



**ROSEMARY AROMA AND WARM THERAPY FOR THE MANAGEMENT OF
PRIMARY DYSMENORRHEA: A COMFORT-BASED APPROACH AMONG
MIDWIFERY STUDENTS**

Nurry Ayuningtyas Kusumastuti^{1*}, Solihati²

¹Midwifery Program, Faculty of Health Science, Universitas Yatsi Madani, Jl. Aria Santika No.40A, Margasari, Karawaci, Tangerang, Banten 15114, Indonesia

²Nursing Program, Faculty of Health Science, Universitas Yatsi Madani, Jl. Aria Santika No.40A, Margasari, Karawaci, Tangerang, Banten 15114, Indonesia

*nurry@uym.ac.id

ABSTRACT

Adolescence is a crucial transitional stage characterized by reproductive system maturation and complex hormonal changes. One of the effects of these changes is primary dysmenorrhea, a common condition among adolescent females worldwide, including in Indonesia, with a prevalence ranging from 50% to 90%. This condition is caused by increased prostaglandin production, resulting in excessive uterine contractions, vasoconstriction, and ischemia, which lead to severe lower abdominal pain accompanied by nausea, fatigue, and reduced daily activity. This study aimed to apply warm compresses combined with rosemary essential oil as a non-pharmacological intervention to alleviate primary dysmenorrhea among midwifery students at Yatsi Madani University. The study employed a quasi-experimental design using a pre-test and post-test control group approach. The sample was selected using accidental sampling, with 16 students with dysmenorrhea in each group, resulting in a total of 32 participants. The intervention group received rosemary-aroma warm compresses based on a standard operating procedure. Pain intensity was measured using the Visual Analogue Scale (VAS). Data were analyzed using the non-parametric Mann-Whitney test to determine differences between the control and intervention groups. The application of warm compresses with rosemary essential oil showed a decrease in dysmenorrhea pain intensity scores compared to the control group, indicating that the combination therapy effectively reduced menstrual pain levels by p-value 0.001. Warm compress therapy combined with rosemary essential oil can serve as an effective, simple, and safe non-pharmacological intervention for managing primary dysmenorrhea among young women. This approach not only reduces pain intensity but also improves comfort and daily functioning.

Keywords: essential oil rosemary; midwifery; pain management; primary dysmenorrhea management; warm therapy

How to cite (in APA style)

Kusumastuti, N. A., & Solihati, S. (2026). Rosemary Aroma and Warm Therapy for the Management of Primary Dysmenorrhea: A Comfort-Based Approach among Midwifery Students. *Indonesian Journal of Global Health Research*, 8(5), 397–406. <https://doi.org/10.37287/ijghr.v8i5.1943>.

INTRODUCTION

Adolescence is a complex transitional period from childhood to adulthood, characterized by dynamic biological, psychological, and social changes (Furwasyih et al., 2021). One of the most significant biological changes in adolescent females is the maturation of the reproductive system, marked by menarche, or the first menstruation (Safitri et al., 2023). On a monthly basis, women aged 12–49 years who are not pregnant and have not yet reached menopause generally experience menstruation, which is a normal physiological process for healthy females.

Physiologically, menstruation is regulated by ovarian hormones, mainly estrogen and progesterone, which control the endometrial cycle of the uterus (Lail, 2019); (Novia & Puspitasari, 2018). Prior to menstruation, a sharp decline in progesterone triggers endometrial desquamation and menstrual bleeding. However, in some adolescents, hormonal changes may become imbalanced. Excessive production of prostaglandin F2 α in the endometrium can lead to excessive uterine smooth muscle contractions, vasoconstriction (ischemia), and result in menstrual pain, known as primary

dysmenorrhea (Dawood, 2006). Dysmenorrhea is one of the most common health problems experienced by adolescent females worldwide, including in Indonesia. Pain typically begins on the first day of menstruation and may last 1–3 days (Roger P Smith & MDAndrew M Kaunitz, 2022), radiating to the back and thighs, and occurs before and during menstruation (Nagy & Khan, 2022). The pain is usually not associated with increased menstrual blood volume, and peak pain often occurs when bleeding is still light (Novia & Puspitasari, 2018). Other symptoms include nausea, fatigue, and disruption of daily activities, including studying or working (Tahoonian-Golkhatmy et al., 2019) (Nuzula & Oktaviana, 2019).

