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RESEARCH ARTICLE

Effect of *Rosmarinus officinalis L* inhalation on reducing primary dysmenorrhoea in female students of the Bali International University

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Abstract

Background: Primary dysmenorrhea is a symptom that occurs in the absence of genital organ abnormalities. Non-steroidal anti-inflammatory drugs (NSAIDs) can be used but may cause adverse reactions if used repeatedly without doctor supervision. This study aims to analyse the effect of rosemary aromatherapy inhalation on reducing primary dysmenorrhoea in female students of the Bali International University. **Method:** This experimental research with a pretest and posttest control group design was conducted in March 2021 among 56 female students of the Bali International University. Pain intensity was measured by the Numerical Rating Scale (NRS) scale. **Result:** The Mann Whitney test revealed a *p*-value = 0.0001, indicating that rosemary aromatherapy (-3.250) has a significant effect on reducing the intensity of menstrual pain compared to jojoba oil used as a placebo (0,928). **Conclusion:** This research could demonstrate that rosemary aromatherapy inhalation can reduce pain levels and be a non-pharmacological therapy option for primary dysmenorrhoea.

Introduction

Primary dysmenorrhoea is a symptom that occurs in the absence of significant genital organ abnormalities (Anurogo & Wulandari, 2011). Dysmenorrhoea is characterised by the excessive secretion of PGF2α, which increases the amplitude and frequency of uterine smooth muscle contractions and causes vasospasm in uterine arterioles leading to ischemia and lower abdominal cramps (Lowdermilk, Perry & Cashion, 2013). According to the Bali Provincial Health Office in 2014, the incidence of menstrual pain was 48.05% (Ministry of Health of the Republic of Indonesia, 2014).

Several interventions have been suggested to reduce the intensity of primary dysmenorrhoea, including non-pharmacological interventions, such as aromatherapy. The main components of Rosemary (*Rosmarinus officinalis L*), a plant with a refreshing and fragrant aroma often used in perfumes, are α-pinene, camphor, and 1,8-cineole. Camphor and 1,8-cineole can activate potassium (K^+) channels, which will lead to smooth muscle relaxation (Heghes *et al.,* 2019). Research comparing Rosemary and mefenamic acid demonstrated there was no significant difference between the two groups ($p > 0.05$), showing that Rosemary could significantly reduce pain and thus can be used as a non-pharmacological alternative in primary dysmenorrhoea (Tahoonian *et al.,* 2020). Therefore, this study was conducted to investigate the effect of Rosemary (*Rosmarinus officinalis L*) aromatherapy inhalation on reducing primary dysmenorrhoea in female students of the Bali International University.

Methods

This experimental study used a pre-test and post-test control group design approach, consisting of a control group and an intervention group selected randomly. The intervention group was given rosemary aromatherapy inhalation, while the control group in

this study was given jojoba oil as a placebo. Jojoba oil was chosen as a placebo because it does not have a specific odour; it is commonly used as a carrier oil and does not cause any effects. Research subjects were first informed of the purpose of the study then asked about their willingness to participate by filling out the informed consent form.

The research inclusion criteria were female students of the Bali International University who experienced primary dysmenorrhoea with moderate pain intensity, scored 4 to 6 on the Numerical Rating Scale (NRS) ranging from 0-10, aged 19 to 22 years, single, with regular menstrual cycles (with a menstruation of 3 to 8 days, and a cycle of 21 to 35 days), and willing to participate in the study. The exclusion criteria were female students allergic to aromatherapy, with a history of gynaecological issues, a heavy workload or activities, and using analgesics or other non-pharmacological therapies. Based on effect size (r = 0.30) and a test power of 0.70, the final number of participants who met the criteria was 56. The data collection tool included two parts. The first part gathered demographic information. The second part consisted of the 10-point NRS used to measure pain intensity, classified as no pain (0), mild (1-3), moderate (4-6), and severe (7-10). Since the NRS is a validated tool, there was no need for revalidation in determining the severity of pain (Hjermstad *et al.,* 2011). This study was approved by the Research Ethics Commission of the Medical Faculty of Udayana University/Sanglah Hospital Denpasar, research permit number 1413/UN14.2.2.VII.14/LT/2021.

Results

Characteristics of research subjects

As illustrated in Table I, most participants were 21 years old, 35.7% in the rosemary group and 42.9% in the jojoba group. Women aged 17 to 24 years experience primary dysmenorrhoea due to the optimisation of uterine functions; it will resolve after 30 (Fitriana, 2017). Most research subjects (82.1% in the intervention group and 78.6% in the placebo group) had a 7-day menstrual period. Menstruation (from the first to the last day of blood flow) lasts from 3-7 days (Samsulhadi, 2011). Also, 75% of the rosemary group and 82.1% of the jojoba group had a menstrual cycle of 30 days, categorised as normal (range from 21-35 days), with menstruations not exceeding 15 days (Anwar, 2011). All the participants did not take any action when experiencing menstrual pain and were not married.

