

# Reducing Stress Level Cases of Hypogalactia Using Electric and Massage Stimulation Models

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**Abstract.** Postpartum stress is very likely to take place as there are fluctuations in terms of feelings, pressure, anxiety, and guilt that may result in hypogalactia without proper treatment. Hypogalactia itself is an issue breastfeeding mothers face that may stall toddlers' growth, and hence, the future of a nation. This research aims to lower stress levels in hypogalactia cases. It employs non-pharmacological methods of electric and massage stimulation models to activate the biomechanical, psychological, and neurological systems within the body. The electric stimulation model was performed for 10 minutes in acupoints SI, ST, and SP at 0.5 watts frequency. Meanwhile, the massage stimulation was performed for 30 minutes in acupoints GB, BL, ST, CV, and ST. Samples were divided into intervention and control groups, both characteristics and difference tests were performed. Paired t-test results show that there is a significant difference ( $p < 0.05$ ) in stress level with the treatment using both electric and massage stimulation models. Meanwhile, the unpaired t-test results also show differences in stress levels before and after treatment for each group, but the mean difference shows a decrease of 6.249. Therefore, it can be concluded that both electric and massage stimulation models lower stress levels for hypogalactia cases.

**Keywords:** Hypogalactia; Electric Stimulation Model; Massage Stimulation Model; Stress Level.

## 1 Introduction

Breastfeeding is the ultimate intervention with the best impact that it becomes the global gold standard[1]. This strategy is used to meet nutritional needs in order to optimize the growth of babies[2]. Breastfeeding has proven to prevent the death of 823,000 babies across 75 countries of lower and middle income each year[3].

Breastfeeding for more than 6 months improves cognitive, immune, motoric, behavioral and mental development. It also helps with nutritional transmission, biochemical system, immunity, and gets rid of pathogens [4-6]. Late breastfeeding may cause lactation issues and hence, increase anxiety. In turn, continuous lactation issues and anxiety results in hypogalactia which is detrimental to both the mother and the baby[7, 8].

Hypogalactia is a condition in which breast milk does not run optimally after birth. This condition is considered critical in postpartum period. From medical point of view, hypogalactia takes place due to neurohormone, breast milk gland growth and development issues, while in the realms of the Chinese traditional medicine, hypogalactia is due to blocked *chi sie swak* and *chi* of the heart [9-11].

Hypogalactia is a critical issue in breastfeeding mothers. Hypogalactia is a result of problems during the phase of lactogenesis II due to stress, lack of zinc, congenital dysplasia, and dietary issues. Stressful conditions that stem from inadequacy in fulfilling human needs may manifest in alteration of physiological,

cognitive, emotional, and behavioral functions. The current paradigm now is to focus on the relationships among behavior, the central nervous system, endocrine function, and immunity [12].

The pharmacological therapy commonly employed is provision of lithium, CPZ, and anti-psychotic drugs that have their own side effects against the body. Therefore, non-pharmacological methods can be alternative solutions with minimum side effects[4].

The electric stimulation model can be categorized as the latest technology as it uses electricity (electrotherapy). The principle used in various literature studies shows that in the process of activating specific points on the body's meridians it can stimulate the flow of blood and *qi*. The massage stimulation model (massage therapy) serves as circulation stimuli for neurological growth, improves elasticity of the tissues, and offers relaxation effects[13, 14]. Both models stimulate meridian points in the body as the natural control mechanism of the body.

Electrotherapy is effective in increasing the volume of breast milk which is directly related to lower stress levels compared to the other methods. This is possible as it stimulates the meridian points via low-frequency electricity that directly connects to the hypothalamus and related organs. The effect caused by low-frequency electrical stimulation balances the *qi*, and hence, harmonizes the body[15].

