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ORIGINAL RESEARCH

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COMPARISON OF EFFECTS OF MASSAGE THERAPY ALONE AND IN COMBINATION WITH GREEN COCONUT WATER THERAPY ON B-ENDORPHIN LEVEL IN TEENAGE GIRLS WITH DYSMENORRHEA

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ABSTRACT

Background: Dysmenorrhea is pain during menstruation in lower abdomen, and is not due to other diseases. Effleurage massage and consuming green coconut water are considered able to reduce menstrual pain. However, little is known about the effect of the combination between the two interventions.

Objective: To compare the effectiveness of effleurage massage and in combination with green coconut water on pain, anxiety, and β -endorphin level in teenage girls with menstrual pain (dysmenorrhea).

Design: A quasi-experiment with pretest-posttest approach design with control group. There were 36 samples recruited in this study by purposive sampling, which were divided into a massage therapy group, the combination therapy group, and a control group. Menstrual pain was measured using Numeric Rating Scale, while anxiety was measured using Zung Self rating Anxiety Scale (ZSAS), and endorphin level using ELISA (Enzyme-Linked Immunosorbent Assay). One-way ANOVA test and repeated ANOVA were performed as a bivariate analysis. MANCOVA and post hoc ANOVA were used for multivariate analysis.

Result: The combination of massage and green coconut water was more effective in reducing pain (p 0.013) and anxiety levels (p 0.000), and in increasing β -endorphin (p 0.029) with significant value of <0.05 compared to the massage therapy alone.

Conclusion: The combination of effleurage massage and green coconut water had significant effect in decreasing anxiety and pain levels, and increasing β -endorphin levels in teenage girls with painful periods (dysmenorrhea); and more effective than performing effleurage massage only. It is suggested that this combination therapy could be used as an alternative therapy for women with dysmenorrhea.

Keywords: massage, green coconut water, menstrual pain, β -endorphin levels, anxiety, dysmenorrhea

INTRODUCTION

Prevalence rates of dysmenorrhea in the United States are 30-50 percent in women in reproductive age.¹ Approximately 15% of them lose their job opportunities, and their schools and family life are damaged.¹ The prevalence rate of dysmenorrhea in Thailand is as high as 84.2% among female adolescents, which cause low school attendance rates (21.1%) associated with severity of the symptoms.² In Malaysia, the incidence of dysmenorrhea among students is 62.3%, which had an effect on their study concentration (59.9%) and social interaction (58.6%).³ In Indonesia, the incidence of dysmenorrhea is 64.25%, consisting of 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea. The primary dysmenorrhea is experienced by 60-75% of young women, with $\frac{3}{4}$ of them experiencing mild to moderate pain and $\frac{1}{4}$ experiencing severe pain.⁴

The impact of dysmenorrhea cannot be ignored. Ten percent of high school students cannot attend the class due to menstrual pain.⁴ Research conducted by Dasuki concluded that the incidence of dysmenorrhea in the area is around 97.6% and resulted in the disruption of daily activities for 87.8 percent.⁵

The preliminary study conducted by researchers at SMK Duta Karya on 20 students who had dysmenorrhea found that 7 (35%) students experienced mild pain, 11 (55%) students had moderate pain, and 2 (10%) students with severe pain.

Dysmenorrhea, also known as painful periods, or menstrual cramps, is pain during menstruation in lower abdomen, and is not due to other diseases.⁶ It is often called as primary dysmenorrhea. Although this condition is normal for every woman, but most of

them cannot handle that because of the pain. Some are still able to work but with facial grimace of pain.⁷ However, this might affect mental and physical function. In fact, the preliminary study revealed that most of the participants (100%) had anxiety. Thus, the intervention to reduce the pain is needed.

Most of women take pain relievers or prostaglandin inhibitors such as NSAIDs (non-steroids anti-inflammatory drugs) in the form of ibuprofen, mefenamic acid, naproxen and aspirin are widely used as initial therapy for dysmenorrhea.⁸ However, these drugs have side effects of gastrointestinal disorders such as nausea, dyspepsia and vomiting.⁹

The preliminary result showed that of the total number of the students, 70% of them took anti-pain medication, and 30% of them only had some rests. By seeing this phenomenon, this study aims to propose the non-pharmacological treatment to reduce menstrual pain by giving massage or the combination of massage and green coconut water, which is safe, cheap, easy to do, and no side effects. Massage, such as effleurage massage, had a significant effect on pain in the previous study.¹⁰ Similar with green coconut water had an effect on menstrual pain.¹¹

However, the effect of the combination between the two interventions is remarkable. It is assumed that the combination will reduce pain significantly, compared with one intervention only.

Therefore, this study aims to determine the effect of the combination of massage and green coconut water in reducing menstrual pain, and compare with the massage alone.

METHODS

Design

A quasi experiment with pretest-posttest approach design with control group.

Setting

The study was conducted for 1.5 months at SMKN 1 Demak in November - December 2016.

