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EFFECTS OF PEPPERMINT LOTION ON PAIN INTENSITY AND CORTISOL LEVELS IN ADOLESCENTS WITH PRIMARY DYSMENORRHEA

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ABSTRACT

Dysmenorrhea is an important topic in reproductive health, especially in adolescents because it has a major impact on the quality of life of adolescents. Dysmenorrhea in adolescents negatively affects physical activity, school attendance, concentration during lessons and academic performance. Some of the symptoms that adolescents often experience in dysmenorrhea include headaches, back pain, fatigue, anxiety and other physical and psychological complaints. Pharmacological treatments commonly used often cause dangerous side effects so alternative treatments are needed that are considered safer and more effective. Peppermint is an example of a nonpharmacological therapy that aims to provide a distraction and relaxation effect of the body by stimulating the body to release endorphine compounds which are pain relievers so as to create feelings of comfort, calm nerves, and stabilize blood pressure. Objective: This study aims to analyze the effect of Peppermint lotion administration on pain intensity and cortisol levels in adolescents with primary dysmenorrhea. Method: This study is a true experiment with randomized pretest-posttest with control group. The number of samples in the study was 40 adolescent respondents with primary dysmenorrhea according to inclusion criteria divided into 20 people in the intervention group who were given 3% peppermint lotion with a frequency of administration 3 times a day for 3 days and 20 people in the control group given placebo lotion. Measurement of pain intensity using the Numeric Rating Scale (NRS) and cortisol levels using blood serum performed on the first day (pretest) and third day of menstruation (posttest). Data analysis using independent t test and mann whitney. Results: In the intervention group given peppermint lotion there was an average decrease in pain intensity of 4.6 while the control group was 3.55 with effect size 0.867 and p value = 0.013. The average decrease in cortisol levels in the intervention group was 2.64 µg/dL and the control group was 0.94 µg/dL with effect size 0.864 and p value = 0.010. Conclusions: Administration of peppermint lotion for 3 days has an effect on reducing pain intensity and cortisol levels in adolescents with primary dysmenorrhea.

Keywords: cortisol; dysmenorrhea; pain intensity; peppermint

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INTRODUCTION

Dysmenorrhea is a condition of cramps during menstruation which is a gynecological complaint in women of reproductive age. Adolescent menstrual health must be a concern in the community because adolescents who do not get good education and knowledge about menstruation, cannot overcome problems and get treatment appropriately so that it has an impact on several problems during menstruation such as dysmenorrhea(Holmes et al., 2021). Dysmenorrhea is an important topic in adolescent health because it has a major impact on the quality of life of adolescents and productive women (Gutman et al., 2022),(Fernández-Martínez et al., 2020). Dysmenorrhea or menstrual pain is the most common symptom of

menstruation in adolescent girls, some experience primary dysmenorrhea is pain that arises during menstruation in the absence of pelvic pathology(Gerancher, 2018).

Dysmenorrhea and Pre Menstrual Syndrome (PMS) is a major public health problem because it has a negative impact on health, employment and psychosocial status (Arafa et al., 2018). Based on research Elia et al (2019) found 60.5% of adolescents do not attend class at least one day a year for reasons related to menstruation, one of which is due to dysmenorrhea(Fernández-Martínez et al., 2020). Some of the symptoms that teenagers often experience in dysmenorrhea include headaches, back pain, pain throughout the body, and anxiety(Arafa et al., 2018),(Bianchin et al., 2019). Dysmenorrhea is the most common symptom with psychological complaints, fatigue, 38% of all women reported being unable to perform daily routine activities due to dysmenorrhea during menstruation(Schoep et al., 2019).

