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Endorphin massage decreases cortisol during menstruation



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ABSTRACT

Introduction: Numerous relaxing techniques have been used with endorphin massage. There is not much proof that it affects blood cortisol levels, though. Therefore, this study set out to analyze the implementation of endorphin massage decrease cortisol during menstruation.

Methods: Cortisol data measured involving 46 respondents was obtained by taking venous blood and analyzed using the Enzyme-linked Immunosorbent Assay method. Data analysis used Paired and independent T-test to determine changes in cortisol levels before and after the implementation of endorphin massage and the mean difference between the endorphin massage group and the control group. Analysis of covariance (ANCOVA) was used to examine the mean difference between the two groups compared to baseline.

Results: Based on previous research, this study found that age, weight, and age at menarche did not significantly affect cortisol levels during menstruation. The endorphin massage resulted in a drop in cortisol levels ($p=0,0000$), and there was a significant difference in mean between the two groups ($p=0,0000$). When compared to the starting point, blood cortisol levels in both groups were significantly lower ($p=0,000$).

Conclusion: This study has found that generally endorphin massage could reduce cortisol level in final year nursing students.

Keywords: endorphin massage, dysmenorrhea, cortisol, period, student.

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INTRODUCTION

Primary dysmenorrhea is a common problem that is often expressed by teenage girls during menstruation¹. Studies conducted in the US in 17-19 year-old students who were 13% experiencing severe pain.² The occurrence of dysmenorrhea causes disruption in learning activities, absence from class, and poor academic performance.^{3,4} The psychological factors causing dysmenorrhea are stress and anxiety.¹ The Hypothalamus-Pituitary-Adrenal axis is activated by the stress that final-year students experience as a result of the pressure to finish a thesis on time. The adrenal cortex's production of the hormone cortisol can be increased by activation of the HPA axis.^{5,6} Menstrual pain is made worse by increased uterine muscular contractions brought on by increased cortisol release.^{4,7}

A large amount of literature has been published on the efficacy of endorphin massage. For example, Sari et al (2017)

implemented endorphin massage to reduce uterine fundal height and the study found that endorphin massage was effective in accelerating uterine involution with a decrease in uterine fundal height of about 2-3 cm. In addition, Afiyah (2017) implemented endorphin massage to reduce anxiety facing childbirth and the study found that endorphin massage was effective in reducing anxiety about childbirth.⁸ Moreover, Endorphin massage was used by Hartati et al. in their study of pregnant women's low back discomfort, and it was discovered that this treatment was successful in doing so.⁹ In a similar vein, Cahyani used endorphin massage to ease pregnant women's low back pain, and a research revealed that it was successful in doing so.¹⁰ Endorphin massage is also given to students who experience dysmenorrhea, for example, Rahayu et al (2017) implemented endorphin massage to reduce dysmenorrhea in students and the study showed that endorphin massage

was effective in reducing dysmenorrhea in students.¹¹ Although research on the efficacy of endorphin massage has been carried out, in general, the above research shows that there is only one intervention in the form of endorphin massage. Most studies show that endorphin massage is effective for pregnant women⁸⁻¹⁰, but it is rarely given to adolescent girls. In addition, there are no studies reporting the effectiveness of endorphin massage on blood cortisol levels.

The discussion above showed that endorphin massage can involve different respondents with different indicators is still needed. Therefore, present study aimed to analyze the implementation of endorphin massage decrease cortisol during menstruation. This is the first investigation, to the best of our knowledge, on how endorphin massage affects students' blood cortisol levels during menstruation.

METHOD

General Background of Research

This randomized control trial was conducted in the Universitas Nahdlatul Ulama Surabaya from May-July 2019. The research subjects were randomly selected according to the sample size formula of 46 respondents. Furthermore, the study subjects were divided into two groups randomly, 23 respondents were included in the treatment group (received endorphin massage treatment) and 23 respondents were included in the control group (received deep breathing therapy).

Sample of Research

All final-year nursing students who met the following criteria made up the study's population: Female students with primary dysmenorrhea must meet the following criteria in order to be included in the study: a) age of 18 to 20; b) normal menstrual cycle (21 to 35 days); c) menstrual period of 3 to 7 days; d) no menstrual disorders; e) willingness to participate in the study and signing of an informed consent; f) students who use painkillers or herbal remedies, get married, or become pregnant; and g) criteria for dropping out. There is a desire to halt the research subjects' intervention before it is finished in full.