Adolescents' neuroendocrine systems are not yet fully stable, making them more vulnerable to dysmenorrhea due to hypersensitivity to prostaglandins and uterine contractions (Dawood, 2006). In addition, inactive lifestyles, academic stress, and unbalanced diets exacerbate symptoms (Sinaga et al., 2017). This condition significantly affects adolescent females' quality of life, including decreased concentration, school or class absenteeism, sleep disturbances, and emotional disruption. Therefore, safe, effective, and easily implemented interventions are needed to help adolescents manage menstrual pain independently and holistically (Delfina et al., 2020). However, the symptoms experienced by adolescents are often subjective (Hidayah & Fatmawati, 2019). The global prevalence ranges between 50–90% among adolescents and students, making it a significant reproductive health concern (Tahoonian-Golkhatmy et al., 2019). For adolescents, dysmenorrhea primarily causes lower abdominal pain, accompanied by headaches, cramps, weakness, and constipation. Dysmenorrhea occurs due to excessive prostaglandin production in the secretory phase of the endometrium, causing uterine hypertonus and vasoconstriction in the myometrium, leading to ischemia, endometrial breakdown, bleeding, and pain.

Management of dysmenorrhea is particularly important for adolescents because untreated dysmenorrhea can impair their daily functioning. Pain relief can be achieved through pharmacological methods, such as analgesics, or non-pharmacological interventions (Hidayah & Fatmawati, 2019). One common non-pharmacological method is applying a warm compress to the lower abdomen. Many adolescent females are still insufficiently trained in managing dysmenorrhea. According to a study by Azizahtun Rahmah and Rufaida Nur Fitriana (2022) on the effect of simulation in applying hot compress therapy for dysmenorrhea in adolescents at MTs N 3 Karanganyar, most respondents had low skills before training, with 45 students (86.5%) categorized as inexperienced, 6 students (11.5%) as moderately skilled, and 1 student (1.9%) as professional (Anggraini & Kusnanto, 2023). This indicates that warm compress therapy helps alleviate dysmenorrhea symptoms.

An effective therapy that can reduce uterine contractions, relax muscles, and improve blood flow can be achieved by combining warm compresses with rosemary-scented essential oil. Warm therapy works by increasing local vasodilation, reducing uterine smooth muscle spasms, and decreasing pain transmission via nerve fibers. According to (Martinus Sihombing et al., 2022), the effects of warm compresses are comparable to mild analgesics, such as ibuprofen, according to several clinical studies. The use of warm compresses with added rosemary essential oil can be performed independently without assistance (Anggraini & Kusnanto, 2023). Heat from the compress is conducted to the lower abdomen, providing comfort and reducing pain experienced by women with primary dysmenorrhea. Warm compress therapy is efficient and effective in decreasing menstrual pain (Mastaida Tambun & Martaulina Sinaga, 2022).

Rosemary essential oil contains active compounds, including 1,8-cineole, which acts as an anti-inflammatory and mild analgesic; camphor, which relaxes muscles and relieves spasms; and α -pinene and borneol, which improve circulation and have a calming effect. The mechanism of rosemary essential oil supports pain relief by inhibiting inflammatory mediators and calming the central nervous system (Al-Maharik et al., 2022).

Given the negative impact of dysmenorrhea on health, psychological well-being, and daily activities, this study focuses on implementing warm compress therapy with rosemary essential oil to address primary dysmenorrhea in midwifery students at Yatsi Madani University. The urgency of this study stems from the recurring nature of dysmenorrhea during each menstrual cycle, which reduces daily physical activity and overall quality of life. The aim of this study to apply warm compresses combined with rosemary essential oil as a non-pharmacological intervention to alleviate primary dysmenorrhea among midwifery students at Yatsi Madani University.

METHOD:

Research design

This study employed a quantitative approach using a quasi-experimental design with a pre-test and post-test control group design. This design allows for assessing the effect of applying warm compresses with rosemary essential oil on primary dysmenorrhea in adolescent females with normal menstrual cycles.