The prevalence of adolescents with primary dysmenorrhea in the world is 64.85% with 69.60% experiencing mild pain and 30.40% experiencing moderate pain(Zurawiecka & Wronka, 2018) and there is increased pain sensitivity in women with primary dysmenorrhea at all phases of the menstrual cycle (Payne et al., 2019). Dysmenorrhea affects 80% of women of reproductive age, irregular menstrual cycles increase the chances of dysmenorrhea 72.5%. The prevalence of dysmenorrhea in adolescents in Ghana was 68.1% with 0.3% with severe pain rates and negatively affecting physical activity (22.5%), school attendance (6.9%), concentration during lessons (27.9%) and academic achievement (31.1%)(Acheampong et al., 2019). Side effects of dysmenorrhea include fatigue (83%), headaches (82%), dysezia (37%), dysuria (35%) and 59% of adolescent girls do not engage in social activities due to dysmenorrhea(Söderman et al., 2019), There are even some experiencing dizziness, nausea, vomiting and depression(Fernández-Martínez et al., 2020),(Abreu-Sánchez et al., 2020). In a study conducted by Soderman, et al (2019) on adolescents in Sweden, out of 1785 adolescent girls, 1580 people (89%) had dysmenorrhea, with 36% experiencing severe pain(Söderman et al., 2019). The prevalence of dysmenorrhea in nursing students in Southern Spain was 73.8% with 63.3% having primary dysmenorrhea and 10.5% having secondary dysmenorrhea(Abreu-Sánchez et al., 2020).

In Indonesia, the prevalence of dysmenorrhea is 64.25% with 54.89% experiencing primary dysmenorrhea and 9.36% secondary dysmenorrhea. Primary dysmenorrhea is experienced by 60-75% of adolescent girls, the majority of whom experience mild to moderate pain and the rest experience severe pain. The study was conducted on adolescent girls with dysmenorrhea, 7-15% of the total 30-60% who had dysmenorrhea did not attend school or work(Larasati, T. A. & Alatas, 2016). Knowledge about menstruation among adolescents is still very low (Odds Ratio/ OR = 3.49) which means that adolescents are 4.49 times less likely to have low knowledge about menstruation and that some of these adolescents have experienced pain during menstruation that affects school attendance rates (OR 1.68)(Davis et al., 2018),(Yücel et al., 2018). Dysmenorrhea is a major problem among adolescents and has been shown to have an impact on quality of life or Quality of Life (QoL) so that treatment should be promoted in health care(Fernández-Martínez et al., 2019). Research in Palembang conducted on senior high school students found that 74.7% had primary dysmenorrhea at the age of 15-17 years by 84.2% and 64.4% had a family history of dysmenorrhea(Mona et al., 2017). Based on a preliminary study on midwifery students at STIKES Abdurahman Palembang, it was obtained from 112 students, as many as 83 people (74.10%) experienced dysmenorrhea during menstruation.

Dysmenorrhea in adolescents is influenced by several factors, among others, menarche age, Body Mass Index (BMI), a family history of dysmenorrhea, the cycle and duration of menstruation, physical activity, parental education, and abnormal levels of belly fat(Zurawiecka & Wronka, 2018). Based on literature reviews that analyze the relationship of diet to the incidence of dysmenorrhea, it was found that by consuming fruits, vegetables, fish, milk can reduce the incidence of dysmenorrhea followed by a good diet because the wrong weight loss diet has a negative impact on dysmenorrhea(Bajalan et al., 2019). Management of primary dysmenorrhea is directed at controlling other symptoms experienced by the patient and despite its high prevalence, dysmenorrhoea is still underdiagnosed and does not receive adequate treatment(Kho & Shields, 2020). If dysmenorrhea does not experience clinical improvement within 3-6 months of therapy, then further examination should be carried out to find out if there are other causes of dysmenorrhea experienced (Gerancher, 2018), based on Knox's (2019) study one in five women who experience endometriosis has a history of dysmenorrhea on average 10 years earlier (Knox et al., 2019).

Research In women with dysmenorrhea it was found that dysmenorrhea women had higher levels of depression, anxiety, somatization, negative self-perception compared to those without dysmenorrhea (Zhao et al., 2021). Feelings of depression and anxiety felt during dysmenorrhea cause an increase in cortisol hormone levels in the blood. The hormone cortisol is made by two adrenal glands, which are hormone producers located above the kidneys to be subsequently released into the blood and flowed throughout the body. The best cortisol test time is done in the morning and is more accurate if the test is in the form of serum or blood plasma.