Instrument and Procedures

In the intervention group, an endorphin massage tester will be given; if the respondent agrees with the massage then the student can sign an informed consent. Before being given Endorphin massage, both groups had venous blood drawn for cortisol examination. Endorphin massage is given for 30 minutes based on Standard

Operating Procedure (SOP). The control group was received deep breathing therapy for 30 minutes. Evaluation of blood collection is done after the intervention with a 15 minute break. Blood sampling was carried out before noon because the peak of cortisol levels occurred at 7-11 a.m.^{12,13} The body's stress response is sensitively reflected by the hormone cortisol. To assess the effects of endorphin massage on cortisol level in this study, venous whole blood samples from each student were taken. Laboratory tests for blood cortisol levels were performed using the Enzyme-linked Immunosorbent Assay (ELISA) method.

Data Analysis

The SPSS 25.0 statistical package was used to conduct the statistical analysis (IBM Corp., Armonk, NY, USA). While paired t-tests were used to compare cortisol levels before and after treatment, independent t-tests were used to compare demographic data between the two groups (assuming the data were normally distributed). With baseline as a covariate and a pre-test as a covariate variable, ANCOVA was performed to compare the differences in cortisol levels between two groups after treatment.^{14,15} All statistical tests were considered significant as p -value <0.05 . Effect sizes d were calculated and classified as small (0.21-0.5), medium (0.5-0.8) and large (> 0.8) according to Cohen (1988).¹⁶

RESULTS

The demographic data of the respondents shown in table 1 are based on age, weight, and menarche. The sample of this study was 46 students who were

divided into 2 groups, the endorphin massage group was 23 students and the control group was 23 students. The youngest age in the control group, the heaviest weight in the endorphin massage group, and age at menarche was lowest in the endorphin massage group. The homogeneity test of all variables showed significant ($p>0.05$). However, there were no mean differences in age ($p=0.702$), weight ($p=0.797$), and age at menarche ($p=0.585$) between the two groups.

Blood cortisol levels in the endorphin massage group ($n=23$) and the control group ($n=23$) are shown in table 2, there is a decrease in cortisol levels in the endorphin massage group (mean difference: 18.25; 95%CI: 12.12-24.38; $p = 0.000$), whereas in the control group there was an increase in cortisol levels (mean difference: -7.12; 95%CI: -14.55-0.30; $p = 0.059$). The results of the paired t-test showed that there was a significant difference in cortisol levels in the endorphin massage group ($p < 0.05$).

Table 3 shows the mean difference in cortisol levels in the two groups, in the endorphin massage group (18.25 \pm 14.18) and the control group (-7.12 \pm 17.17) with 95% CI: 25.37 (16.02 -34.73) and $p = 0.000$, which means there is a significant difference in cortisol levels in the two groups. Concerning the research outcome there was a significant difference between the two groups after treatment ($p=0.000$). Bonferroni adjusted post-hoc tests revealed a significant difference between endorphin massage and control group (mean difference: -24,142; 95% CI: -33,218 to -15,067; $p=0,000$; ES: 1,61). The results of this analysis indicate that endorphin massage can effectively reduce cortisol levels with high effect size.

Table 1. Demographic data of respondents in the endorphin massage and control groups.

| Variable | EM Group (n=23) | Control Group (n=23) | F | df | p |
|-------------------------|-----------------|----------------------|-------|----|-------|
| | Mean (SD) | Mean (SD) | | | |
| Age (years) | 21.22 (0.518) | 21.26 (0.449) | 0.877 | 44 | 0.539 |
| Weight (kg) | 55.17 (5.202) | 54.87 (5.570) | 0.676 | 44 | 0.849 |
| Age at menarche (years) | 11.87 (1.180) | 12.09 (1.203) | 0.773 | 44 | 0.763 |

EM group: Endorphin massage group

Table 2. Blood cortisol levels before and after treatment in both groups.

| Group | Before | After | 95% CI | p |
|--------------------------------|--------------------|--------------------|---------------------|-------|
| | Mean \pm SD | Mean \pm SD | | |
| Endorphin massage group (n=23) | 116.57 \pm 23.34 | 98.32 \pm 23.42 | 18.25 (12.12-24.38) | 0.000 |
| Control group (n=23) | 110.7 \pm 23.36 | 117.82 \pm 24.08 | -7.12 (-14.55-0.30) | 0.059 |

Table 3. Differences in cortisol levels between the endorphin massage group and the control group.

| Group | Mean±SD | 95% CI | F | df | p |
|--------------------------------|---------------|---------------------|-------|----|-------|
| Endorphin massage group (n=23) | 18,25 (14,18) | 25,37 (16,02-34,73) | 0,522 | 44 | 0,000 |
| Control group (n=23) | -7,12 (17,17) | | | | |

