumentation can facilitate performance so as to increase productivity in the industrial world [10, 11].

2 METHOD

This is a *truly experimental* research using *randomized controlled trials* (RCTs) design of phase III clinical test. It was carried out in 6 working areas of Puskesmas (community health center) Semarang City in Indonesia. Two research groups were involved, i. e. intervention and control. The intervention group consists of breastfeeding mothers undergoing *electrical acupoint* treatment and massage therapy, while the control comprises breastfeeding mothers undergoing only massage therapy. Both group members were measured for their breast milk volume, and their prolactin content.

Population of the 6 working areas consists of 269 people. During the research, 229 respondents were in the exclusion criterion. Other than that, 4 respondents had to be dropped out. This means that there were 36 subjects meet the inclusion criteria of this research. They then underwent intervention using *electrical acupoint* and massage therapy according to the manual book for 2 weeks.

This research applied *hypogalactia* treatment using *electrical acupoint* involving *acupoint* points ST_{36}, SI_1 and SP_6. *Electrotherapyacupoint* (SI_1) does not only increase breast milk production, but it also improves prolactin content. Low frequency electrical stimuli (0. 5 W) in *electrical acupoint* are applied on the skin surface using *stainless steel* electrodes on scale 3 for 10 seconds for each *acupoint*.

Prolactin content is analyzed using laboratory blood serum sample for both pre and post tests. Other than that, breast milk volume is evaluated by pumping for both pre and post tests. Results of this pre and post tests show improvement in terms of more breast milk volume, and better prolactin content. Therefore, it can be concluded that Ho is rejected, whereas Ha is accepted. Those data indicate that the effect of implementing *electrical acupoint* to increase breast milk volume, and gain proper prolactin content is significant.

Data of this research are compared for pre and post test values using mean difference in order to show the discrepancies between the two. Results show that the mean difference for breast milk volume and prolactin content for the intervention group is higher, compared to that of the control group.

Interpretations from data of breast milk volume and prolactin content before and after the implementation of *electrical acupoint* show significant mean values with *p value* (>0. 05).

3 RESULT ANALYSES

Univariate analysis was used to characterize research subjects in terms of age, educational level, employment, parity, and breastfeeding history. Results of that analysis reveal descriptions of frequency, mean, and standard deviation. Respondents' mean age is found to be homogeneous with p value = 0. 508. Univariate analysis test was also carried out for results of breast milk volume and prolactin content in order to analyze frequency distribution of each measurement.

Meanwhile, for bivariate analysis, statistical test was conducted prior to normality and homogeneity tests. Normality test employed skewness calculation. Dependent bivariate analysis then proceeded for normal data distribution using parametric testing (paired t-test), whereas abnormal data distribution made use of non-parametric testing (Wilcoxon test).

On the other hand, independent bivariate analysis proceeded for normal data distribution using parametric testing (unpaired t-test), while abnormal data distribution employed non-parametric testing (Mann-Whitney test). Homogeneity tests for both prior to and after treatment reveal that each group is homogeneous (p>0. 05). Results of bivariate analysis have been analyzed for measurements of breast milk volume and prolactin content. Further analysis then compared results, both among variables and among groups.

Analysis for breast milk volume both prior to and after treatment using *electrical acupoint* for intervention and control groups is depicted in Figure 1.
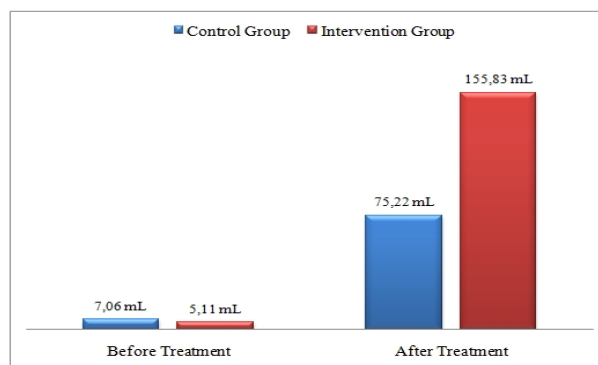

Figure 1. Frequency distribution of breast milk volume before and after *electrical acupoint* treatment.