Based on data from Australia, the majority of young women use information from the internet, self-management by using over-the-counter drugs (paracetamol or ibuprofen) to cope with menstrual symptoms, they do not seek medical advice to check for such complaints (Armour et al., 2021). Some pharmacological treatments commonly used to reduce dysmenorrhea pain are nonsteroidal anti-inflammatory drugs, hormonal contraceptive therapy(Ferries-Rowe et al., 2020) and Cyclooxygenase (COX)-2 inhibitors. However, some of the side effects include mild neurological side effects (e.g., headache, drowsiness, dizziness) and gastrointestinal symptoms (e.g., nausea, indigestion), and cardiovascular effects(Bajalan et al., 2019). Dysmenorrhea is a major problem among adolescents today and has an impact on the quality of life of adolescents, so treatment options using complementary therapies that are safer and have fewer side effects. The use of nonsteroidal anti-inflammatory drugs (NSAIDs) in the treatment of primary dysmenorrhea has several side effects, for which new methods are needed to relieve symptoms with the use of natural pharmacological applications and new biotechnologies especially optimizing efforts to reduce the side effects of treatment (Dias et al., 2019).

In addition to pharmacological treatment, more than one-third of adolescent women use nonpharmacological pain relief methods to manage dysmenorrhea pain such as the use of heat pads/warm compresses using herbs, massase, aromatherapy inhalation, and yoga(Acheampong et al., 2019). Some of these non-pharmacological therapies have their own advantages and disadvantages, for example the use of aromatherapy by inhalation needs to pay attention to the distance between the nose and aromatherapy and the size of the room affects the effect of aromatherapy because the wider the room, the less aromatherapy inhaled(Salsabila et al., 2022). Other complementary therapies include yoga, Although more and more information is available regarding the beneficial effects of yoga and the scientific mechanisms behind the physical and physiological variables involved when practicing yoga,

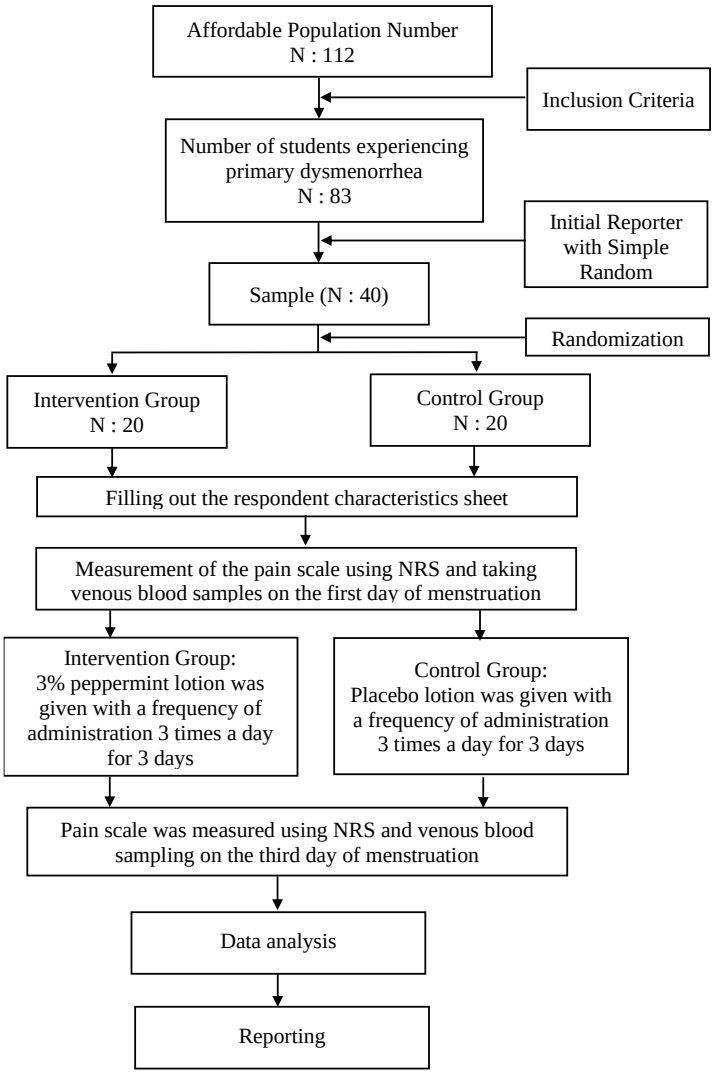
it has still not been widely adopted as part of a program to prevent menstrual pain in women with primary dysmenorrhea. This implies that a way is needed to identify the effectiveness of yoga on menstrual pain in women with primary dysmenorrhea through the analytical methods needed to correct the shortcomings of previous research methodologies regarding the effects of yoga on menstrual pain associated with primary dysmenorrhea (Kim, 2019).