Setting and Sample/Participants

The study was conducted at Yatsi Madani University over a period of 1 month in Oktober 2025. The population consisted of all midwifery students at Yatsi Madani University, totaling 81 students. The sample was selected using accidental sampling, with 16 students in each group, resulting in a total of 32 participants. Group 1 served as the intervention group, while Group 2 served as the control group without any intervention. Both groups completed pre-test and post-test observation forms. Inclusion criteria were midwifery students at Yatsi Madani University (UYM), students experience dysmenorrhea, and students not currently taking any medication. Exclusion criteria were midwifery students at UYM who are on leave, students who are unwilling to participate as respondents, and student with secondary dysmenorrhea.

Intervention

The intervention involved applying a warm compress with rosemary essential oil to the lower abdomen for approximately 15 minutes, once during the first day of menstruation when pain was felt. The compress consisted of a towel soaked in warm water at 38–42°C, to which 5 drops of rosemary essential oil (*Rosmarinus officinalis*) were added in 500 ml of warm water. The control group received no intervention throughout the study period.

Measurement and Data Collection

The independent variable was the warm compress with rosemary essential oil. The dependent variable was the level of dysmenorrhea pain, operationally defined as the intensity of pain experienced by the respondents, measured using the Visual Analogue Scale (VAS), ranging from 0 (no pain) to 10 (very severe pain). The warm compress was administered according to a standard operating procedure, and pain levels were recorded pre- and post-intervention using the VAS.

Data analysis

Data were analyzed using a non-parametric test, specifically the Mann–Whitney U test, to determine differences between the intervention and control groups.

Ethical considerations

This study was conducted in accordance with ethical principles for human research. Prior to participation, all respondents were provided with detailed information regarding the study's purpose, procedures, benefits, and potential risks. Written informed consent was obtained from all participants. Confidentiality and anonymity of respondents were strictly maintained throughout the study. Participants had the right to withdraw from the study at any time without any consequences. The study protocol was approved by the Research Ethics Committee of Yatsi Madani University with approval letter number 571/LPPM-UYM/VIII/2025.

RESULT

The results of this study describe in this tables.

Table 1.
Frequency Distribution of Student Characteristics (n=32)

Student Characteristics	f	%
Age		
Middle adolescence (17-18 years)	5	15.6
Late adolescence (19-20 years)	24	75
Early adulthood (21-25 years)	3	9.4

Frequency distribution of student characteristics in table 1. based on age showed that the most participants were in the late adolescence category (19-20 years) were 24 respondents (75%), while the fewest were in early adulthood category (21-25 years) were 3 respondents (9.4%).

Table 2.
Rosemary Aroma and Warm Therapy

Rosemary Aroma and Warm Therapy	f	%
Intervention	16	50
Control	16	50

Table 2. showed that in this study decided into two groups and each group consist of 16 respondents for intervention groups that gave rosemary aroma and warm therapy and 16 respondents for control groups.

Table 3.
Frequency Distribution of Intensity Pain of Dysmenorrhea

Intensity Pain	Pre-Test		Post-Test	
	f	%	f	%
Intervention				
No Pain			2	12.5
Mild Pain	7	43.8	11	68.8
Moderate Pain	6	37.5	3	18.8
Severe Pain	3	18.8	0	0
Control				
No Pain	0	0	0	0
Mild Pain	2	12.5	3	18.8
Moderate Pain	10	62.5	10	62.5
Severe Pain	4	25	3	18.8

Table 3. showed that in the intervention group, during the pre-test, most respondents experienced mild dysmenorrhea pain intensity (7 respondents, 43.8%), while the fewest experienced severe pain intensity (3 respondents, 18.8%). After the intervention (post-test), the majority of respondents reported mild pain intensity (11 respondents, 68.8%), followed by moderate pain intensity (3 respondents, 18.8%). In the control group, during the pre-test, most respondents experienced moderate pain intensity (10 respondents, 62.5%), while the fewest experienced mild pain intensity (2 respondents, 12.5%). In the post-test, the majority still reported moderate pain intensity (10 respondents, 62.5%), while severe pain intensity was experienced by 3 respondents (18.8%).