It can be inferred from Figure 2 that for the intervention group, mean breast milk volume prior to treatment is 5. 11 mL, and it increases to 155. 83 mL after treatment. In the meantime, the control group indicates

mean breast milk volume of 7. 06 mL prior to treatment. Therefore, mean breast milk volume after treatment increases to a mean of 75. 22 mL.

Lactation process itself is affected by complex hormonal mechanisms including reproduction hormones (estrogen, progesterone, placental lactogenic, prolactin, and oxytocin), as well as metabolic hormones (glucocorticoid, insulin, growth hormone, and thyroid). Reproduction hormones directly involves in lactation in mammary gland, while metabolic hormones indirectly influences lactation via endocrine and nutritional response to the breast glands. Producing and secreting breast milk requires balanced coordination among sensory, autonomous, and hormonal responses to stimulate the periphery nerves, central mechanism, and myoephitel cells[12].

Analysis for prolactin content both prior to and after treatment using *electrical acupoint* for intervention and control groups is depicted in Figure 2.
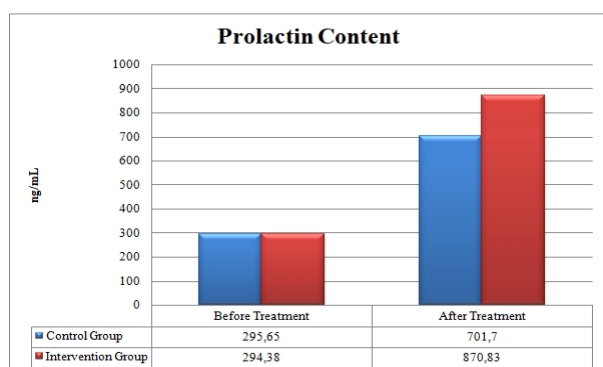

Figure 2. Frequency distribution of prolactin content before and after *electrical acupoint* treatment.

It can be interpreted from Figure 2 that both intervention and control group experience significant increases in prolactin content before and after treatment. Mean prolactin content for the intervention group prior to treatment was 294. 38 ng/mL, and was increased to 870. 83 ng/mL after treatment. Meanwhile, the control group saw an increase from 295. 65 ng/mL to 701. 70 ng/mL.

Early lactation stimulates more prolactin production that in turn affects breast milk production. Prolactin hormone produces breast milk by triggering contraction among myoephitel cells in the breast as a response to suction of the nipple, thanks to neurogenic reflexes sent to the hypothalamus via *medulla spinalis*[13]. Breastfeeding by providing stimuli via *mu* or *kappa* receptor increases prolactin secretion. These stimuli can be obtained from the use of *electrical acupoint* that triggers secretion of mu receptor that is associated with cGMP[14].

Results of analysis of difference in stress level, breast milk volume and prolactin content before and after *electrical acupoint* treatment are given in Table 1.

Table 1. Differences in breast milk volume and prolactin content before and after treatment.

No	Group	Mean Pre-test	Mean Post-test	Mean Diff	Unit	P value
		Intervention				
	a. Breast Milk Volume	5. 11± 2. 026	155. 8±29. 8	150. 72	mL	0. 000**
	b. Prolactin Content	294. 38±585	870. 8±202. 0	576. 45	ng/mL	0. 000**
1						
		Control				
	a. Breast Milk Volume	7. 06±3,670	75. 22±14. 6	68. 16	mL	0. 000*
	b. Prolactin Content	295. 65± 508. 18	701. 70± 141. 43	406. 04	ng/dL	0. 000**
2						

*Paired t-test with p value < 0. 05, ** Wilcoxon test with p value < 0. 05

Based on Table 1, it can be concluded that both intervention and control groups experience significant increase in breast milk volume and prolactin content, prior to and after treatment with p=<0. 05. Hence, the effect of *electrical acupoint* treatment in increasing breast milk and improving prolactin content is significant. This conclusion is supported by results from mean difference evaluation for the intervention group which proves to have higher mean difference compared to the control group.

Results of analysis of differences in breast milk volume and prolactin content before and after *electrical acupoint* treatment are given in Table 2.

Table 2. Differences in breast milk volume and prolactin content before and after *electrical acupoint* treatment between the groups.