Peppermint It is a plant that contains menthol, methone, cineol, limonene, and menthofuran obtained from fresh leaves Peppermint through steam distillation (Aronson, 2016). Peppermint Widely used as an analgesic to reduce joint pain, headache, cramps, digestive complaints, colonic spasms, primary dysmenroe, menstrual disorders, nausea and diarrhea(Agajani Delavar et al., 2019). The study used a blend of lavender essential oil and Peppermint For use with massage in the upper sympisis area, there was a decrease in the massage and aromatherapy group ($\rho = 0.014$)(Farahani et al., 2012). Research using Peppermint also done Masoumi (2016) using capsules from extracts Peppermint, also proven to reduce pain due to dysmenorrhea(Masoumi et al., 2016). Peppermint is an example of nonpharmacological therapy that aims to provide a distraction and relaxation effect of the body by stimulating the body to release endorphine compounds which are pain relievers so as to create a feeling of comfort, calm nerves, and stabilize blood pressure (Saatsaz et al., 2016),(Najaf Najafi et al., 2022). Food and Drug Administration (FDA) has mentioned that Peppermint and oil Peppermint Generally safe to use for humans (Aronson, 2016).

Lotion is one of the uses of products that are applied to the skin, both for treatment and skin care. On topical use, Lotion which has a high water content compared to oil although there are also those that contain alcohol. This resulted in Lotion It is easily absorbed and can cover large areas of skin and leave little residue making it suitable for daily use (Kristeen Cherney, PhD, 2022). The aim of this study was to determine whether there was an effect of giving peppermint lotion on reducing pain intensity and cortisol levels in adolescents with dysmenorrhea.

METHOD

This research was conducted on midwifery students at one of STIKES in Palembang. The study was conducted from November to December 2023 there were 112 female students who were initially identified and there were 83 students who met the inclusion criteria (aged 18-24 years, had never married and given birth, were not currently using other dysmenorrhea therapies). Students will be excluded from the study if they are not willing to follow treatment protocols, take painkillers or other herbal medicines during the ongoing study and fail to give consent as respondents. The method used is true experiment with randomized pretest-posttest with control group. The number of samples in the study was 40 adolescent respondents taken based on respondents who experienced menstruation first then a draw was made with a lottery system to determine entry in the intervention group or control group with a sample number of 20 people in the intervention group who were given 3% peppermint lotion with a frequency of giving 3 times a day for 3 days and 20 people in the control group given placebo lotion with a frequency of administration 3 times a day for 3 days . Measurement of pain intensity using the Numeric Rating Scale (NRS) and cortisol levels using blood serum performed on the first day (pretest) and third day of menstruation (posttest). Data analysis for pain intensity using the Mann Whitney test and for cortisol levels using the independent t test. Making peppermint lotion is done by a 3% pure peppermint oil nanoemulsion process mixed into the lotion making ingredients.



Picture 1 Consolidated Standards of Reporting Trials (CONSORT)

RESULTS

Characteristics of respondents consisting of BMI, menstrual duration, and menstrual cycle have been analyzed descriptively data, and presented in the table:

Table 1.
Characteristics of Respondents

Characteristics	Intervention		Control	
	f	%	f	%
BMI				
Thin	3	15	6	30
Normal	11	55	10	50
Fat	6	6	4	20
Duration of Menstruation				
Normal	18	90	16	80
Abnormal	2	10	4	20
Menstrual Cycle				
Normal	16	80	17	85
Long	4	20	3	15

Based on the table above, the BMI of respondents in this study became 3 categories, namely thin, normal, and fat. Most respondents had a normal BMI, with 11 respondents (55%) in the intervention group and 10 respondents (50%) in the control group. The length of menstruation was mostly in the normal category with 18 respondents (90%) in the intervention group and 16 respondents (80%) in the control group. And the menstrual cycles of both groups were mostly in the normal category, namely 16 respondents (80%) in the intervention group and 17 respondents (85%) in the control group.