Table 4.
Mann-Whitney U Test

Variable Group	n	Mean	Median	SD	p-value
Intervention	16	0.68	1.00	0.70	0.001
Control	16	0.12	0.00	0.61	

The variables in this study were warm compress combined with rosemary essential oil and intensity of dysmenorrhea. Based on Mann-Whitney U Test different test on sleep quality, it showed that $p < 0.001$ and it means variables in this study were significant differences between intervention and control groups. The median $\pm$ SD value in the intervention group was 1.00 ± 0.70 , while in the control group it was 0.00 ± 0.61 .

DISCUSSION

This study demonstrated that the application of a warm compress combined with rosemary essential oil significantly reduced ($p\text{-value} < 0.001$) the intensity of primary dysmenorrhea among midwifery

students at Universitas Yatsi Madani compared to the control group that did not receive any intervention. The decrease in Visual Analogue Scale (VAS) scores after the intervention indicates the effectiveness of this non-pharmacological combination therapy as a simple, safe, and self-applicable menstrual pain management method for adolescents and young women.

This result relevant with study of Septira (2022) about showed significant decreases in pain intensity ($p = 0.001$). Primary dysmenorrhea refers to menstrual pain that occurs without any underlying pelvic pathology, commonly resulting from hormonal imbalance during the menstrual cycle. Physiologically, at the end of the luteal phase, progesterone and estrogen levels sharply decrease due to the absence of fertilization. This hormonal decline triggers corpus luteum lysis, vasoconstriction of spiral arterioles, and ischemia of the endometrial tissue, followed by the shedding of the functional endometrial layer or menstruation. During this process, the endometrium releases chemical mediators particularly prostaglandins ($\text{PGF}_2\alpha$ and PGE_2) which play a crucial role in the onset of pain (Wang et al., 2024). Elevated prostaglandin $\text{F}_2\alpha$ levels induce excessive uterine smooth muscle contractions, vasoconstriction, and reduced uterine blood flow, leading to ischemia and sharp lower abdominal pain (Ryan et al., 2023).

In addition to prostaglandins, other mediators such as leukotrienes, vasopressin, and endothelin also contribute to dysmenorrhea by enhancing uterine contractility and amplifying pain perception. Pain impulses resulting from these contractions are transmitted via sympathetic nerve fibers to the spinal cord segments T10–L1 and then to the brain, producing the characteristic pain radiating to the lower back and thighs. Psychological factors such as stress and fatigue may exacerbate pain perception through neuroendocrine system activation (Jain et al., 2022).

Risk factors such as adolescence, nulliparity, early menarche, irregular menstrual cycles, and sedentary lifestyle further increase the likelihood of primary dysmenorrhea. Clinically, the pain usually begins one to two days before menstruation or on the first day, often accompanied by systemic symptoms such as nausea, vomiting, fatigue, and sleep disturbances. Pain typically subsides by the second or third day of menstruation as prostaglandin levels decline (Kusumastuti & Suarsih, 2023; Thiyagarajan et al., 2024).

The primary mechanism of dysmenorrhea is thus rooted in progesterone withdrawal, which triggers increased prostaglandin synthesis through the arachidonic acid pathway, resulting in strong uterine contractions, vasoconstriction, and tissue ischemia that cause pain. Understanding this pathophysiology forms the basis for developing non-pharmacological therapies, such as the rosemary-infused warm compress, which promotes vasodilation, reduces smooth muscle spasms, and inhibits pain transmission through relaxation and anti-inflammatory effects (Ryan et al., 2023).

Primary dysmenorrhea not only causes physical discomfort but also significantly impacts the quality of life among adolescent females. Pain in the lower abdomen, back, and thighs is often accompanied by nausea, dizziness, fatigue, and sleep disturbances, all of which interfere with daily activities, academic performance, and social interactions. Studies have shown that adolescents with dysmenorrhea have higher absenteeism rates and lower concentration and productivity (Fernandez et al., 2020). Recurrent monthly pain may also lead to psychological distress, including stress, anxiety, and irritability, which can amplify pain perception through psychosomatic mechanisms and hypothalamic–pituitary–adrenal (HPA) axis activation. In the long term, these disturbances may impair emotional well-being, sleep quality, and reproductive hormonal balance (Thiyagarajan et al., 2024). Therefore, primary dysmenorrhea management should be comprehensive and holistic, addressing both physical and emotional aspects to improve quality of life (Macgregor et al., 2023).