Variable	Group	Before Mean±SD	After Mean±SD	Mean Diff.	P value pre	P value post
Breast Milk Volume	Intervention	5. 11±2. 026	155. 8±29. 8	97. 61	0. 057**	0. 000*
	Control	7. 06±3. 670	75. 22±14. 6	44. 22		
Prolactin Content	Intervention	294. 38±585	870. 8±202. 09	359. 79	0. 874**	0. 015*
	Control	295. 65±508	701. 70±141. 43	267. 15		

*Unpaired t-test with p *value*> 0. 05, **p *value*<0. 005, **Mann-Whitney test with p *value*>0. 05, ***p*value*<0. 05

Based on Table 2, it can be concluded that breast milk volume before and after *electrical acupoint* treatment shows significant mean difference. This is proven with *p value* of *unpaired t-test* at 0. 057 before treatment (>0. 05), and 0. 000 after treatment (<0. 05). Those values indicate changing results after treatment. Mean difference values also reveal greater margins for the intervention group, compared to the control group.

Meanwhile, for prolactin content, results show significant mean difference before and after treatment with *electrical acupoint*. This is proven with *p value* of *Mann-Whitney* test at 0. 874 before treatment (>0. 05) and 0. 015 after treatment (<0. 05). Those values indicate changing results after treatment. Mean difference values also reveal greater margins for the intervention group, compared to the control group.

According to the meridian theory, stimulated points along the meridian line affects and triggers the functions of local tissues. Acupoint mediates the secretion of nitride oxide (NO) that is known to improve local condition and the circulation of cyclic monophosphate guanosine (cGMP). This process helps improve physical performance by suppressing molecules that cause blood cloths. Continuous application of pressure effectively improves relaxation, regional blood circulation,

parasympathetic nerves activation, reduced tissue adhesion, and lower neuromuscular stimulus[15].

Nitride Oxide (NO) is one of the most important message carrying molecules, just like neurotransmitter is, with the mechanisms and functions widespread across the body. Secretion of NO an nNOS is consistently higher on acupoint points in the skin due to stimuli with low frequency electricity. Increased NO results from many sources including the NO-ergic neural system that is associated with the function of acupoint in terms of stimulation with low frequency electricity. Latest studies revealed that low frequency electricity stimuli do not only affect acupoint points but also along the meridian line of the body (around 1. 0 mm). Application of low frequency electricity results in neurovascular alteration in the whole body within tens of seconds, which is then followed by changes in secondary bio-chemistry that in turn triggers tertiary endocrine changes within a few days or weeks[16].

Neuropeptide plays an important role in the brain function mechanism. Neuropeptide is secreted from periphery electrical stimuli that are beneficial to human health. Concerning lactation, brain function is governed by the chemical mechanisms of neurotransmitter and neuropeptide. The very latest research involving laboratory mice show that electrical stimuli at certain frequencies applied to particular points in the body are capable of releasing neuropeptide and triggering physiological effects for healing processes. In that case, the electrical stimuli on the mice induce the releases of argininevasoperine and oxytocin into incubation media. Other than that, secretion of peptide opioid effectively reduces pain and eases secretion of breast milk. This means that neuropeptide can be modulated by external stimuli[12, 17].

5. CONCLUSION

The method of *hypogalactia* treatment using *electrical acupoint* effectively increases breast milk volume and improves prolactin content. Paired t-test statistical test has been conducted to differentiate the effects of *electrical acupoint* treatment on breastfeeding mothers. Results show significant differences ($p<0. 05$) after implementation of *electrical acupoint* against breast milk volume and prolactin content. The treatment method in this research involves application of low frequency electrical stimuli to activate meridian line at acupoint points ST_1, SP_6 and ST_{36}. The feedback gained from this application provides both local effects and overall hormonal mechanical responses from the body. Local effects increase concentration of Nitride Oxide (NO) and improve the circulation of cyclic monophosphate guanosine (cGMP), as well as opioid and neuropeptide Y. Overall hormonal mechanical responses activate the hypothalamus pituitary adrenal axis that in turn increases cortisol content and modulates the transmittance of endorphin and serotonin to the brain and certain organs via the nerves. The feedback from this anterior hypophysis helps secretes prolactin hormone. Therefore,

electrical acupoint has been proven to be capable of treating the problem of *hypogalactia*.

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