Biochemical mechanism both from electric and massage stimulation is made possible by stimulus

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impulses activated in the brain that triggers the meridian points to direct to the pituitary hormones via the adrenocortical axis of the central nervous system. The results of feedback from the process that occurs can reduce the cause of hypogalactia by producing a relaxation response and lowering the cortisol levels. Relaxation is the physiological response of the body to stimulation of acupoint and massage by increasing the transmission of endorphins and serotonin to the brain and organs needed by nerves and meridians [16].

Implementation of both models triggers not only response from the hormonal system but also from non-hormonal system via local tissues functions nearest to the acupoints along the body's meridian. The stimulus provided is able to produce secretions of neurotransmitters and opioids through the release of neuropeptide ions which serve as stimuli for the hypothalamus and pituitary gland. The feedback produced is able to secrete cyclic guanosine monophosphate (cGMP) and nitrous oxide (NO) in maintaining the body's mechanical balance in certain organs.

## 2 Method

This research used a phase III clinical test with Randomized Controlled Trials (RCTs). The treatment has been given to each group at 6 working areas of community health center (Puskesmas) Semarang City in Indonesia. Breastfeeding mothers in the intervention group undergo treatment using both electric and massage stimulation models, while those in the control group are only treated using massage stimulation model.

The population of those 6 community health centers is 269 respondents. Four respondents had to drop out during the research. Other than that, 229 respondents belong to the exclusion criteria. Therefore, the number of respondents both for the intervention and control groups that meet inclusion criteria is 36. All research respondents have been subjected to treatment using both electric and massage models in line with the procedure in the manual book of each group for 2 weeks.

The treatment of electric stimulation model entangles points SI<sub>1</sub>, ST<sub>36</sub>, and SP<sub>6</sub> of the acupoint of the body. The electricity produced from these model has low pressure and used low doses ≤ 0,5 watt (0.055 watt) for 10 minutes so it is safe for the human body. Meanwhile, the massage stimulation model was applied by involving points GL<sub>21</sub>, BL<sub>20</sub>, ST<sub>13</sub>, ST<sub>16</sub>, CV<sub>17</sub> and used some movement treatment i.e effleurage, friction, and petrissage. The Instrument of stress scale of this research was used DASS<sup>®</sup> (Depression Anxiety Stress Scale). The assessment indicators consist of nonstress, light stress, medium stress, heavy stress, and very heavy stress.

## 3 Result Analysis

The univariate analysis used in this research to characterize the research subjects in terms of age, breastfeeding history, education level, employment, and parity. The results of the research analysis illustrate the results of the frequency, mean and standard deviation.

(Table 1). The result of respondents' characteristics from the average mean age is found to be homogeneous with p-value = 0.508. Stress level has been tested using univariate test for analysis of frequency distribution of measurement results (Table 2). Prior to bivariate analysis of stress level, data have undergone both normality and homogeneity tests. Calculation of skewness has also been performed in normality analysis.

A parametric test (the paired t-test) as a dependent bivariate test was used to determine that the test results are normally distributed, whereas a non-parametric test (the Wilcoxon test) was used for abnormal data distribution. A parametric test (the unpaired t-test) as an independent bivariate test was used to determine that the test results are normally distributed, whereas a non-parametric test (the Mann-Whitney test) was used for abnormal data distribution. Homogeneity test for each group before and after treatment shows p>0.05. Results of measurement for stress level from bivariate analysis were then further analyzed by comparing both inter-variable and inter-group data (Tables 2 and 3).

Univariate analysis was used in this research included age, breastfeeding history, education level, employment, and parity. This analysis is aimed to characterize variable results based on each research group. Frequency distribution for respondents' characteristics from univariate analysis is given in Table 1.

