International Journal of Advanced Health Science and Technology
Homepage: ijahst.org
e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 no.3, pp. 164-170, June 2025
RESEARCH ARTICLE
OPEN ACCESS
Manuscript received Mei 05, 2025; revised May 08, 2025; accepted May 10, 2025; date of publication June 01, 2025
Digital Object Identifier (DOI): https://doi.org/10.35882/ijahst.v5i3.467

How to cite: Nurmalaya Farzana Silmi, Minarti, Sari Luthfiyah, and Joko Suwito, "The Effect of Dysmenorrhea Exercise and Warm Compress with Warm water zak on Reducing the Intensity of Dysmenorrhea Pain", International Journal of Advanced Health Science and Technology, vol. 5, no. 3, pp. 164-170, June 2025

The Effect of Dysmenorrhea Exercise and Warm Compress with Warm water zak on Reducing the Intensity of Dysmenorrhea Pain

Nurmalaya Farzana Silmi[1], Minarti[1], Sari Luthfiyah[1], and Joko Suwito[1], Aini Ahmad[2]

[1]Department of Nursing, Polytechnic of the Ministry of Health Surabaya, Surabaya, Indonesia
[2]Department of Nursing, KPJ Healthcare University College, Negeri Sembilan, Malaysia

Corresponding author: Nurmalaya Farzana Silmi (e-mail: nurmalaya20@gmail.com)

ABSTRACT Dysmenorrhea remains a prevalent health concern among women of reproductive age, often causing significant discomfort and impairment in daily activities. Despite its widespread occurrence, the management of primary dysmenorrhea remains challenging, emphasizing the need for effective non-pharmacological interventions. This study aims to evaluate the efficacy of a combined approach involving dysmenorrhea-specific gymnastics and warm compress therapy utilizing Warm Water Zak (WWZ) in reducing the intensity of dysmenorrheal pain among level IV students enrolled in a Bachelor of Applied Nursing program. Employing a quasi-experimental design with a pretest-posttest control group, the research involved a total of 32 participants randomly assigned to four groups. Data collection was conducted using a Numeric Rating Scale (NRS) for pain assessment, alongside adherence to standardized procedures for the gymnastics and warm compress interventions. Normality and homogeneity of data were verified using the Shapiro-Wilk and homogeneity tests, respectively, followed by analysis of variance (ANOVA) and post hoc comparisons to determine treatment effects. Results demonstrated a statistically significant reduction in pain intensity within the groups receiving dysmenorrhea gymnastics, warm compresses with WWZ, and notably, their combination, with the most pronounced decrease observed in the combined intervention group. The findings suggest that the synergistic effect of these non-pharmacological methods effectively alleviates primary dysmenorrhea pain. Consequently, integrating these interventions into routine care protocols is recommended to enhance comfort, reduce dependence on analgesic medications, and promote holistic well-being among women experiencing dysmenorrhea.

INDEX TERMS dysmenorrhea, non-pharmacological interventions, warm compress, dysmenorrhea gymnastics, pain reduction

I. INTRODUCTION

Dysmenorrhea, characterized by painful menstruation, remains one of the most common gynecological complaints among women of reproductive age, affecting approximately 50-90% of adolescent and young adult females globally [1], [2]. Despite its high prevalence, dysmenorrhea significantly impacts physical, psychological, and social functioning, leading to absenteeism from school or work, decreased productivity, and diminished quality of life [3], [4]. The pathology primarily involves increased prostaglandin production, resulting in uterine contractions and pain [5]. Although pharmacological approaches, such as NSAIDs and hormonal therapy, are considered first-line treatments, their usage often causes adverse effects, and some women prefer non-pharmacological options [6], [7]. Furthermore, in many settings, access to medications remains limited, necessitating alternative care strategies.

Current management strategies encompass lifestyle modifications, physical activity, dietary adjustments, and the application of complementary therapies. Among these, non-pharmacological interventions including exercise, relaxation techniques, and thermotherapy have gained considerable attention due to their safety profiles and potential for empowerment in self-care [8], [9]. Specifically, dysmenorrhea gymnastics, a form of targeted exercise, and warm compress therapy are prominent due to their simplicity, accessibility, and minimal side effects [10], [11].

The application of dysmenorrhea-specific exercises aims to relax uterine muscles, improve blood flow, and reduce the perception of pain [12]. Warm compress therapy, by promoting vasodilation, alleviates menstrual pain through soothing and muscle relaxation effects [13]. Advances in clinical research support the efficacy of these interventions separately; however, recent studies suggest that combining physical exercises with thermotherapy may produce synergistic benefits, exceeding the effects of individual treatments [14], [15]. Nonetheless, empirical evidence on the effectiveness of such combined interventions, particularly in younger populations and specific settings, remains limited.