Population and Sample

There were 36 samples recruited in this study by purposive sampling, which were divided into three groups, namely: 1) a group given massage therapy (12 respondents), 2) a group given the combination of massage and green coconut water (12 respondents), and 3) a control group (12 respondents). The inclusion criteria of this study included: a) the adolescent girls who were suffered from dysmenorrhea on the first day of menstruation for 3 consecutive months at least on the 1st – 3rd day, b) had been willing not to use any kind of therapies other than therapy given by the researchers, c) was not afraid of syringes when doing blood sampling, d) never married and given birth, and e) had been willing to be a respondent and follow the research procedure. The exclusion criteria were: a) those who were diagnosed with certain gynecologic diseases, and b) underwent pharmacologic treatment with painkillers. For those who did not follow the procedure, they were dropped out.

Intervention

For the massage group only, the intervention was given 2 times per day for 3 days. While for the combination group, the combined therapy was also given 2 times per day for 3 days. The interventions were performed by researchers and enumerators who were certified to give intervention. Effleurage

abdominal massage was given for 5 minutes was one of the massage techniques by rubbing slowly and circularly in the abdomen. The pure green coconut water was given as much as 250 cc after given massage. In the control group, the intervention such as giving pharmacological drugs or just taking some rests were recommended.

Instrument

Menstrual pain was measured using Numeric Rating Scale with a pain score of 0-10, which 0: no pain, 1-3: mild pain, 4-6: moderate pain. Anxiety was measured using Zung Self rating Anxiety Scale (ZSAS) with score 20-40 refers to no anxiety, 40-60: mild anxiety, medium anxiety: 61-80, and severe anxiety: 81-100. While β -endorphin level was measured using ELISA ((Enzyme-Linked Immunosorbent Assay), a biochemical technique primarily used in the field of immunology to detect the presence of antibodies or antigens in a sample.

Ethical consideration

Ethical clearance number for the study was 021 / KEPK / Poltekkes-SMG / EC / 2017. Informed consent was given to the respondents in the form of a written statement of consent, which each respondent needs to approve and sign without coercion (voluntary).

Data analysis

One-way ANOVA test and repeated ANOVA were performed as a bivariate analysis. MANCOVA and post hoc ANOVA were used for multivariate analysis. The MANCOVA test for testing the confounding factor whether the increase in beta-endorphin levels is influenced by confounding or pure factors of the given intervention. Post hoc

ANOVA test was to see the effectiveness of the intervention.

RESULTS

As shown in table 1, the result of descriptive analysis and homogeneity test between group of massage, combination group, and control group indicated that mean age of respondents was 16 with p-

value 0.549. The average length of menstruation was 7 with p-value 0.956, and the average of dysmenorrhea was 3 with p-value 0.781. Thus, it can be concluded that the characteristics of the respondents were no different or homogeneous (Sig.> 0.05).

Table 1 Respondent distribution in the group of massage, combination group (massage + green coconut water), and control group

Variable	Group			<i>p-value</i>
	Control	Massage	Combination	
Age (Year)				0.549
Mean	15.67	16.25	15.92	
Median	15.5	16	16	
SD	0.985	0.754	0.996	
Length of menstruation (day)				0.956
Mean	6.58	6.58	6.92	
Median	6.5	7	7	
SD	0.9	0.992	1.084	
Length of dysmenorrhea				0.781
Mean	3.42	3.50	3.50	
Median	3	3	3	
SD	0.669	0.798	0.905	

Table 2 Mean difference in anxiety level, pain, and endorphin levels before and after intervention among the three groups using One-way ANOVA

Variable		Group			<i>p-value</i>
		Control	Massage	Combination	
β-Endorphin level					
Before	Mean	241.42	221.96	203.50	0.294
	SD	59.04	60.66	54.97	
After	Mean	244.33	283.74	282.72	0.046
	SD	58.66	30.20	32.09	
Anxiety level					
Before	Mean	35.75	37.08	37.42	0.137
	SD	2.491	1.975	1.782	
After	Mean	23.33	22.67	19.42	0.000
	SD	2.741	2.015	2.109	
Pain level					
Before	Mean	5.50	5.58	5.17	0.569
	SD	0.905	0.996	1.115	
After	Mean	3.17	2.83	2.00	0.037
	SD	0.937	1.267	1.044	

Table 2 shows that there was significant difference in β -endorphin level after intervention among the combination, massage, and control groups with p-value 0.046 (<0.05). Similar with the anxiety

and pain level which showed the significant difference between the three groups, with p-value of anxiety level was 0.000 and pain level was 0.037.

Table 3 Mean difference in anxiety and pain level before and after intervention among the three groups using Repeated ANOVA

Variable	Group	Before		After		p-value
		Mean	SD	Mean	SD	
Anxiety level	Control group	35.75	2.491	23.33	2.741	0.000
	Massage group	37.08	1.975	22.67	2.015	0.000
	Combination group	37.42	1.782	19.42	2.109	0.000
Pain level	Control group	5.50	0.905	3.17	0.937	0.000
	Massage group	5.58	0.996	2.83	1.267	0.000
	Combination group	5.17	1.115	2.00	1.044	0.000

Table 3 shows that there were statistically significant differences in

anxiety and pain levels among the three groups with p-value < 0.05.

