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The Effectiveness of Moxibustion on Salivary Cortisol Levels in Primiparous Breastfeeding Mothers: Quasi-Experimental Study

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Abstract

Optimal breastfeeding practices play a crucial role in enhancing the health of infants and children. However, increased anxiety among postpartum mothers can lead to higher cortisol levels. Moxibustion is a traditional therapy that has been shown to improve blood circulation, reduce discomfort, and influence the central nervous system by stimulating specific meridian points. This study aimed to examine the effect of moxibustion on cortisol levels in breastfeeding mothers. A quasi-experimental design with pretest and posttest was used. Participants were divided into two groups: an intervention group that received moxibustion and a control group that received acupuncture. A total of 32 breastfeeding mothers from Ngaliyan Public Health Center in Semarang participated in the study, with 16 individuals in each group. Moxibustion was applied to specific meridian points (CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18). Cortisol levels were measured using the Enzyme-Linked Immunosorbent Assay (ELISA) method, and data were analyzed using the Mann-Whitney test. The results showed no significant difference in cortisol levels between the two groups ($p = 0.864$). The average cortisol change was -0.063 in the intervention group and -0.113 in the control group. It was concluded that moxibustion had no significant effect on cortisol levels. Further studies are recommended to explore other factors that may influence cortisol levels in postpartum mothers.

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INTRODUCTION

Breastfeeding is a natural way to provide the best nutrition (breast milk) for babies (The et al., 2023). Exclusive breastfeeding for the first six months, followed by partial breastfeeding until the age of two, can improve a child's health. However, many mothers do not fully utilize breast milk for their babies (Prihatini et al., 2023). Anxiety during pregnancy increases the risk of postpartum depression by three times, which can lead to difficulties or even the cessation of breastfeeding (Prihatini et al., 2023). Research shows that 55% of postpartum mothers with severe anxiety often struggle to produce enough breast milk. (Endriani et al., 2022). Anxiety raises cortisol levels, a stress hormone that also affects the mental health of postpartum mothers (Matyas et al., 2024; Shriyan et al., 2023).

Moxibustion is a traditional Chinese non-drug therapy that may help reduce anxiety during pregnancy and improve overall well-being (Suzuki & Tobe, 2017). It works by applying heat to specific acupuncture points using burning herbs (Hw et al., 2018). This technique can improve blood circulation, reduce pain, and positively influence the central nervous system (Dong et al., 2022). The warmth produced during treatment also helps release endorphins and enhance energy flow. Endorphin hormones stimulate euphoric effects (Purnomo et al., 2020). The meridian system connects all parts of the body and plays an important role in traditional Chinese medicine. There are six main meridian pairs and eight special meridians. These pathways help transport blood (Qi and Xue), body fluids (Jin and Ye), and link internal organs with the external parts of the body. The meridian system is essential for diagnosing and treating various health problems. When the body's balance is disrupted due to illness, the meridians may show different responses along their pathways. Therefore, this study was conducted to examine whether moxibustion can affect the salivary cortisol levels of first-time breastfeeding mothers.

METHODS

This study used a quasi-experimental design with a pre-test and post-test approach, comparing two groups: a moxibustion group and an acupressure group. The participants were breastfeeding mothers who visited the outpatient clinic at Ngaliyan Public Health Center (Puskesmas), Semarang. The total sample size was 32 mothers, with 16 in the moxibustion group and 16 in the acupressure group. The sampling method used was consecutive sampling, based on odd and even registration numbers. Moxibustion treatment was applied to specific meridian points: CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18, for 15 minutes daily over a period of 2 weeks. The control group received acupressure therapy. The study was supported by an enumerator, a certified midwife in moxibustion. Data collection was conducted door-to-door by visiting each participant directly. Cortisol hormone levels were measured using the Enzyme-Linked Immunosorbent Assay (ELISA) from Etana Biotechnologies Indonesia (EBI). The Mann-Whitney test was used for data analysis to compare the two groups. This study received ethical approval from UNISULA on April 22, 2019 under reference number 065/B.1-KEPK/SA-FKG/IV/2019.