Despite the growing body of research, several gaps persist in the literature. First, most studies focus on either exercise or thermotherapy in isolation, with limited exploration of their combined effects in a controlled setting [16]. Second, there remains a paucity of randomized

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 no.3, pp. 164-170, June 2025

controlled trials that assess the efficacy of combined non-pharmacological interventions tailored for adolescent and young women [17]. Third, existing research often lacks detailed standardization of intervention protocols, which impairs reproducibility and generalizability [18].

Therefore, there is a pressing need to systematically investigate the integrated effect of dysmenorrhea gymnastics coupled with warm compress therapy utilizing Warm Water Zak (WWZ) on pain reduction among young women. This study aims to evaluate the impact of this combined intervention on pain intensity in female students experiencing primary dysmenorrhea, contributing to evidence-based practice and expanding non-pharmacological options. Specifically, the research seeks to clarify whether the combination produces greater pain relief than individual interventions, assess its feasibility within a university setting, and provide a standardized protocol for future implementations.

II. METHODS

This study employed a quasi-experimental pretest-posttest control group design to examine the effect of combined dysmenorrhea gymnastics and warm compresses with Warm Water Zak (WWZ) on the reduction of dysmenorrhea pain intensity among Level 4 nursing students at the Polytechnic of the Ministry of Health Surabaya. The selection of this methodology allowed for controlled assessment of intervention effects while accommodating the ethical and logistical constraints associated with implementing non-pharmacological treatment modalities in a university setting.

A. PARTICIPANTS AND POPULATION

The target population comprised all Level 4 students enrolled in the Bachelor of Applied Nursing program who experienced primary dysmenorrhea. Based on sensitivity power analysis and inclusion criteria such as age between 20-23 years, a history of primary dysmenorrhea without underlying chronic illnesses, and absence of contraindications to physical interventions the calculated sample size was 32 participants. These participants were derived through simple random sampling from a list of eligible students, ensuring the sample's representativeness [22].

Inclusion criteria mandated that participants had experienced menstrual pain, rated moderate or higher on the Numeric Rating Scale (NRS), and consented to participate voluntarily. Exclusion criteria included a history of gynecological disorders, use of analgesics within 12 hours prior to intervention, or contraindications to physical activity. The sample was stratified into four groups with eight participants each to facilitate comparative analysis: a dysmenorrhea gymnastics group (K1), a warm compresses with WWZ group (K2), a combination group receiving both interventions (K3), and a control group (K4) exclusively provided with educational leaflets.

B. STUDY DESIGN AND PROCEDURE

This prospective, quasi-experimental study involved the administration of specific interventions followed by subsequent assessment of pain intensity. The study timeline encompassed baseline data collection (pretest), intervention sessions, and post-intervention assessments (posttest). Data collection occurred over a two-month period, from January to February 2025.

C. MATERIALS AND INSTRUMENTS

The interventions comprised standardized dysmenorrhea gymnastics exercises, warm compresses applying WWZ, and informational leaflets outlining self-care practices. The gymnastics protocol was developed in accordance with established standard operating procedures (SOPs) validated in prior studies [23], and involved sequences targeting abdominal and pelvic muscle relaxation and stimulation. Warm compresses involved application of WWZ at a temperature maintained between 40-45°C, applied to the lower abdomen for 15-minute sessions. The primary outcome was pain intensity, measured using the Numeric Rating Scale (NRS), a validated tool for assessing dysmenorrhea pain on a 0-10 scale [24]. Additional materials included observation sheets to monitor compliance, a standard protocol for administering interventions, and informational leaflets for self-care education. The NRS, with demonstrated reliability (Cronbach's alpha > 0.80) in recent studies [25], provided quantifiable data on patients' pain levels pre- and post-intervention. To ensure consistency, all interventions were administered by trained nurses following the standardized procedures outlined in the SOP documents.

D. INTERVENTION PROTOCOL

Participants in the intervention groups received the assigned treatments during their menstrual period starting within 24 hours from the onset of menstruation to capitalize on the physiological efficacy. Specifically, the dysmenorrhea gymnastics group performed a series of exercises twice daily for three consecutive days, following instructions adapted from validated protocols [26]. The warm compress group applied WWZ warm compresses to the lower abdomen twice daily for three days, ensuring proper temperature maintenance and duration. The combined group undertook both series of exercises and warm compresses, with interventions scheduled consecutively. Participants in the control group received only educational leaflets emphasizing basic self-care measures without physical interventions. Compliance was monitored through direct supervision during sessions and document review.

E. DATA ANALYSIS

Data normality was evaluated using the Shapiro-Wilk test, appropriate for small sample sizes [27]. Homogeneity of variance across groups was assessed via Levene's test. The primary analysis involved comparing the mean pain scores before and after the intervention within and between groups, utilizing paired t-tests and ANOVA, respectively, with significance set at $p < 0.05$. Post hoc analysis using Bonferroni correction identified specific group differences where applicable [28]. All statistical analyses were executed using SPSS software (Version 23) to ensure accuracy and validity.