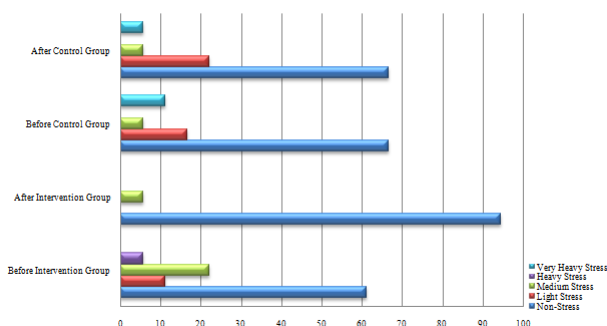
**Table 1.** Frequency distribution of age, breastfeeding history, educational level, employment, and parity.

| No | Variable Characteristics               | Research Group                 |      |                          |      |
|----|--|--------------------------------|------|--------------------------|------|
|    |  | X <sub>1</sub> (Interventio n) |      | X <sub>2</sub> (Control) |      |
|    |  | Freque ncy                     | %    | Freque ncy               | %    |
| 1. | <b>Age Classification (year)</b>       |                                |      |                          |      |
|    | a. < 19                                | -                              | -    | 1                        | 5.6  |
|    | b. 20-35                               | 17                             | 94.4 | 14                       | 77.8 |
|    | c. > 35                                | 1                              | 5.6  | 3                        | 16.7 |
|    | Number                                 | 18                             | 100  | 18                       | 100  |
| 2. | <b>Breastfeeding history</b>           |                                |      |                          |      |
|    | a. Non-breastfeedin g                  | 12                             | 66.7 | 11                       | 61.1 |
|    | b. Breastfeedin g                      | 6                              | 33.3 | 7                        | 38.9 |
|    | Number                                 | 18                             | 100  | 18                       | 100  |
| 3. | <b>Education Level</b>                 |                                |      |                          |      |
|    | a. Elementary School                   | 1                              | 5.6  | -                        | -    |
|    | b. Junior High School                  | 2                              | 11.1 | 4                        | 22.2 |
|    | c. High School/Vocati onal High School | 12                             | 66.7 | 10                       | 55.6 |
|    | d. University                          | 3                              | 16.7 | 4                        | 22.2 |
|    | Number                                 | 18                             | 100  | 18                       | 100  |
| 4. | <b>Employment</b>                      |                                |      |                          |      |

|           |                            |    |      |    |      |
|-----------|----------------------------|----|------|----|------|
|           | a. Housewife               | 5  | 27.8 | 11 | 61.1 |
|           | b. Private Sector Employee | 11 | 61.1 | 3  | 16.7 |
|           | c. Civil Servant           | -  | -    | 2  | 11.1 |
|           | d. Self-Employed           | 2  | 11.1 | 2  | 11.1 |
|           | Number                     | 18 | 100  | 18 | 100  |
| <b>5.</b> | <b>Parity</b>              |    |      |    |      |
|           | a. Primipara               | 6  | 33.3 | 6  | 33.3 |
|           | b. Multipara               | 11 | 61.1 | 11 | 61.1 |
|           | c. Grande Multipara        | 1  | 5.6  | 1  | 5.6  |
|           | Number                     | 18 | 100  | 18 | 100  |

Based on Table 1, it can be inferred that in terms of age, respondents that are statistically in the reproductive age of 20 - 35 years are 31 mothers (86.1%). In terms of educational level, most of the respondents are graduates of high school/vocational high school. There are 22 of them (61.1%). For the category of employment, most respondents are housewives. There are 16 of them (44.4%). For parity, multipara dominates the others with 22 respondents (61.1). Meanwhile, for breastfeeding history, most of those mothers do not breastfeed their babies. There are 23 of them (63.9%).

Results of analysis for stress level both before and after treatment using both electric and massage stimulation models for each group is illustrated in Figure 1.



**Fig. 1.** Frequency distribution of stress level before and after treatment using electric stimulation model.

Based on Table 2, it can be concluded that for the intervention group, there is an increase in non-stress condition with 11 respondents (61.1%) being non-stressful prior to treatment, and 17 (94.4%) of them registered to be non-stressful after treatment. It is an increase from conditions suffered by respondents prior to treatment with 2 (11.1%) individuals reporting light stress and 1 (5.6%) person reporting heavy stress. It is also an improvement from the score of medium stress that was earlier suffered by 4 respondents (22.2%) before treatment and was reduced to only reported by 1 individual (5.6%) after treatment.