RESULTS

1. Univariate Analysis

a. Descriptive Analysis of Respondent Characteristics by Age, Education, and Occupation

Table 1. Respondent Characteristics of Treatment dan Control Group

Characteristics		Respondent				Total		*P value* [a]
		Intervention		Control				
		n	%	n	%	n	%	
Age	Less than 20 y.o	1	6.3	1	6.3	2	6.25	0.463 *
	20 to 35 y.o	15	93.7	15	93.7	30	93.5	

	More than 35 y.o							
Education	Elementary	1	6.3	1	6.3	2	6.25	0.952*
	Senior high school	9	56.3	9	56.3	18	56.2	
	Bachelor degree	6	37.4	6	37.4	12	5	
							37.5	
Occupation	Worked	7	43.8	8	50	15	46.9	0.723*
	Do not work	9	56.2	8	50	17	53.1	
Total		16		16		32	100	

a. Chi Square
** Level of sig >0.05*

In the Table 1 most respondents in the treatment group were aged 20 to 35 years (93.7%), and the same was true for the control group (93.7%). The chi-square test revealed no significant difference between the two groups (p = 0.463, which means p > 0.05). In terms of education, most respondents in the intervention group had completed senior high school (56.3%), followed by a bachelor's degree (37.4%), and junior high school (6.3%). The chi-square test again showed no significant difference between the groups (p = 0.952, p > 0.05). Regarding occupation, in the intervention group, 9 mothers (56.2%) were unemployed and 7 mothers (43.8%) were employed. In the control group, 8 mothers (50%) were employed, and 8 mothers (50%) were unemployed. Once again, there was no significant difference between the groups (p = 0.723).

b. Descriptive Analysis of Dependent Variable on Treatment dan Control Group

Table 2. Descriptive Analysis of Dependent Variable on Treatment dan Control Group

Variable	Group		n	Median	Mean	SD	*p value* [a]
Cortisol Level	Treatment	*Pre-test*	16	4.650	5.219	1.7837	0.386*
	Control	*Pre-test*	16	4.300	5.031	2.1105	
	Intervention	*Post-test*		5.500	5.156	1.5051	0.680*
	Control	*Post-test*		4.350	4.919	2.4588	

a. Lavene test
** Level of sig >0.05*

Table 2 shows that before the intervention, the average cortisol level in the moxibustion group was 5.156 (SD = 1.5051), while in the control group it was 5.219 (SD = 1.7837). The results of the homogeneity test indicate that the data variance was homogeneous, meaning there was no significant difference in the average cortisol levels between the intervention and control groups before treatment (p = 0.386; p > 0.05). After the intervention, the average cortisol level in the moxibustion group slightly increased to 5.031 (SD = 1.7837), while in the control group it decreased to 4.919 (SD = 2.4588). The test results once again showed homogeneous data distribution, with no significant difference between the two groups (p = 0.680).

2. Bivariate Analysis

a. Normality Test for treatment and control group was applied to specific meridian points CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18.

Table 3. Table of Normality Test (*Shapiro-Wilk*) before and after treatment in both groups

Variable	Group		*df*	*p value* [a]
Cortisol Levels	Treatment	*Pre-test*	16	0.117*
		Post-test	16	0.466*
	Control	*Pre-test*	16	0.003
		Post-test	16	0.007
Gain kortisol	Treatment		16	0.038*
	Control		16	0.009

a. Shapiro Wilk

** Level of sig >0.05*

Table 3 presents the results of the normality test using the Shapiro-Wilk method. This test was used to determine whether cortisol levels before and after treatment were normally distributed. In the treatment group, cortisol levels before and after treatment followed a normal distribution ($p > 0.05$), so the paired t-test was applied. In the control group, the data were not normally distributed ($p < 0.05$), so the Wilcoxon test was used instead.

b. Differences in cortisol hormone levels before and after treatment in the treatment and control groups were applied to specific meridian points CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18.