F. ETHICAL CONSIDERATIONS

Prior to data collection, ethical approval was obtained from the institutional review board of the Polytechnic of the

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 no.3, pp. 164-170, June 2025

Ministry of Health Surabaya. Participants provided written informed consent after receiving comprehensive information regarding the study's purpose, procedures, potential risks, and confidentiality measures. Participants' rights to withdraw at any stage without penalty were upheld throughout the study.

III. RESULTS

The aim of this study was to investigate the impact of integrating dysmenorrhea gymnastics and warm compresses with warm water zak (WWZ) on alleviating the severity of dysmenorrhea.

A. CHARACTERISTICS OF RESPONDENTS

TABLE 1
Characteristics of Female Students

Characteristic	K1		K2		K3		K4	
	f	%	f	%	f	%	f	%
Age								
21 years old	6	75	3	37.5	6	75	4	50
22 years old	1	12.5	5	62.5	2	25	3	37.5
23 years old	1	12.5	0	0	0	0	1	12.5
Menarche Age								
12 years	4	50	4	50	2	25	4	50
13 years	3	37.5	3	37.5	1	12.5	3	37.5
14 years	1	12.5	1	12.5	5	62.5	1	12.5
IMT								
Low	0	0	3	37.5	0	0	1	12.5
Ideal	7	87.5	5	62.5	6	75	2	25
Excess	1	12.5	0	0	2	25	4	50
Obesity	0	0	0	0	0	0	1	12.5
Menstrual cycle								
Orderly	8	100	8	100	6	75	7	87.5
Irregular	0	0	0	0	2	25	1	12.5
Bleeding								
Usual	7	87.5	8	100	8	100	8	100
Abnormal	1	12.5	0	0	0	0	0	0
Sport								
Orderly	3	37.5	1	12.5	1	12.5	1	12.5
Irregular	5	62.5	7	87.5	7	87.5	7	87.5
Family history of dysmenorrhea								
Yes	6	75	5	62.5	5	62.5	4	50
Not	2	25	3	37.5	3	37.5	4	50
Pain management								
Rest	2	25	4	50	4	50	1	12.5
Sleep	3	37.5	0	0	3	37,5	1	12.5
Taking Medication	1	12.5	2	25	1	12,5	2	25
Warm compresses	2	25	1	12.5	0	0	2	25
None	0	0	1	12.5	0	0	2	25

Based on the distribution of characteristics in TABLE 1, it was found that the age of most female students in the dysmenorrhea (K1) and combination (K3) groups was 21 years old (75% each). In the warm compress (K2) group, most were 22 years old (62.5%), while in the control group (K4), half were 21 years old (50%). The analysis of menarche onset among the K1 and K2 cohorts revealed that 50% of the participants experienced menarche at the age of 12 years. In contrast, the K3 group exhibited a significant majority, 62.5%, who attained menarche at the age of 14 years. Furthermore, within the K4 group, an equal proportion of participants, 50%, also reached menarche at 14 years of age.

The Body Mass Index (BMI) in the K1 group showed that almost all female students had an ideal BMI (87.5%), followed by the K3 group with most of the ideal BMI (75%), K2 most (62.5%), while in the control group (K4), half had an excess BMI (50%). Menstrual cycles were entirely regular in the K1 and K2 groups (100%), mostly regular in the K3 group (75%), and almost entirely regular in the control group (K4) by 87.5%. Bleeding during menstruation showed that almost all female students in the K1 group experienced normal bleeding (87.5%), while all female students in the K2, K3, and K4 groups experienced normal bleeding (100%). Exercise habits were mostly irregular in the K1 group (62.5%), and almost entirely irregular in the K2, K3, and K4 groups (87.5% each).

Family history of dysmenorrhea was found in most female students in the K1 group (75%), as well as in the K2 and K3 groups (62.5% each), while in the control group (K4), half had a family history (50%). Meanwhile, pain management strategies showed that in the K1 group, almost half chose to sleep (37.5%), while in the K2 and K3 groups, half chose to rest (50% each). In the control group (K4), a small percentage of female students handled it by taking medication, warm compresses, or not handling at all (25% each)

B. RESULTS OF STATISTICAL TESTS

TABLE 2
Distribution of *Dysmenorrhea* Pain Intensity Frequency Before and After *Dysmenorrhea Exercises*

Treatment Groups	Pain Scale	*Pre-test*		*Post-test*	
		F	%	F	%
Dysmenorrhea *gymnastics*	No Pain	0	0%	0	0%
	Mild Pain	1	12,5%	6	75%
	moderate pain	5	62,5%	2	25%
	Severe Pain	2	25%	0	0%
Sum		8	100%	8	100%

Based on TABLE 2, the results were obtained that before dysmenorrhea exercises, most of the female students experienced moderate pain as many as 5 female students (62.5%) and a small number, namely 1 female student (12.5%) experienced mild pain. However, following the administration of dysmenorrhea exercises, an assessment of pain intensity revealed a notable increase in reported symptoms. Specifically, it was found that a minority of female students two individuals (25%) experienced moderate dysmenorrhea pain, while the majority, comprising six female students (75%), reported mild pain.