On the other hand, results from the control group reveal that 12 (66.7%) respondents reporting non-stressful condition, with only 1 (5.6%) individual reporting a heavy stress situation, for both before and after treatment. There have been also lower scores in terms of stress with 2 (11.1%) persons reporting heavy stress conditions prior to treatment, and only 1 (5.6%) of them still suffering from

that condition after treatment. However, there has been an increase in light stress condition, from 3 (16.7%) individuals prior to treatment, into 4 people (22.2%) after treatment. This light stress is thought to be the effect of the earlier reported heavy stress before treatment.

Body mechanism in maintaining a healthy condition relates to hormonal changes. Stressful conditions that stem from inadequacy in fulfilling human needs may manifest in alteration of physiological, cognitive, emotional, and behavioral functions. Most women suffer from postpartum depression with symptoms detected within 6 to 8 weeks after giving birth, with remains of this may last up to a year after giving birth[10]. Evidence shows that a mother's decision to breastfeed results in a series of outcomes that serve as socio-economic, behavioral, and biological buffers that effectively lowers stress in the long run[16]. The hormonal mechanism in breastfeeding cortisol and lactogenic hormones such as prolactin and oxytocin that have depressant and anxiolytic effects for the body[17]. Breastfeeding mothers have higher cortisol serum levels compared to those only giving formulated milk. Those simple associations indicate that breastfeeding mothers have lower stress and depression level compared to those choosing to give formulated milk to their babies.

Stress depends on cardiovascular and metabolic regulation system in giving response by the hypothalamus and hypophysis (HPA) axis. Stress stimulant releases pro-inflammation cytokine that activates the HPA axis to send signal to the other body organs in order to improve physiological responses such as increased heart rate and blood glucose. Cortisol as a biological indicator of response to stress is released by the HPA axis and forms a feedback loop to deactivate the immune system and hence, reduces inflammation. The neuroendocrine system undergoing long terms stress response may deregulate the HPA axis and keeps the immune system, and this automatically hampers the function of cortisol. A very high level of cortisol suppresses the immune system and increases the risk of inflammation. On the other hand, too little cortisol may trigger inflammation response. Breastfeeding lowers the stress response both in infants and their mothers[18].

Results of analysis for stress level both before and after treatment using both electric and massage stimulation models for each group is illustrated in Table 2.

**Table 2.** Differences are stress levels before and after treatment using both electric and massage stimulation models.

| N o | Group               | Mean Pre-test | Mean Post-test | Mean Diff | Unit  | P value |
|-----|---------------------|---------------|----------------|-----------|-------|---------|
| 1   | <b>Intervention</b> |               |                |           |       |         |
|     | Stress Level        | 12.33±9.54    | 4.17±4.27      | 8,166     | scale | 0.000** |
| 2   | <b>Control</b>      |               |                |           |       |         |
|     | Stress Level        | 13.61±13.0    | 9.28±10.91     | 4,333     | scale | 0.025** |

\*Paired t-test with p-value < 0.05, \*\* Wilcoxon test with p-value < 0.05

Based on Table 2 shows that both groups experience significant increase in stress levels. There is a significant difference in stress level before and after treatment with both electric and massage stimulation models with  $p < 0.05$ . Pre and post-test results from both groups show changes in values. It can be concluded that in this research,  $H_0$  is rejected and  $H_a$  is accepted which means that treatment using both electric and massage intervention models does have an effect. The following are mean differences of stress levels for both intervention and control group, with the former having higher values compared to the later.