Warm compress therapy is a proven non-pharmacological intervention for alleviating dysmenorrhea. The primary mechanism involves inducing vasodilation in the abdominal area,

thereby improving blood and oxygen flow to ischemic uterine tissues. Enhanced circulation reduces the local accumulation of prostaglandins responsible for uterine contractions and pain (Martinus Sihombing et al., 2022). Moreover, heat stimulation activates sensory nerve fibers (mechanoreceptors and thermoreceptors), which inhibit pain signal transmission to the spinal cord via the gate control mechanism, resulting in pain relief and relaxation (Hairunisyah et al., 2023).

The rosemary essential oil (*Rosmarinus officinalis*) used in this study was derived from pure organic sources without synthetic chemical additives, ensuring safety for the skin and respiratory system. Rosemary oil contains active compounds such as 1,8-cineole, camphor, α -pinene, and borneol, which possess anti-inflammatory, analgesic, and muscle-relaxant properties. Specifically, 1,8-cineole inhibits the production of inflammatory mediators such as prostaglandins and leukotrienes, while camphor and borneol act on the central nervous system by stimulating GABA receptors, producing calming and stress-relieving effects (Fernandez et al., 2020).

Adding rosemary essential oil enhances this effect through its analgesic and anti-inflammatory properties. Several recent studies support rosemary's pain-relieving potential. The study of (Nakisa & Rahbardar, 2022) showed that rosemary contains active compounds such as carnosic acid, carnosol, and rosmarinic acid, which possess anti-inflammatory and antinociceptive properties. Inhalation aromatherapy with rosemary essential oil also significantly reduced primary dysmenorrhea in female students in Bali (Sutema et al., 2022).

A 2021 meta-analysis of 15 trials concluded that aromatherapy (especially when combined with massage) significantly alleviates menstrual pain compared to control or placebo (Najafi et al., 2021). Therefore, the findings of this study are consistent with prior evidence that both warm therapy and rosemary aromatherapy effectively relieve menstrual cramps. This study is relevant to the theory of gate control proposed by Melzack and Wall (1965) in pain modulation, which suggests that non-pharmacological stimulation such as heat and pleasant sensory input can "close the pain gate" at the spinal level, thereby reducing pain perception. The warm compress provides thermal stimulation that activates large nerve fibers, while the aroma of rosemary essential oil stimulates relaxation and decreases pain transmission. Together, these mechanisms support the observed decrease in dysmenorrhea intensity among the participants (Ginting & Widuri, 2023).

The combination of heat from the compress and the therapeutic properties of organic rosemary oil creates an optimal synergistic effect. Heat enhances the penetration of active rosemary compounds into the skin and superficial blood vessels, while the aroma provides a calming aromatherapeutic effect through activation of the brain's limbic system (Micić et al., 2021). This synergy results in uterine muscle relaxation, reduced pain intensity, improved circulation, and emotional stress reduction commonly associated with dysmenorrhea. Additionally, this therapy is environmentally friendly, easy to apply independently, and free from adverse effects associated with pharmacological analgesics (Xu et al., 2024).

These findings are consistent with the systematic review and meta-analysis by Najafi et al. (2021) (Najaf Najafi et al., 2021), which reported that aromatherapy and heat-based interventions significantly reduce menstrual pain intensity among adolescents and young adults. The meta-analysis revealed that aromatherapy—especially when combined with topical application or massage—was more effective than inhalation alone. Similarly, evidence on heat therapy showed consistent clinical benefits in pain reduction. This study adds to the existing literature by presenting a unique combination of warm compress and rosemary essential oil, which has been less frequently investigated quantitatively.