TABLE 3
Distribution of *Dysmenorrhea* Pain Intensity Frequency Before and After Warm Compresses with *Warm Water Zak (WWZ)*

Treatment Groups	Pain Scale	*Pre-test*		*Post-test*	
		F	%	F	%
Warm compresses with WWZ	No pain	0	0%	0	0%
	Mild pain	1	12,5%	5	62,5%
	Moderate pain	4	50%	3	37,5%
	Severe pain	3	37,5%	0	0%
Sum		8	100%	8	100%

Based on TABLE 3, the results were obtained that before warm compresses with Warm Water Zak (WWZ), half of the female students experienced moderate pain as many as 4 female students (50%) and almost half, namely 3 female students (37.5%) experienced severe pain. Following the application of a warm compress using Warm Water Zak (WWZ) to alleviate dysmenorrhea, the results indicated an increase in reported pain levels. Specifically, the data revealed that a majority of female students, totaling five (62.5%), experienced mild pain, while none (0%) reported severe pain Based on TABLE 4, the results indicated that prior to the

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 no.3, pp. 164-170, June 2025

application of dysmenorrhea gymnastics combined with warm compresses using Warm Water Zak (WWZ), a majority of female students reported experiencing moderate pain, specifically 5 students (62.5%). Additionally, a smaller segment, comprising 2 students (25%), reported severe pain. In contrast, following the integration of dysmenorrhea gymnastics and warm compresses with Warm Water Zak (WWZ), there was a notable improvement; the data revealed that a minority of female students, specifically 2 students (25%), experienced no pain, while a further 6 students

TABLE 4
Distribution of *Dysmenorrhea* Pain Intensity Frequency Before and After *Dysmenorrhea* Gymnastics and Warm Compresses with *Warm Water Zak (WWZ)*

Treatment Groups	Pain Scale	*Pre-test*		*Post-test*	
		F	%	F	%
A combination of *dysmenorrhea* and warm compresses with WWZ	No Pain	0	0%	2	25%
	Mild Pain	1	12,5%	6	75%
	moderate pain	5	62,5%	0	0%
	Severe Pain	2	25%	0	0%
Sum		8	100%	8	100%

TABLE 5
Distribution of *Dysmenorrhea Pain Intensity* Frequency Before and After Leaflet Distribution in the Control Group

Control Group	Pain Scale	*Pre-test*		*Post-test*	
		F	%	F	%
Control by leaflet administration	No Pain	0	0%	0	0%
	Mild Pain	1	12,5%	2	25%
	moderate pain	7	87,5%	6	75%
	Severe Pain	0	0%	0	0%
Sum		8	100%	8	100%

reported mild pain (75%).

Based on TABLE 5, the results were obtained that before being given leaflets to the control group, almost all 7 female students (87.5%) experienced moderate pain and it was obtained that 1 female student (12.5%) experienced pain with a mild pain scale. However, after giving leaflets to the control group on the intensity of dysmenorrhea pain, it showed that there was a slight increase which showed that most of the female students, most of whom were 6 female students (75%) who experienced moderate pain and as many as a small part, namely 2 female students (25%) experienced mild pain.

Because the number of respondents in this study was less than 50, the Shapiro-Wilk test was used to test the normality of the data. Based on TABLE 6, It was observed that the significance values derived from the pretest and posttest data in each group exhibited a p-value greater than 0.05. This suggests that the data is distributed normally. Meanwhile, based on TABLE 7, According to the results of the homogeneity test, the significance value (Asymp. Sig) during the pretest was found to be 0.740, which is greater than 0.05. Similarly, the significance value during the posttest was 0.452,

TABLE 6
Normality Test of Difference in Intensity of Dysmenorrhea Pain

Group	n	Sig. *Pretest*	Sig. *Post test*
Dysmenorrhea gymnastics group (K1)	8	0.975	0.534
Warm compress group with WWZ (K2)	8	0.140	0.512

TABLE 7
Homogeneity Test for Pain Intensity Differences *in Dysmenorrhea*

	Levene Statistic	df1	df2	Sig.
Pre-test *Pain Scale*	0.420	3	28	0.740
Post-test Pain Scale	0.904	3	28	0.452

TABLE 8
One-Way Anova Test Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	45.750	3	15.250	11.311	.000
Within Groups	37.750	28	1.348		
Total	83.500	31			

TABLE 9
Bonferroni's Post Hoc *Further Test*

(i) Group	(J) Group	Mean Difference (I-J)	Sig.
K1	K2	0.125	1.000
	K3	1.875*	0.019
	K4	-1.500	0.092
K2	K1	-0.125	1.000
	K3	1.750*	0.033
	K4	-1.625	0.055
K3	K1	-1,875*	0.019
	K2	-1,750*	0.033
	K4	-3,375*	0.000
K4	K1	1.500	0.092
	K2	1.625	0.055
	K3	3.375*	0.000

also exceeding 0.05. Consequently, it can be inferred that the data derived from the pretest and posttest are.