Table 4 Mean difference in β -endorphin level before and after intervention among the three groups using Friedman test

Variable	Group	Mean Rank	p-value
β -Endorphin level	Control group	3.17	0.000
	Massage group	4.83	
	Combination group	5.00	

Table 4 shows that the mean of β -endorphin level in the combination group was higher than β -endorphin level in the other two groups. Friedman test shows p-

value 0.000 (<0.05), indicated that there was statistically significant difference of β -endorphin level among the three groups

Table 5 Confounding factors on anxiety level, pain, and β -endorphin levels using MANCOVA

Variable	p-value		
	Age	Length of menstruation	Length of dysmenorrhea
Pain level	0.780	0.592	0.606
Anxiety level	0.711	0.631	0.846
β -endorphin level	0.217	0.489	0.272

MANCOVA test in Table 5 shows that there were no significant relationships between confounding factors (age, length

of menstruation, and length of dysmenorrhea) with pain, anxiety, and endorphin level with p-value >0.05.

Table 6 Comparison the effect of massage and combined massage-green coconut water on anxiety level, pain, and β -endorphin levels using Post Hoc ANOVA

Variable	Group	Mean Difference	<i>p-value</i>
Anxiety level	Massage group	0.667	0.485
	Combination	3.917	0.000
Pain level	Massage group	0.333	0.460
	Combination	1.167	0.013
β -Endorphin level	Massage group	38.39	0.030
	Combination	39.41	0.029

Post-hoc ANOVA test shows that the combination of massage and green coconut water was more effective in reducing pain and anxiety levels with *p*-value <0.05 compared to the massage only. But similar effect in increasing β -endorphin levels with *p*-value <0.05. However, the combination group is a higher than massage group alone.

DISCUSSION

Characteristics of respondents such as age, length of menstruation and dysmenorrhea are often associated with pain levels during menstruation. Age less than 20 years is considered as a primary risk factor for dysmenorrhea.¹² It is estimated that 50% of young women aged between 15 and 24 experience pain during menstruation.¹² However, findings of this study revealed that there was no significant relationship of age factor, length of menstruation and duration of dysmenorrhea with the level of anxiety, pain and β -endorphin.

Findings of this study revealed that both effleurage massage only and combined massage and green coconut water had a significant effect on anxiety level, pain, and β -endorphin levels. However, the combined intervention is much more effective compared with the effleurage massage only.

It is because effleurage massage technique aims to improve blood

circulation, put pressure, warm the abdominal muscles, and increase physical and mental relaxation.¹³ The mechanical effect of effleurage technique is to help the vein work and cause body heat as warming up. The physiological influence of strong rubbing of the massage affects the circulation of blood in the deepest tissues and in the muscles, which is a safe, easy, costless, no side effects, and can be done alone or with the help of others.^{13,14}

In addition, during massage, the body secretes endorphin compound as a natural body pain reliever and also create a comfortable feeling. This was supported by previous study on the gate control theory of pain asserts that non-painful input closes the "gates" to painful input, which prevents pain sensation from traveling to the central nervous system.¹⁵ Therefore, stimulation by non-noxious input is able to suppress pain. Similarly, the massage that has a distraction effect can also increase the formation of endorphins in the control system descend. Massage can make patients more comfortable due to muscle relaxation. It is one non-pharmacological method that is considered effective in reducing pain.^{13,14}

On the other hand, green coconut water contains magnesium, which can overcome the pelvic flush due to muscle relaxant effect during dysmenorrhea. Magnesium also contributes to the

formation of serotonin neurotransmitter that can increase appetite, feelings of happiness and anti-depression.¹⁶ In addition to serotonin, magnesium also plays a role in the formation of endorphin and enkephalin neuropeptides that play a role in the perception of pain received by nerve endings.¹⁶ Magnesium has an important role in physiological processes of the body, particularly in the inhibition of acetylcholine presynaps and N-Methyl-D-aspartic acid (NMDA) that inhibit signal transduction, so that the pain and contraction are decreased.¹⁷ Another function of magnesium is an inhibitor of neuromuscular junction and inositol triphosphate that play a role in the opening of calcium channel and inhibiting catecholamine secretion which implies in decreasing the strength of uterine contractions and improvement of blood supply, which decrease the pain sensation.^{16,17}

It can be said that magnesium contained in the green coconut water can help relax the tension of the uterine muscle during menstruation, and working together with the effect of massage effleurage, thus making anxious and pain levels decreased as well as lowering the prostaglandin hormone that affects the β -endorphin hormone endorphin as a precursor of relaxation and calm and comfort. However, this study did not examine the levels of prostaglandins hormone.

CONCLUSION

It is concluded that the combination of effleurage massage and green coconut water had significant effect in decreasing anxiety and pain levels, and increasing β -endorphin levels in teenage girls with painful periods (dysmenorrhea); and more effective than performing effleurage massage only. Therefore, it is suggested

that performing effleurage massage and consuming green coconut water could be used as an alternative therapy for women with dysmenorrhea. Further research is needed to explore the working mechanism of some composition of green coconut water besides magnesium that can decrease menstrual pain.

Declaration of Conflicting Interest

None declared.

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Author Contribution

All authors contributed equally in this study.

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