Table 2.
Analysis of the effect of *peppermint lotion* on pain intensity in adolescent with primary dysmenorrhea

Variable	Data	Intervention Group	Control Group	*P value*
		Mean±SD	Mean±SD	
Pain	Pre	7.10±1.48	7.25±1.65	0,764**
	Post	2.5±1.051	3.7±1.261	0,004***
P value		0,000*	0,000*	
	Δ	4.6±1.046	3.55±1.356	0,013***

Based on table 2, the average measurement of pain intensity in the intervention group before peppermint *lotion* was 7.10±1.48 and after peppermint *lotion* use was 2.5±1.051 with an average difference of 4.6±1.046 while the control group given *placebo lotion* the average pain intensity before was 7.25±1.65 and after to 3.7±1.261 with an average decrease of 3.55±1.356. The intervention group given *peppermint lotion* on the *Wilcoxon* test was found $p = 0.000$, meaning that there was an effect on reducing pain intensity after using *peppermint lotion*. Analysis of the difference test between the two groups using *the man whitney test* obtained the result of *p value* = 0.013 so that it can be concluded that there is a difference in the average decrease in the intervention group given *peppermint lotion* with the control group given placebo *lotion.*

Table 3.
Percentage decrease in average pain intensity

Variable	Group	%
Pain Intensity	Intervention	64,78 %
	Control	48,96 %

The table above found that the percentage of reduction in the average pain in the group given *peppermint lotion* was greater at 64.78% while the group given *placebo lotion* was 48.96%.

Table 4.
Effect size of intervention group with control group on decreasing pain intensity

Variable	Group	Sample	Mean±SD	**Cohens d Effect*
Pain Intensity	Intervention	20	4.6±1.046	0,867
	Control	20	3.55±1.356	

Table 4 above shows the *effect size* obtained from each group shows that the intervention treatment and control group gave a large effect (*effect size* > 0.8) which is 0.867 in reducing pain intensity.

Table 5.
Analysis of the effect of *peppermint lotion* on cortisol levels in adolescents with primary dysmenorrhea

Variable	Data	Intervention Group	Control Group	*P value*
		Mean±SD	Mean±SD	
Cortisol	Pre	10.19±3.46	8.75±3.40	0,193**
	Post	7.55±3.12	7.80±3.80	0,818**
P value		0,000*	0,052*	
	Δ	2.64±1.90	0.94±2.03	0,010**

Table 5, the average measurement of cortisol levels in the intervention group before using *peppermint lotion* was 10.19±3.46 and after using *peppermint lotion* to 7.55±3.12 with an average difference of 2.64±1.90 and *Wilcoxon* test obtained *p* = 0.000 meaning that there was an effect of decreasing cortisol levels after using *peppermint lotion*. While for the control group, the average cortisol levels before 8.75±3.40 and after 7.80±3.80 with an average decrease difference of 0.94±2.03 and p value = *0.052* means that giving *placebo lotion* has no effect on reducing cortisol levels. The difference test between groups using the *independent t test* obtained the result of *p value* = 0.010 so that it can be concluded that there is a difference in decreasing cortisol levels in the intervention group given *peppermint lotion* and the control group given placebo *lotion.*

Table 6.
Percentage decrease in mean pain intensity

Variable	Group	%
Cortisol Levels	Intervention	25,9 %
	Control	10,85 %

Table 6 above found that the percentage of cortisol reduction in the group given *peppermint lotion* was greater at 25.9% while the group given *placebo lotion* was 10.85%.

Table 7.
Effect size of intervention group with control group on cortisol reduction

Variable	Group	Sample	Mean±SD	**Cohens d Effect*
Cortisol	Intervention	20	2.64±1.90	0,864
	Control	20	0.94±2.03	

Table 7 above shows the *effect size* obtained from each group shows that the intervention treatment and control group gave a large effect (*effect size* > 0.8) which is 0.864 in decreasing cortisol.

DISCUSSION

The effect of *peppermint lotion* on pain intensity in adolescents with primary dysmenorrhea

This study used 3% *peppermint lotion* with 2 grams in one administration 3 times a day for 3 days and used the Numeric Rating Scale (NRS) to measure pain intensity before and after the intervention. From the results of the study, there was a decrease in the scale of pain before and after the intervention with *a p value* of 0.000 with an average before the intervention of 7.10 and decreased to 2.5 after the intervention. Likewise, for the control group, the average decrease was obtained from 7.25 to 3.7 after with *a p value* of 0.000. This showed a decrease in the average intensity of pain in the intervention group and the control group. The results of the statistical difference test of Man Whitney intervention variables given peppermint lotion and the control group given placebo lotion for 3 days obtained *a p value* of 0.013 which means that there is a difference between the intervention and control groups. The mean difference was 4.6 in the intervention group and 3.55 in the control group where the intervention group had a greater average decrease compared to the control group.