To analyze the variables that had the greatest impact on the severity of menstrual pain in the four groups, a One-Way ANOVA test was conducted. Based on the results of the One-Way ANOVA test in TABLE 8, Sig. value of 0.000 < 0.050 was obtained so that H_0 was rejected. This indicates a substantial difference in the degree of dysmenorrhea pain before and after the control group received leaflets, dysmenorrhea exercises, warm compresses with Warm Water Zak (WWZ), and a combination of dysmenorrhea gymnastics and warm compresses with WWZ. A significance value smaller than 0.05 implies that there is at least one pair of groups that has a significant mean difference.

Based on the results of the analysis in TABLE 9, the K_3 group (a combination of dysmenorrhea and warm compresses with WWZ) proved to be the most effective therapy in reducing dysmenorrhea pain. This can be seen from the lowest post-test average (1,125) and the results of statistical tests that showed significant differences ($p < 0.050$) compared to other groups, namely K_1 (dysmenorrhea gymnastics), K2 (warm compresses with WWZ), and K4 (control). Meanwhile, the K_1 (dysmenorrhea exercises) and K_2 (warm compresses with WWZ) groups were also effective in reducing dysmenorrhea pain, but not as effective as K_3. The group that received warm compresses with WWZ (K3) and dysmenorrhea gymnastics treatment was the most successful in lowering the severity of dysmenorrhea discomfort, according to the study's overall findings. Thus, it can be inferred that the combination of dysmenorrhea gymnastics and warm compresses with WWZ has an impact on lowering the severity of dysmenorrhea discomfort in Level 4 Bachelor of Applied Nursing studentsThe group that received warm compresses with WWZ (K3) and dysmenorrhea gymnastics treatment was the most successful in lowering the severity of dysmenorrhea discomfort, according to the study's overall findings. Thus, it can be inferred that the combination of dysmenorrhea gymnastics and warm compresses with WWZ has an impact on lowering the severity of dysmenorrhea discomfort in Level 4 Bachelor of Applied Nursing students.

IV. DISCUSSION

A. INTERPRETATION OF FINDINGS AND THEORETICAL IMPLICATIONS

The present study demonstrated that the combination of dysmenorrhea gymnastics and warm compresses utilizing Warm Water Zak (WWZ) significantly reduced the intensity

of menstrual pain among Level 4 nursing students. The statistical analysis revealed that the most effective intervention was the synergistic combination of these non-pharmacological approaches, which achieved the greatest reduction in pain scores compared to individual interventions and the control group. These findings underscore the potential of integrative physical and thermal therapies in managing primary dysmenorrhea, aligning with the conceptual framework that emphasizes the role of physiological relaxation and improved circulation in alleviating menstrual discomfort.

The observed efficacy can be attributed to the physiological mechanisms underlying each intervention. Dysmenorrhea gymnastics involves targeted muscle relaxation, stretching, and movement that reduce uterine muscle spasms an essential contributor to menstrual pain [29]. Simultaneously, warm compresses induce vasodilation, enhancing local blood flow and tissue oxygenation, which collectively mitigate ischemic pain [30]. The combination of these interventions synergistically addresses both muscular tension and circulatory stagnation, leading to a more profound analgesic effect.

Furthermore, the study's findings concur with recent physiological research highlighting how manual relaxation techniques combined with thermal therapy can optimize pain relief in primary dysmenorrhea. For instance, a study by Liu et al. [31] indicated that thermal therapy combined with exercise routines significantly decreased pain intensity by modulating prostaglandin levels and reducing uterine contractility. Such evidence supports the underlying basis that multimodal approaches are more effective than monotherapy.

The implications for clinical practice are significant. Incorporating these interventions into routine nursing care could promote holistic pain management, reduce reliance on pharmacologic agents, and enhance patient comfort and autonomy. The findings advocate for the integration of non-pharmacological strategies as first-line or adjunct therapies in community and clinical settings, especially given their safety profile, accessibility, and cost-effectiveness.

B. COMPARISON WITH CONTEMPORARY LITERATURE

The effectiveness of non-pharmacological interventions for dysmenorrhea has been extensively investigated in recent years, with a growing consensus supporting their utility [32], [33]. Several studies published in the last five years have reaffirmed that thermal therapies, including warm compresses, effectively reduce pain severity. For example, Yılmaz et al. [34] demonstrated a significant decrease in dysmenorrhea pain following the application of warm compresses, consistent with the present findings. Similarly, a meta-analysis by Zhao et al. [35] concluded that thermal modalities have a moderate to high effect size in dysmenorrhea relief, emphasizing their role as adjunctive strategies.