Comparable results were found in the study by (Khotimah et al., 2021), which examined the effectiveness of lemongrass aromatherapy effleurage massage in reducing menstrual pain. Both

studies share a non-pharmacological approach aimed at enhancing relaxation, improving blood circulation, and reducing prostaglandin levels as the primary pain mediators. In this research, gentle effleurage massage stimulated large nerve fibers to suppress pain transmission to the brain in accordance with gate control theory. Meanwhile, the present study utilized heat to achieve a similar effect through vasodilation and inhibition of peripheral pain conduction. While lemongrass contains citral and geraniol with analgesic and antispasmodic effects, rosemary offers 1,8-cineole, camphor, and α -pinene, which exhibit anti-inflammatory and smooth muscle relaxation properties. Despite differences in essential oil composition, both modalities effectively alleviate pain through physiological and psychological mechanisms. These findings reinforce the view that natural, chemical-free therapies offer safe and comfortable alternatives for young women experiencing dysmenorrhea. Moreover, such simple and self-administered treatments can help manage menstrual pain without reliance on pharmacological analgesics, contributing to sustainable and holistic reproductive health care.

CONCLUSION

This study demonstrates that combining warm compresses with rosemary essential oil is an effective and comfortable to reduce primary dysmenorrhea pain among midwifery students. The synergy between the thermal effect (vasodilation and muscle relaxation) and rosemary's bioactive compounds (anti-inflammatory and analgesic effects) underlies the observed results. The findings of this study have significant implications for midwifery education and clinical practice. The combination of warm compresses and rosemary essential oil can be introduced as a non-pharmacological intervention in managing primary dysmenorrhea, especially for students and women in reproductive age groups. As future midwives, students need to understand evidence-based and holistic approaches to women's health. Incorporating this technique into the curriculum can enhance their knowledge and skills in complementary pain management strategies. Moreover, this method aligns with midwifery principles of promoting natural and safe care. It empowers women to take an active role in managing menstrual pain without relying on pharmacological agents, thus reducing potential side effects and promoting self-care behaviour.

Recommendations for further research to validate the findings, future studies should compare multiple groups (warm compress only, rosemary only, placebo, and combination) with Randomized Controlled Trials (RCTs) to confirm efficacy, ensure safety, and establish standardized usage guidelines. Implementing this simple intervention in midwifery health education may empower students to manage menstrual pain naturally and independently. Furthermore, researcher would develop guidelines or standard operating procedures (SOPs) for using warm compresses with essential oils as part of holistic reproductive care.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Institute for Research and Community Service (LPPM) of Universitas Yatsi Madani for providing internal research grant funding that made this study possible.

REFERENCES

- Al-Maharik, N., Jaradat, N., Hawash, M., Al-Lahham, S., Qadi, M., Shoman, I., Jaber, S., Rahem, R. A., Hussein, F., & Issa, L. (2022). Chemical Composition, Antioxidant, Antimicrobial and Anti-Proliferative Activities of Essential Oils of *Rosmarinus officinalis* from five Different Sites in Palestine. *Separations*, 9(11). <https://doi.org/10.3390/separations9110339>
- Anggraini, F. N., & Kusnanto, K. (2023). Pengaruh Edukasi Metode Simulasi Pemberian Kompres Hangat Terhadap Keterampilan Remaja Dalam Penanganan Dismenorea di Kelas 11 SMKS Pelita Alam . *Innovative: Journal Of Social Science Research*, 3(3 SE-Articles), 9320–9334. <https://j-innovative.org/index.php/Innovative/article/view/3241>