During menstruation, women sometimes experience pain. The nature and extent of pain varies, ranging from mild to severe. This condition is called dysmenorrhea, which is a state of severe pain that can interfere with daily activities. Dysmenorrhea is a symptomatic phenomenon including abdominal pain, cramps, and back pain. Gastrointestinal symptoms such as nausea and diarrhea can occur as menstrual symptoms. Primary dysmenorrhea is defined as menstrual pain without pelvic pathology characterized by recurrent lower abdominal pain, cramps during menstruation of which 50-90% affect women and some of

them describe moderate to severe pain (Kho & Shields, 2020). An increase in prostaglandins causes uterine contractions that restrict blood flow and lead to the production of anaerobic metabolites that stimulate pain receptors (Ferries-Rowe et al., 2020). Research using massage *peppermint oil* What has been done shows a significant reduction in the severity of dysmenorrhea p = 0.001. The duration of pain, anorexia, diarrhea and constipation and mood levels improved in the massage group *peppermint oil* Compared to placebo massage group(Rizk, 2013). Similar research has also been done using 2% peppermint oil massage in the suprapubic for 15 minutes was able to reduce menstrual pain significantly (p = 0.03) compared to regular massage (Amiri Farahani, L.; Heidari, T.; Roozbahani, N.; Attarha, M.; Akbari Torkestani, N.; Bekhradi, R.; Siyanaki, 2012).

Peppermint It is a plant that contains menthol, methone, cineol, limonene, and menthofuran obtained from fresh leaves *Peppermint* through steam distillation (Aronson, 2016). *Peppermint* Widely used as an analgesic to reduce joint pain, headache, cramps, digestive complaints, colonic spasms, primary dysmenorrhea, menstrual disorders, nausea and diarrhea (Agajani Delavar et al., 2019). *Peppermint* As an analgetic that has a powerful effect for pain relief mediated through the activity of kappa-opioid receptors that help block the transmission of pain signals. Research using capsules *Peppermint* To measure the severity of PMS symptoms, there was a decrease in PMS scores during the PMS scores of two menstrual cycles, from 30.3 ± 10.1 to 15.5 ± 6.0 in the group given peppermint capsules(Agajani Delavar et al., 2019). The use of peppermint and mefenamic acid was also able to reduce the intensity and duration of dysmenorrhea pain (p = 0.001) [7,] Several other studies using mint have also been conducted By giving a paste of 5gr mint leaves and honey on the first to the fifth day menstruation is obtained Statistically significant differences are noted in the mean Dysmenorrhoea pain score (P<0.05) in the group given mint paste and honey. In addition to capsules and pastes, peppermint is also often used in the form of essential oils that are used as warm compresses to reduce menstrual pain and also found that aromatherapy *Peppermint* With the warm compress method can relieve menstrual pain, symptoms, and duration(Kartikasari, 2020). The use of peppermint topically can provide a quick reaction in reducing pain in the suprapubic region which is the area of pain most often experienced by adolescents during menstruation. Based on this study *peppermint lotion* Able to reduce dysmenorrhea pain in adolescents with primary dysmenorrhea. *Peppermint lotion* which is processed through nanoemulsions makes the menthol content of *Peppermint* It absorbs into the skin faster and is effective for use. The use of peppermint to treat primary dysmenorrhea pain in real clinical practice also has the problem that there is no standard treatment procedure in each study, potential risks may exist because aromatherapy essential oils are an aggregate source of exposure to skin allergens (Dornic N, Ficheux AS, 2016).