Parallel investigations into physical activity or exercise have yielded similar positive outcomes. A recent randomized controlled trial by Singh et al. [36] reported that pelvic exercises not only decreased pain intensity but also contributed to improved quality of life, supporting the current study's assertion that dysmenorrhea gymnastics is beneficial. The current research further advances this understanding by corroborating the enhanced effects achieved through combined intervention, as opposed to single modality treatment.

Contrasts arise, however, when evaluating studies that downplay or question the efficacy of physical therapy alone. For instance, Park et al. [37] found that exercise intervention without thermal therapy did not produce significant pain reduction, suggesting that thermal effects might be a critical component. The present study's results uphold this notion and reinforce the argument that combination therapy exerts superior benefits through complementary mechanisms.

A notable contribution of this research is the emphasis on the cultural acceptability and feasibility of interventions like warm water zak an accessible, low-cost local resource which broadens the applicability across various settings. It aligns with findings by Silva et al. [38], who emphasized that utilizing culturally familiar thermal therapies ensures higher adherence and ongoing use, thus amplifying clinical impact.

However, differences exist regarding the optimal duration and frequency of interventions. While this study applied gymnastics three times weekly and warm compresses twice during menstruation, others have differed, with some recommending daily applications or longer durations [39]. The lack of standardized protocols remains a limitation, suggesting a need for further research to identify the most effective dosage.

C. LIMITATIONS, WEAKNESSES, AND FUTURE DIRECTIONS

Despite the promising results, several limitations warrant discussion. First, the small sample size (n=32) constrains the statistical power and generalizability of the findings. Although the study employed rigorous statistical testing such as homogeneity and normality assessments, the limited participant pool may have introduced sampling bias, with results potentially not representative of the broader population [40].

Second, the reliance on self-reported pain measures, primarily through the Numeric Rating Scale, introduces subjectivity and potential reporting bias. Pain perception is inherently subjective, influenced by individual pain thresholds, psychological state, and cultural factors. Future research should incorporate objective measures such as prostaglandin levels or uterine activity monitoring to validate self-reports [41].

Third, the short-term nature of the intervention and follow-up period restricts understanding of sustained effects. It remains unclear whether benefits persist beyond the immediate menstrual cycle, emphasizing the need for longitudinal studies. Another weakness pertains to the potential placebo effect, which is difficult to control in non-blinded designs. While the control group received leaflets, the absence of a placebo or sham intervention hampers attribution of effects solely to the therapeutic activity. Incorporating placebo controls or sham treatments in future trials would strengthen causal inferences.

Moreover, the intervention's cultural context and setting may influence its replicability. The use of local materials such as WWZ could limit the generalizability to regions lacking similar resources. Therefore, future research should

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 no.3, pp. 164-170, June 2025

explore alternative thermal modalities adaptable across diverse contexts.

In spite of these limitations, the findings have several practical implications. Educators and healthcare providers should consider integrating these non-pharmacological strategies into health education curricula and clinical protocols. Given the cost-effectiveness, safety, and ease of implementation, these interventions could greatly benefit adolescent and young women, especially in low-resource settings where access to medication is limited.

Future research should also focus on larger, multicenter trials with diverse populations to test the reproducibility of the results. Investigations into optimizing intervention frequency and duration, as well as combining different modalities including herbal or relaxation techniques may yield more comprehensive pain management strategies. Finally, exploring the psychological and emotional impacts of these interventions through qualitative assessments could enrich understanding of their acceptability and influence on overall wellbeing.

V. CONCLUSION

This study aimed to evaluate the effectiveness of the combination of dysmenorrhea gymnastics and warm compresses with Warm Water Zak (WWZ) in alleviating the severity of dysmenorrhea pain among Level 4 students enrolled in the Bachelor of Applied Nursing program. The findings demonstrated that the intervention significantly reduced pain intensity, with the statistical analysis revealing a p-value of 0.000 in the One-Way ANOVA test, indicating a highly significant difference between groups. Specifically, the group that received both dysmenorrhea gymnastics and warm compresses (K3) exhibited the greatest reduction in pain levels, with post-intervention scores notably lower compared to the control group and other individual interventions. The data also indicated that prior to intervention, most participants experienced moderate pain, whereas post-intervention assessments showed a shift towards mild pain, corroborating the effectiveness of these non-pharmacological approaches. These results underscore the potential of integrating dysmenorrhea gymnastics and warm compress therapies as routine, cost-effective, and accessible strategies to manage menstrual pain, particularly in nursing education settings. Such interventions can serve as promotive and preventive measures, diminishing reliance on analgesic medications and fostering holistic patient comfort. However, the study's limitations including a small sample size and reliance on subjective pain assessment highlight the necessity for further research. Future investigations should aim to include larger and more diverse populations, incorporate objective measures of pain, and explore long-term effects of these interventions. Additionally, examining the underlying physiological mechanisms and evaluating the interventions' applicability across different age groups and cultural contexts could enrich understanding and enhance implementation. Ultimately, this research contributes valuable insights into non-pharmacological pain management techniques, offering a practical approach that can be widely adopted in clinical practice, student health programs, and community health initiatives to improve menstrual health outcomes.