Table 4. Mean differences between two groups after treatment.

| Group | Mean±SE | 95% CI | Difference | p | ES |
|--------------------------------|---------------|--------------------|------------|-------|------|
| Endorphin massage group (n=23) | 95,99±3,169 | -33,218 to -15,067 | -24,142 | 0,000 | 1,61 |
| Control group (n=23) | 120,141±3,169 | | | | |

DISCUSSION

Several reports have shown that endorphin massage is effective for pregnant women to reduce back pain¹⁰, reduce anxiety and pain during childbirth.^{8,9,17} However, little research discusses the effectiveness of endorphin massage in adolescent girls. Rahayu et al (2017) reported that endorphin massage given for 10 minutes was effective in reducing pain in students with dysmenorrhea. Although this study also involved students as respondents, the indicators measured were subjective and not standardized.¹¹

On the other hand, massage-induced reductions in cortisol levels in general were also shown in other studies. Bennett et al (2017) reported a decrease in salivary cortisol in college students who experienced academic stress after 90 minutes of traditional Thai massage.¹⁵ In contrast to this study, by applying pressure to certain body points, while endorphin massage used light touch techniques. Endorphin massage is a light massage technique that can increase the release of beta endorphins so that comfort is achieved.¹⁸ In line with Hosseini et al (2013) who proved massage therapy was effective in reducing cortisol levels during the first active phase, Van Dijk (2020) reported a decrease in cortisol after a Swedish massage. Both studies did not report effect sizes, making it difficult to compare the results of the previous study and the current study.¹⁹

So far, there has been no published randomized control trial researching the effect of endorphins massage on blood cortisol levels. In summary, this study showed that there is a significant decrease in cortisol levels after treatment. Other studies that examine endorphin massage include Afyah (2018) which proves that endorphin massage is effective in

reducing labor anxiety, but this study was a control group so it was difficult to evaluate the efficacy of interventions.⁸ This study proves that short-term endorphin massage is effective in reducing cortisol levels, as well as traditional Thai massage.¹⁵ Endorphin massage which in this study was implemented for 30 minutes, is the same as the study of Kartikasari et al (2016) which proved that endorphin massage for 30 minutes was able to reduce low back pain in pregnant women.²⁰

Cortisol level examination was carried out by taking blood and saliva, however, few studies have discussed the comparison of the accuracy of the two samples. Previous studies used saliva for cortisol examination to measure the efficacy of massage^{15,21}, but this study is in line with Hosseini's study which used blood cortisol to prove the effectiveness of massage therapy.¹⁹ Blood sampling in both groups was carried out at the same time, namely in the morning so that the cortisol data was homogeneous. Cortisol synthesis and secretion is regulated by the pituitary hormone ACTH (adrenocorticotrophic), which then stimulates activation of the HPA axis.¹² A significant component of the neuroendocrine system is the HPA axis, whose primary function is to support the body's response to a stressor.¹³

In general, this study proved that endorphin massage is effective in reducing cortisol levels with a high effect size compared to the control group. Endorphin massage is a relaxation technique to stimulate the release of endorphins, causing feelings of comfort and peace.^{8,22} The effectiveness of the massage intervention is shown in table 4, where this study has a large effect size (d=1.61), in contrast to the review study by Moyer et al (2010) which showed that most of the studies reviewed had an effect size that was

not too large which is *Cohen d* less than 1 after a single dose of massage therapy in the first session.²³

Due to a lack of prior research that addresses endorphin massage applied to students, this study's ability to calculate the precise sample size is limited. The development of stress instruments is needed to measure stress subjectively so that the results presented are more accurate.

CONCLUSIONS

The main finding in this study is that endorphin massage significantly reduces blood cortisol levels in students during menstruation compare to deep breathing therapy. The implementation of endorphin massage as a nurse's independent intervention is expected to improve the reproductive health of adolescent girls. In addition, a major challenge in nursing care, especially maternity nursing, is to develop independent interventions based on appropriate evidence-based nursing. For future studies, a larger sample size and the addition of other covariates (such as stress coping, perceived stress, anxiety, and support system) are needed to follow-up the long-term effects of endorphin massage on stress during menstruation.

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AUTHOR CONTRIBUTION

All authors contributed to this study's conception and design, data analysis and

interpretation, article drafting, critical revision of the article, final approval of the article, and data collection.

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CONFLICT OF INTEREST

There is no conflict of interest for this manuscript.

ETHICAL CONSIDERATION

This study has been declared ethical by the Ethical Commission for Health Research of the Universitas Nahdlatul Ulama Surabaya.

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