Table 4. *Paired t-test* for cortisol hormone levels before and after the treatment and control groups

Group		Mean	SD	*p value* [a] *p value* [b]
Treatment	Pre-test	5.219	1.7837	0.167*
	Post-test	5.156	1.5051	
Control	Pre-test	5.031	2.1105	
	Post-test	4.919	2.4588	0.717*

a. Wilcoxon

b. Paired t-test

** Level of sig <0.05*

Table 4 compares the average cortisol levels before and after treatment: 1) In the treatment group, the average level before treatment was 5.219 (SD = 1.7837), and after treatment, it was 5.156 (SD = 1.5051). The paired t-test result showed p = 0.167, indicating no significant difference; 2) In the control group, the average level before treatment was 5.031 (SD = 2.1105), and after treatment, it was 4.919 (SD = 2.4588). The Wilcoxon test result showed p = 0.717, also indicating no significant difference. These results suggest that neither the treatment group nor the control group showed a significant change in cortisol levels among breastfeeding mothers.

c. Effectiveness Comparison Between Treatment and Control Groups on cortisol hormone levels was applied to specific meridian points CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18.

This part of the study compares the difference in cortisol level changes (gain scores) between the treatment and control groups.

Table 5. Comparison of cortisol gain scores between the treatment and control group

Variable	Group	Mean	SD	*p value* [a]
Cortisol gain scores	Treatment	-0.063	1.871	0.864*
	Control	-0.113	3.6040	

a. Mann-Whitney
** Level of sig < 0.05*

Table 5 shows that there was no significant difference between the treatment and control groups in reducing cortisol levels. The analysis using the Mann-Whitney test yielded a p-value of 0.864, indicating that the difference in cortisol levels between the two groups, based on gain scores, was not statistically significant ($p > 0.05$). The mean difference in cortisol levels was -0.063 in the treatment group and -0.113 in the control group. These results suggest that neither treatment was effective in lowering cortisol levels in breastfeeding mothers.

3. Covariance Analysis (ANCOVA)

Table 6. The ANCOVA test was used to see if age influenced cortisol levels in the treatment and control groups

Variable		*P values*	R Square
Cortisol Levels	Group	0.961	0.134
	Age	0.044	

a. Ancova
** Level of sig <0.05*

In Table 6, the Analysis of Covariance (ANCOVA) test was used to determine whether age influenced cortisol levels. The difference in cortisol gain scores between the two groups was not affected by age ($p = 0.961$, $p > 0.05$). However, the age variable itself showed a slight influence on cortisol levels ($p = 0.044$, which is less than 0.05).

DISCUSSION

Differences in Cortisol Levels Before and After Treatment in the Moxibustion and Acupressure Groups Applied to Specific Meridian Points (CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18)

In the treatment group, the average cortisol level before treatment was 5.219, and after treatment, it was 5.156. Statistical analysis showed $p = 0.167$, indicating no significant difference before and after the intervention. This means that moxibustion did not have an effect on cortisol levels. Cortisol is a hormone that helps maintain the body's balance during physical and psychological stress. It plays a role in regulating energy, controlling blood sugar levels, and supporting the immune system (Buckner et al., 2016). In this study, cortisol levels were not influenced by moxibustion. Moxibustion works by generating heat, which improves blood circulation and the flow of energy (qi). Previous research on cancer patients also showed that cortisol levels, which are regulated by the brain and the body's stress response system, were not directly affected by moxibustion (Ou et al., 2023). Genetic factors may also influence cortisol levels. A study found that breastfeeding mothers with the CA/AA genotype experienced a greater reduction in cortisol levels after breastfeeding compared to mothers with the CC genotype (Krol et al., 2018). Therefore, both genetic factors and the type of treatment may influence how cortisol levels respond to moxibustion.