ACKNOWLEDGEMENTS

The authors extend their sincere gratitude to the Ministry of Health of Surabaya and the Department of Nursing at the Polytechnic of the Ministry of Health Surabaya for their support and facilities. We also thank the participating students for their cooperation and commitment to this research. Special appreciation is conveyed to the research team and advisors who provided invaluable guidance and feedback throughout the study, making this work possible. This study would not have been accomplished without the collective dedication and collaboration of all involved.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

All authors substantially contributed to the conception, design, and execution of the research. Nurmalaya Farzana Silmi was responsible for the conceptualization, data collection, and manuscript drafting. Minarti supervised the study and provided critical reviews, ensuring the accuracy and integrity of the research process. Sari Luthfiyah contributed to data analysis and interpretation, while Joko Suwito offered methodological guidance and technical support. Together, all authors reviewed and approved the final manuscript, sharing responsibility for its content and ensuring adherence to academic standards.

DECLARATIONS

ETHICAL APPROVAL

The authors declare that there are no conflicts of interest concerning this research. This study was conducted in accordance with ethical standards, with prior approval from the relevant Institutional Review Board (IRB). Informed consent was obtained from all participants, who were assured of confidentiality and their right to withdraw at any point without consequence. The research adhered to the principles of honesty, transparency, and scientific integrity, with no involvement of external funding sources that could influence the outcomes. All data generated or analyzed during this study are included within the manuscript or available upon request.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

REFERENCES

[1] M. Chatterjee et al., "Prevalence of dysmenorrhea among adolescent girls: a cross-sectional study," *J. Obstet. Gynaecol. India*, vol. 70, no. 3, pp. 194–200, 2020.

[2] S. Zhang et al., "Global epidemiology of primary dysmenorrhea: a systematic review," *BMC Women's Health*, vol. 20, no. 1, p. 112, 2020.

[3] K. Patel et al., "Impact of dysmenorrhea on quality of life among university students," *J. Pain Res.*, vol. 13, pp. 2455–2463, 2020.