Effect of *peppermint lotion* on cortisol levels in adolescents with primary dysmenorrhea

This study uses *peppermint lotion* 3% with 2 grams in one administration as much as 3 uses a day for 3 days then serum cortisol blood tests were carried out on the first and third days after the intervention. Based on the results of the study, the decrease in cortisol levels before and after in the intervention group was more significant with values *p value* 0.000 while in the control group the decrease was not significant with *p value* 0.052. The mean cortisol level in the intervention group before was 10.19 µg/dL and after the intervention decreased to 7.55 µg/dL. As for the control group, cortisol levels before 8.75 µg/dL and after became down 7.80 µg/dL. The mean difference in the intervention group was 2.64 µg/dL and the control group was 0.094 µg/dL where the greatest decrease was in the intervention group. From the results of the analysis *independent t test* Between the control group and the intervention group, scores were obtained *p value* 0.010 which means that there is a significant difference in cortisol

levels reduction between the intervention group and the control group. Primary dysmenorrhea has an influence on increasing blood cortisol levels, in accordance with research that has been conducted in the group of women who have dysmenorrhea have higher cortisol levels (7.2 g / dL) compared to the group that does not experience dysmenorrhea (6 g / dL) although still within normal limits and the results of bivariate analysis obtained p value = 0.148 so that it is said that there is no significant difference between serum cortisol levels of primary dysmenorrhea patients with who do not have primary dysmenorrhea(Ertandri et al., 2020). A study showed a positive relationship between psychological stress and dysmenorrhea p = 0.001(Ertiana, D., Akhyar, M. & Budihastuti, 2016). Stress can directly alter the pituitary setting of the hypothalamus which will lead to menstrual disorders such as dysmenorrhea and irregular menstrual patterns(Kural, M., Noor, N.N., Pandit, D., Joshi & A, 2015). However, until now biomarkers and the gold standard value for chronic stress screening have been debated due to their complex etiologic and diverse manifestations(Lee DY, Kim E, 2015). Peppermint was also able to overcome anxiety in cardiac catheter patients by using the peppermint oil inhalation method for 5 minutes obtained a significant difference before and after the intervention ($p < 0.001$) (Akbari et al., 2019).

Pain is usually felt 1-2 days before or when the menstrual period begins. It is recurrent and has a characteristic throbbing or cramping that disappears but is intense, but can also be dull pain that is persistent. Dysmenorrhea is a major public health problem because it has a negative impact on health, employment and psychosocial status (Arafa et al., 2018). Women with dysmenorrhea are considered to have cardiovascular risk factors because of the decrease *Heart Rate Variability* (HRV) in the form of increased sympathetic tone and decreased parasympathetic activity (Singh et al., 2013). Based on relevant research investigating the different impacts on the lives of women with or without dysmenorrhea, women with dysmenorrhea are prone to have higher levels of depression, anxiety, somatization, negative self-perception compared to those without dysmenorrhea (Zhao et al., 2021). Feelings of depression and anxiety felt during dysmenorrhea cause an increase in cortisol levels in the blood. Cortisol is a hormone made by two adrenal glands, which are hormone producers located above the kidneys which will then be released into the blood and flowed throughout the body. The best cortisol test time is done in the morning and is more accurate if the test is in the form of serum or blood plasma.

Peppermint essential oil Consisting of menthol, menthone, neomenthol and iso-menthone is a mixture of secondary metabolites that are active as anti-inflammatory, antibacterial, antiviral, scolilicide, immunomodulatory, antitumor activity, neuroprotective, antifatigue and antioxidant (Bardaweel et al., 2018). Antispasmodic properties of oil *Peppermint* Being the best virtue in reducing pain associated with the menstrual cycle (Ali et al., 2015),(Balakrishnan, 2015). Menthol can increase cellular energy metabolism by stimulating the central nervous system through stimulation of the adrenal cortex to increase energy, and lowering blood lactate levels. In addition, PEO can increase lung capacity in healthy conditions to deliver more oxygen to the brain and relieve fatigue effectively. Other effects of PEO increase mental freshness, eliminate anxiety, reduce pain and impulses and improve sleep quality, contributing to anti-fatigue activity. In this study, the use of *peppermint oil* In the form of lotions are able to significantly lower cortisol levels in adolescents with dysmenorrhea. *peppermint lotion* applied to the suprapubic area gives a comfortable effect so as to reduce complaints of pain felt during menstruation. If the pain can be overcome properly, the anxious condition due to menstrual pain can be reduced so that the hormone cortisol as a marker of anxiety can decrease. With the influence of this decrease in cortisol, at least it gives a calm effect to young women so that it does not interfere with daily activities

CONCLUSION

Administration of peppermint lotion for 3 days is effective for reducing pain intensity and cortisol levels in adolescents with primary dysmenorrhea.

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