Table I: Characteristics of the research subjects

Characteristics	Rosemary (N = 28)	(%)	Jojoba (N = 28)	(%)	*p-value*
Age (years)					
a. 19	3	10.7	3	10.7	
b. 20	7	25.0	6	21.4	0.993
c. 21	10	35.7	12	42.9	
d. 22	8	28.6	7	25.0	
Menstruation duration (days)					
a. 5	2	7.1	1	3.6	0.804
b. 6	3	10.7	5	17.9	
c. 7	23	82.1	22	78.6	
Menstrual cycle (days)					
a. 28	1	3.6	3	10.7	
b. 29	1	3.6	1	3.6	0.082
c. 30	21	75.0	23	82.1	
d. 31	5	17.9	1	3.6	
Actions					
a. Give a warm compress	0	0	0	0	1
b. Taken medicine	0	0	0	0	
c. Ignore it	28	100	28	100	
Marital status					
a. Not married yet	28	100	28	100	1
b. Married	0	0	0	0	

Test results of Rosemary and Jojoba oil aromatherapy effects

Table II shows the results of hypothesis testing using the Friedmann test. Based on the results, the significance value in the intervention group was 0.0001; therefore, it can be concluded that Rosemary could significantly reduce primary dysmenorrhoea. In the control group, the significance value was 0.455, indicating that inhaling jojoba oil does not affect the intensity of primary dysmenorrhoea.

Table II: *Friedmann* Test

Group	Hypothesis (H_0)	*p*-value
Intervention	The distribution of pre-test, post-test-1, post-test-2 and post-test-3 is the same	0.0001
Control		0.455

Test results of the effect of Rosemary and Jojoba oil aromatherapy in a certain period

As illustrated in Table III, the pre-test and post-test 1 results in the rosemary groups revealed a significance value of 0.0001<0.05, indicating a significant decrease in the intensity of dysmenorrhoea. In the jojoba oil group, the significance value obtained in the pre-test and post-test 1 was 0.004<0.05; therefore, it can be concluded that there was a significant difference in pain intensity between the test and placebo.

Table III: Post-hoc Bonferroni test

Period	Rosemary		Jojoba oil	
	Mean	Sig.	Mean	Sig.
Post-test II-Post-test III	0.107	1.000	0.071	1.000
Post-test I-Post-test III	0.178	1.000	-0.035	1.000
Post-test I-Post-test II	0.071	1.000	-0.107	1.000
Pre-test-Post-test III	3.214	0.0001	-0.892	0.002
Pre-test-Post-test II	3.107	0.0001	-0.964	0.001
Pre-test-Post-test I	3.035	0.0001	-0.857	0.004

Comparison of the effectiveness of Rosemary and placebo aromatherapy

The Mann Whitney test yielded a *p*-value = 0.000<0.05 (Table IV), indicating that rosemary aromatherapy could significantly reduce the intensity of menstrual pain compared to jojoba oil (placebo).

Table IV: Mann Whitney test

Group	Mean	*p*-value
Intervention	-3.250	0.0001
Control	0.928	

Discussion

Inhaled lavender aromatherapy can reduce tension due to stress that triggers increased pain in primary dysmenorrhoea, where the vapour molecules will directly hit the olfactory receptors in the nasal cavity (Akgül *et al.*, 2021). This study used rosemary aromatherapy. The inhalation method was chosen because it feels clean, does not leave residues like topicals, which can give discomfort, and avoid going through the process of absorbing cell membranes. The stimulatory effect of rosemary oil provides supporting evidence that brain wave activity, autonomic nervous system activity, and mood are significantly affected by inhaling rosemary oil (Sayorwan *et al.,* 2013).

A study conducted at the Islamic Azad University of Mashhad, Iran, on 82 female students aged 18-25 with primary dysmenorrhoea reported a decreased pain intensity on the first-day post hoc. The mean score for pain intensity was significantly lower in the rosemary group by 16.81 ± 10.96 ($p < 0.0001$) (Tahoonian *et al.,* 2020). The camphor and 1.8 cineole present in Rosemary inhibit Ca^{2+} channels through L-type VGCC currents in smooth muscle, leading to the myorelaxant and antispasmodic effect on smooth muscle. (Pereira *et al.,* 2018).

The Mann-Whitney test was conducted to compare the intervention group (Rosemary) and the control group (placebo). It yielded a p-value of 0.0001, indicating a significant effect of inhaled rosemary aromatherapy on reducing primary dysmenorrhoea compared to placebo among students of the Bali International University. Of the 28 participants who received the placebo, ten experienced an increase in pain intensity. This result shows that the administration of jojoba oil did not produce the expected treatment effect.

This study was based on previous research among a sample of women with primary dysmenorrhoea aged 18-29 and divided into four intervention groups and one placebo group (jojoba oil) of 28 participants each. Intervention groups were lavender inhalation, rosemary inhalation, lavender+rosemary inhalation, and mefenamic acid. The results showed a significant decrease in pain intensity only in the aromatherapy and mefenamic acid groups ($p < 0.0001$). As per the material safety data sheet (MSDS) at the time of the study, no side effects were reported for both the intervention group (rosemary aromatherapy) and the control group (jojoba oil) (Davari, Reihani, & Khoshrang, 2014).

Conclusion

This research could demonstrate that rosemary aromatherapy inhalation can reduce pain levels and be a non-pharmacological therapy option for primary dysmenorrhoea.

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