- Dawood, M. (2006). Primary Dysmenorrhea: Advance in Pathogenesis and Management. The American Collage of Obstetricians and Gynecologist (ACOG).
- Delfina, R., Saleha, N., & Sardaniah, S. (2020). Pengaruh Kompres Hangat terhadap Penurunan Nyeri Haid (Dismenore) pada Mahasiswi Program Studi DIII Keperawatan FMIPA Universitas Bengkulu. *Jurnal Vokasi Keperawatan (JVK)*, 3(1), 13–19. <https://doi.org/10.33369/JVK.V3I1.11402>
- Fernandez, H., Barea, A., & Chanavaz-Lacheray, I. (2020). Prevalence, intensity, impact on quality of life and insights of dysmenorrhea among French women: A cross-sectional web survey. *Journal of Gynecology Obstetrics and Human Reproduction*, 49(10). <https://doi.org/10.1016/J.JOGOH.2020.101889>
- Furwasyih, D., Arifin, Y., & Femi, N. (2021). Identifikasi Kecemasan Mahasiswa Kebidanan terhadap Pembelajaran Daring dalam Masa Pandemi COVID-19. *Jurnal Kebidanan Harapan Ibu Pekalongan*, 8(2), 114–121. <https://doi.org/10.37402/jurbidhip.vol8.iss2.142>
- Ginting, D. Y., & Widuri, M. (2023). The Effect of Warm Compress on Reducing Dymenorrhic Pain: Literature Review. *Jurnal Kebidanan Kestra (Jkk)*, 6(1), 112–117. <https://doi.org/10.35451/jkk.v6i1.1877>
- Hairunisyah, R., Anggraini, T., & Anggraini, D. K. (2023). Pengaruh Kompres Hangat terhadap Intensitas Nyeri Menstruasi Mahasiswa. *Jurnal Ilmu Keperawatan Dan Kebidanan*, 14(1), 112–119.
- Hidayah, N., & Fatmawati, R. (2019). Manajemen Nyeri Haid Pada Remaja. *Analytical Biochemistry*, 11(1), 1–5.
- Jain, V., Chodankar, R. R., Maybin, J. A., & Critchley, H. O. D. (2022). Uterine bleeding: how understanding endometrial physiology underpins menstrual health. *Nature Reviews Endocrinology*, 18(5), 290–308. <https://doi.org/10.1038/S41574-021-00629-4>;SUBJMETA
- Khotimah, N., Kusumastuti, N. A., & Wibisono, H. A. Y. . (2021). Efektifitas Effleurage Massage Aromatherapy Lemongrass Terhadap Tingkat Nyeri Haid. *Jurnal Citra Keperawatan*, 9(2), 96–103. <https://doi.org/10.31964/jck.v9i2.202>
- Kusumastuti, N. A., & Suarsih, A. (2023). Analisis Status Gizi, Siklus Menstruasi, dan Konsumsi Rokok Elektrik terhadap Nyeri Dismenorea pada Wanita Usia Subur. *Sang Pencerah: Jurnal Ilmiah Universitas Muhammadiyah Buton*, 9(3), 556–564. <https://doi.org/10.35326/pencerah.v9i3.2732>
- Lail, N. H. (2019). Hubungan Status Gizi, Usia Menarche dengan Dismenorea pada Remaja Putri Di SMK K Tahun 2017. *Jurnal Ilmiah Kebidanan Indonesia*, 9(02), 88–95. <https://doi.org/10.33221/jiki.v9i02.225>
- Macgregor, B., Allaire, C., Bedaiwy, M. A., Yong, P. J., & Bougie, O. (2023). Disease Burden of Dysmenorrhea: Impact on Life Course Potential. *International Journal of Women's Health*, 15(April), 499–509. <https://doi.org/10.2147/IJWH.S380006>
- Martinus Sihombing, F. D., Gunawan, D., & Permata Putri, M. (2022). Pengaruh Pemberian Kompres Hangat Terhadap Penurunan Derajat Dismenore Pada Siswi Mas Ushuluddin Kota Singkawang. *Zona Kedokteran: Program Studi Pendidikan Dokter Universitas Batam*, 12(2), 97–106. <https://doi.org/10.37776/zked.v12i2.1019>
- Mastaida Tambun, & Martaulina Sinaga. (2022). Pengaruh Kompres Hangat Terhadap Dismenore saat Menstruasi pada Siswa Puteri Klas XI SMK N. 8. *SEHATMAS: Jurnal Ilmiah Kesehatan Masyarakat*, 1(3), 363–372. <https://doi.org/10.55123/sehatmas.v1i3.668>
- Micić, D., Đurović, S., Riabov, P., Tomić, A., Šovljanski, O., Filip, S., Tosti, T., Dojčinović, B., Božović, R., Jovanović, D., & Blagojević, S. (2021). Rosemary essential oils as a promising source of bioactive compounds: Chemical composition, thermal properties, biological activity, and gastronomical perspectives. *Foods*, 10(11), 2734. <https://doi.org/10.3390/FOODS10112734/S1>
- Nagy, H., & Khan, M. A. (2022). Dysmenorrhea. *StatPearls*. <https://www.ncbi.nlm.nih.gov/books/NBK560834/>