**Table 3.** Mean differences in stress level between the two groups

| Variable     | Group        | Before     | After      | Mean Diff. | P value |        |
|--------------|--------------|------------|------------|------------|---------|--------|
|              |              | Mean ±SD   | Mean ±SD   |            | pre     | post   |
| Stress Level | Intervention | 12.33±9.54 | 4.17±4.27  | 8.166      | 0.739*  | 0.073* |
|              | Control      | 13.61±13.0 | 9.28±10.91 | 4.333      |         |        |

\*Unpaired t-test with  $pvalue > 0.05$ , \*\* $pvalue < 0.005$ , \*\*Mann-Whitney test with  $pvalue > 0.05$ , \*\*\* $pvalue < 0.05$

Based on Table 3, it can be concluded that there is no significant mean difference in stress level before and after treatment using both electric and massage stimulation models. These results were evidenced by the unpaired p-test value of 0.739 before treatment, and 0.073 after treatment ( $> 0.05$ ). In addition, the mean difference values also prove a greater margin for the intervention group, compared to the control group.

Breastfeeding is one of the ways to mitigate postpartum complications due to chronic depression. The hormonal mechanism in breastfeeding cortisol and lactogenic hormones such as prolactin and oxytocin that have depressant and anxiolytic effects for the body [19].

Treatment using electric stimulation model involves acupoints ST<sub>36</sub>, SI<sub>1</sub>, and SP<sub>6</sub>. Function of ST<sub>36</sub>. Meanwhile, treatment using massage stimulation model involves acupoints GB<sub>21</sub>, BL<sub>20</sub>, ST<sub>16</sub>, ST<sub>13</sub>, CV<sub>17</sub>, and ST<sub>18</sub>. Both treatment models share the common purpose of strengthening *qi*, spleen and calming the nerves as well as balancing the yin and yang in the body via receptor 5-HT (serotonin receptor), which is one of the causes for depression [20]. Touches play a basis role in improving bodily activities and developmental processes. Other than that, low-frequency electric stimulus (3.7 V/0.5W) for the electric stimulation model that is administered via the skin can activate local hormonal and systemic mechanisms.

The Chinese traditional medication maps a line along the body meridian to be stimulated that will in turn responds and affects the function of local tissues. Stimulated acupoints help to mediate secretion of nitric oxide (NO) that improves local condition and circulation of cyclic guanosine monophosphate (cGMP) that enhances physical performance via blood circulation in the body. Effectively administered stimulus increases relaxation, regional blood circulation, intramuscular temperature, and activities of sympathetic nerves [21].

Bodily secretions due to stimulated parts are not only hormone systems but also local system, i.e. organs near the stimulated acupoint. Responses from this condition are the ones that mediate opioid neuropeptide secretions. Results of neuropeptide secretion play important roles in brain function mechanisms that are essential for human health and in this case related to lactation process that is regulated by chemical mechanisms from neurotransmitter and neuropeptide. Opioid peptide secretion helps to reduce pain and ease secretion of breast milk [16].

## 4 Conclusion

The methods of reducing stress level in hypogalactia using both electric and massage stimulation models have proven to be significantly effective. Results of paired t-test show a significant difference ( $p < 0.05$ ) from treatment using both electric and massage stimulation models for acupoints SI<sub>1</sub>, ST<sub>36</sub>, SP<sub>6</sub>, GB<sub>21</sub>, BL<sub>20</sub>, ST<sub>16</sub>, ST<sub>13</sub>, CV<sub>17</sub>, and ST<sub>18</sub>. The feedback response has an impact on both local systems and boy hormonal mechanism. The hormone system activates the hypothalamic-pituitary adrenal axis which increases cortisol levels and modulates serotonin and endorphin transmission through the nervous system. Other effects are an increase in the concentration of Nitride Oxide (NO) and increased cyclic circulation of Guanosine Monophosphate (cGMP), as well as opioid neuropeptide. These mechanisms prove to be positive for lowering stress level and mitigating issues associated with hypogalactia.

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