In the control group (acupressure group), the average cortisol level before treatment was 5.031, and after treatment, it was 4.919. The result was p = 0.717, so again, there was no significant difference. This means that acupressure also did not affect cortisol levels.

This finding is similar to a study, which showed that pressing acupuncture points SP6 and LI4 did not cause significant changes in cortisol levels in laboring women (p = 0.359) (Asadi et al., 2015). Cortisol is regulated by the hypothalamus, pituitary gland, and adrenal glands. These organs work together to keep cortisol levels normal (Vorbach & Bennett, 2021). During pregnancy, high cortisol can increase stress. Acupressure combined with positive self-talk may help reduce stress (Sihaloho et al., 2024). Meanwhile, in breastfeeding mothers, acupressure reduced cortisol levels less than in the control group (Machmudah et al., 2018). Acupressure will be meaningful with various determining factors (Restawan et al., 2023). Acupressure had no effect in reducing cortisol levels in this study, presumably due to the single treatment without a combination of other techniques.

Effectiveness of Moxibustion Compared to Acupressure on Cortisol Levels was Applied to Specific Meridian Points (CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18)

Based on the average gain scores, the change in cortisol levels in the moxibustion group was -0.063, and in the acupressure group, it was -0.113. These values are very similar, and the p-value = 0.864, indicating no significant difference. So, it can be concluded that both moxibustion and acupressure had no effect on reducing cortisol levels in breastfeeding mothers. Therefore, it can be concluded that neither moxibustion nor acupressure had a significant effect on reducing cortisol levels in breastfeeding mothers. Treatment can be influenced by the possibility of being influenced by duration factors (Ningrum & Alfitri, 2025).

This result is consistent with a previous study by Machmudah et al. (2018), which found that Oketani massage was more effective in reducing cortisol levels compared to acupressure at the GB21 point. However, a study by showed that auricular acupressure (ear acupressure) significantly reduced cortisol levels ($p < 0.05$) in women after cesarean delivery. The same study reported an average cortisol reduction of 4 mg/dL, suggesting that acupressure can be effective when applied correctly and at the appropriate location (Shu-Yu Kuo, Su-Hua Tsai & Ya-Ling Tzeng, 2016). In another study, acupressure affected postpartum mothers in Tegal district (Herlina & Aprilia Wardani, 2024).

Cortisol Levels Before and After Treatment in the Moxibustion and Acupressure Groups Applied to Specific Meridian Points: CV17, LI4, SP6, ST16, ST18, ST36, BL17, and BL18 in Relation to Occupation

When the researchers controlled for the occupation variable, the difference in cortisol levels between the two groups still did not change significantly ($p = 0.961$, or $p > 0.05$). However, the occupation variable itself had a significant effect on cortisol levels ($p = 0.044$). This shows that a mother's work situation can affect her nationstress levels and cortisol production (Burek et al., 2022). Working mothers may experience different stress levels that affect breastfeeding and hormone levels (Olya et al., 2023) (Wahyudi et al., 2021).

CONCLUSION

There was no significant difference in cortisol levels before and after treatment in either the moxibustion or acupressure groups. Neither the intervention group nor the control group had a clear effect on cortisol levels. The occupation variable was found to influence cortisol levels in breastfeeding mothers.

SUGGESTION

It is important to consider additional variables that contribute to the efficacy of Moxibustion to achieve more comprehensive results, including aspects of maternal employment and other respondent characteristics.

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CONFLICTS OF INTEREST

The authors confirm that there are no conflicts of interest related to this study.

AUTHOR CONTRIBUTIONS

Miftah Chairunnisa was responsible for the study's concept development, data management, formal analysis, research methods, validation, writing the original draft, as well as reviewing and editing. Thatit Nurmawati contributed to the investigation, methodology, data collection, verification, and provided the necessary resources. Raden Roro Dewi contributed to the investigation, as well as reviewing and editing the manuscript.

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