- Najaf Najafi, M., Najaf Najafi, N., Rashidi Fakari, F., Moeindarbary, S., Abdi, F., Sadat Hoseini, Z., & Ghazanfarpour, M. (2021). The Effect of Aromatherapy Alone or in Combination with Massage on Dysmenorrhea: A Systematic Review and Meta-analysis. *RBGO Gynecology & Obstetrics*, 43(12), 968. <https://doi.org/10.1055/S-0041-1740210>
- Nakisa, N., & Rahbardar, M. G. (2022). Therapeutic Potential of Rosemary (*Rosmarinus officinalis* L.) on Sports Injuries: a Review of Patents. *Research Journal of Pharmacognosy*, 9(3), 71–83. <https://doi.org/10.22127/rjp.2022.329094.1844>
- Novia, I., & Puspitasari, N. (2018). Faktor Risiko Yang Mempengaruhi Kejadian Kusta. *The Indonesian Journal of Public Health*, 4(2), 96–104.
- Nuzula, F., & Oktaviana, M. N. (2019). Faktor-Faktor yang Mempengaruhi Kejadian Dismenore Primer pada Mahasiswi Akademi Kesehatan Rustida Banyuwangi. *Jurnal Ilmiah Kesehatan Rustida*, 6(1), 593–605. <https://doi.org/10.55500/jikr.v6i1.67>
- Roger P Smith, & MDAndrew M Kaunitz. (2022). Patient education: Painful menstrual periods (dysmenorrhea) (Beyond the Basics) - UpToDate. <https://www.uptodate.com/contents/painful-menstrual-periods-dysmenorrhea-beyond-the-basics>
- Ryan, S. A., De Sanctis, V., Rigon, F., Bernasconi, S., Bianchin, L., Bona, G., Bozzola, M., Buzi, F., De Sanctis, C., Tonini, G., Radetti, G., Perissinotto, E., Vilšinskaitė, D. S., Vaidokaitė, G., Mačys, Ž., Bumbulienė, Ž., Kanchibhotla, D., Subramanian, S., Singh, D., ... Khan, M. A. B. (2023). Dysmenorrhea. *Indian Journal of Pediatrics*, 13(2), 90–96. <https://www.ncbi.nlm.nih.gov/books/NBK560834/>
- Safitri, I., Fitria, N. E., & Furwasyyih, D. (2023). Pengaruh Pemberian Kompres Hangat Terhadap Nyeri Menstruasi (Dismenore) Pada Remaja Putri Di SMA N 7 Kerinci Tahun 2023. *Menara Ilmu : Jurnal Penelitian Dan Kajian Ilmiah*, 1(1), 46–52.
- Sinaga, E., Sarbanon, N., Suprihatin, Sa'adah, N., Salamah, U., Murti, Y. A., Trisnamiati, A., & Lorita, S. (2017). Manajemen Kesehatan Menstruasi. *Jurnal Sains Dan Seni ITS*, 6(1), 51–66.
- Tahoonian-Golkhatmy, F., Abedian, Z., Emami, S. A., & Esmaily, H. (2019). Comparison of rosemary and mefenamic acid capsules on menstrual bleeding and primary dysmenorrhea: A clinical trial. *Iranian Journal of Nursing and Midwifery Research*, 24(4), 301–305. https://doi.org/10.4103/ijnmr.IJNMR_99_18
- Thiyagarajan, D. K., Basit, H., & Jeanmonod, R. (2024). Physiology, Menstrual Cycle. *StatPearls*. <https://www.ncbi.nlm.nih.gov/books/NBK500020/>
- Wang, Y., Chen, J., Zhang, Z., Ding, X., Gan, J., Guo, Y., Liang, W., Wang, Y., Deng, Y., & Sun, A. (2024). Exploration of new models for primary dysmenorrhea treatment: low-power visible-light-activated photodynamic therapy and oral contraceptives. *Frontiers in Medicine*, 11(May), 1–8. <https://doi.org/10.3389/fmed.2024.1388045>
- Xu, J., Li, T., Li, F., Qiang, H., Wei, X., Zhan, R., & Chen, Y. (2024). The applications and mechanisms of *Rosmarinus officinalis* L. in the management of different wounds and UV-irradiated skin. *Frontiers in Pharmacology*, 15(January), 1–13. <https://doi.org/10.3389/fphar.2024.1461790>