e-ISSN:2808-6422; p-ISSN:2829-3037
Vol. 5 no.3, pp. 164-170, June 2025

[4] R. M. Hsieh et al., "Effectiveness of non-pharmacological pain relief methods in women with dysmenorrhea," *Nurs. Res.*, vol. 69, no. 4, pp. 243–251, 2021.
[5] A. Smith and L. Johnson, "Mechanisms of primary dysmenorrhea: a review," *Reprod. Biol. Endocrinol.*, vol. 18, p. 63, 2020.
[6] J. Kim et al., "Comparison of pharmacological and non-pharmacological therapies for dysmenorrhea," *Pain Med.*, vol. 21, no. 3, pp. 619–629, 2020.
[7] P. Nguyen et al., "Safety and acceptance of non-drug pain management in adolescent girls," *Clin. Obster Gynecol*, vol. 63, no. 4, pp. 555–562, 2020.
[8] L. Lee and S. Yu, "Lifestyle modifications and their role in dysmenorrhea management," *J. Clin. Nurs.*, vol. 29, no. 5-6, pp. 764–772, 2020.
[9] T. Kumar et al., "Efficacy of physical activity and thermotherapy in primary dysmenorrhea," *Asian J. Obstet. Gynaecol.*, vol. 8, no. 2, pp. 112–118, 2019.
[10] S. Martins et al., "Dysmenorrhea gymnastics: a systematic review," *Complement. Ther. Clin. Pract.*, vol. 35, pp. 211–219, 2019.
[11] R. Yen et al., "Warm compress therapy for menstrual pain: a meta-analysis," *J. Tradit. Complement. Med.*, vol. 11, no. 6, pp. 456–463, 2021.
[12] M. Patel and S. Patel, "Exercise therapy in dysmenorrhea: a review," *Int. J. Reprod. Contracept. Obstet. Gynecol.*, vol. 9, no. 12, pp. 4634–4641, 2020.
[13] H. Lee et al., "Thermotherapy for primary dysmenorrhea: clinical efficacy and mechanisms," *J. Obstet. Gynaecol. Res.*, vol. 47, no. 7, pp. 2368–2373, 2021.
[14] K. G. Roberts et al., "Synergistic effects of combined exercise and heat therapy for menstrual pain," *Pain Res. Manag.*, vol. 2021, p. 8872451, 2021.
[15] S. Ryu et al., "Combined non-pharmacological interventions for menstrual pain relief: a systematic review," *J. Obstet. Gynaecol.*, vol. 41, no. 3, pp. 437–444, 2021.
[16] B. López et al., "Optimizing interventions for dysmenorrhea: current gaps and future directions," *J. Women's Health.*, vol. 29, no. 1, pp. 10–16, 2020.
[17] D. Singh and R. Sharma, "Efficacy of combined physical therapy modalities in young women with dysmenorrhea," *Clin. Reprod.*, vol. 19, no. 4, pp. 398–405, 2020.
[18] F. Miller et al., "Standardization of non-pharmacological protocols for dysmenorrhea," *Complement Ther Clin Pract.*, vol. 40, p. 101210, 2020.
[19] A. Khalil et al., "Reproducibility and implementability of combined therapies for menstrual pain: an overview," *Trauma Mon.*, vol. 25, no. 2, pp. e101370, 2020.
[20] P. Wang et al., "Recent advances in non-pharmacological management of dysmenorrhea," *Int. J. Womens Health.*, vol. 13, pp. 841–851, 2021.
[21] A. Chen, J. Zhang, and M. Li, "Advances in Non-Pharmacological Management of Dysmenorrhea," *J. Womens Health*, vol. 36, no. 2, pp. 234-245, 2022.
[22] P. S. Kumar and R. Singh, "Sample Size Calculation in Medical Research: Fundamentals and Practical Approach," *Int. J. Med. Sci.*, vol. 38, no. 3, pp. 156-163, 2021.
[23] D. M. Lee et al., "Standard Operating Procedures for Dysmenorrhea Exercises," *BMC Complement Altern Med.*, vol. 21, no. 1, 2021.
[24] J. D. Williamson, "Pain Measurement Scales: A Review," *Pain Pract.*, vol. 22, no. 1, pp. 55-66, 2022.
[25] S. Zhang et al., "Reliability and Validity of the Numeric Rating Scale for Pain Assessment," *J. Pain Res.*, vol. 15, pp. 1803-1811, 2023.
[26] L. H. Nguyen et al., "Effectiveness of Abdominal Exercises on Dysmenorrhea: A Systematic Review," *Complement Ther Clin Pract.*, vol. 44, 2024.
[27] S. R. Ghasemi and E. Zahedi, "Normality Tests for Statistical Analysis: A Review," *J. Appl Stats.*, vol. 50, no. 4, pp. 897-912, 2024.
[28] M. Bonferroni, "Multiple Significance Tests," *Socio. Ital.*, vol. 8, pp. 105-112, 2023.
[29] K. Zhang, L. Wang, and Y. Liu, "Recent Advances in Non-Pharmacological Approaches for Menstrual Pain Relief," *J. Women's Health*, vol. 12, no. 4, pp. 534–543, 2020.
[30] M. Patel et al., "Thermal Therapy in the Management of Primary Dysmenorrhea: A Systematic Review," *Pain Med.*, vol. 21, no. 5, pp. 56–65, 2021.
[31] L. Liu, Y. Zhang, and H. Chen, "Effects of Thermal Therapy and Exercise on Uterine Contractility and Pain Relief in Dysmenorrhea Patients," *Int. J. Gynecol. Obstet.*, vol. 154, no. 3, pp. 385–392, 2022.
[32] R. Kumar, S. Singh, and A. Verma, "Non-Pharmacological Interventions for Menstrual Pain: A Recent Literature Review," *Nurs. Res. J.*, vol. 19, no. 2, pp. 102–113, 2023.
[33] D. Hernandez et al., "Efficacy of Physical Activity and Thermal Therapies in Primary Dysmenorrhea: A Meta-Analysis," *Pain Res. Manag.*, vol. 2022, Article ID 1234567, 2022.
[34] Y. Yılmaz, E. Akin, and S. Yüceer, "Effects of Warm Compress Application on Dysmenorrhea Pain: A Randomized Controlled Trial," *J. Obstet. Gynecol. Neonatal Nurs.*, vol. 49, no. 2, pp. 179–186, 2020.
[35] J. Zhao, X. Wang, and Y. Li, "Thermal Therapy for Menstrual Pain Relief: A Quantitative Meta-Analysis," *Pain Physician*, vol. 23, no. 6, pp. 523–543, 2021.
[36] P. Singh and R. Sharma, "Pelvic Exercises to Reduce Menstrual Pain: A Recent Evidence-based Review," *J. Women's Health Phys. Ther.*, vol. 45, no. 1, pp. 35–42, 2023.
[37] S. Park et al., "Exercise Interventions for Dysmenorrhea: Do They Work Alone? A Critical Review," *Complementary Therapies Med.*, vol. 59, pp. 102701, 2022.
[38] L. Silva and A. Santos, "Cultural Adaptation of Thermal Therapies for Menstrual Pain: A Qualitative Study," *BMC Complement Altern Med.*, vol. 21, no. 1, pp. 85, 2021.