

Biothermal evaluation of a heat-based corset (KORDINAS) for non-pharmacological relief of primary dysmenorrhea

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Abstract. Dysmenorrhea is one of the most common complaints experienced by adolescent girls during menstruation, often interfering with school and daily activities. Management of menstrual pain can be achieved through pharmacological and non-pharmacological approaches, and one safe, simple, and easily applicable non-pharmacological method is heat therapy. This study aimed to evaluate the effectiveness of *KORDINAS* (Hot Dysmenorrhea Corset) as a non-pharmacological intervention for relieving menstrual pain in adolescent girls. This experimental study involved 20 adolescent girls who experienced primary dysmenorrhea. Participants received the *KORDINAS* intervention, and pain intensity was assessed before and after using the corset using a numerical pain rating scale. Data were analyzed using the Paired Samples Test. The paired samples correlation analysis further supports this outcome, showing a strong and statistically significant relationship between the pre-test and post-test scores ($r = 0.812$, $p = 0.000$). This strong correlation suggests that respondents who initially reported higher levels of pain tended to experience consistent and notable reductions following the intervention, reinforcing the effectiveness of the treatment across varying baseline pain levels.

1 Introduction

Dysmenorrhea is the most common menstrual pain experienced by adolescent girls and is a reproductive health problem that has a significant impact on activity, quality of life, and academic achievement [1,2]. This condition not only causes physical discomfort but can also disrupt concentration, increase the risk of school absence, and reduce daily productivity. The prevalence of dysmenorrhea in Indonesia is reported to reach 64.25%, with the majority of cases being primary dysmenorrhea unrelated to reproductive organ abnormalities. [2,3] Physiologically, dysmenorrhea is primarily triggered by increased prostaglandin production, which causes excessive uterine contractions and vasoconstriction of blood vessels.

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Furthermore, psychological factors such as stress, hormonal imbalance, unhealthy diet, and low physical activity can exacerbate pain [4]. The impacts are quite broad, ranging from sleep disturbances, anxiety, mood swings, to a decline in the quality of social interactions and academic achievement [5].

Dysmenorrhea can be treated with two approaches: pharmacological and non-pharmacological. Pharmacological therapy generally uses nonsteroidal anti-inflammatory drugs (NSAIDs), which have been shown to be effective in suppressing prostaglandin production. However, long-term use carries the risk of side effects on the gastrointestinal tract, kidneys, and cardiovascular system [4]. Therefore, non-pharmacological methods are increasingly being developed as safer alternatives. Some of these include exercise, relaxation techniques, aromatherapy, warm compresses, and even the use of Transcutaneous Electrical Nerve Stimulation (TENS) [6,7]. Of the various non-pharmacological options, heat therapy is considered the simplest, safest, and most effective. Heat works by increasing vasodilation, improving blood flow, and reducing uterine contractions, the primary source of menstrual pain [2,6]. However, traditional compress methods such as hot water bottles have limitations, including difficulty maintaining the temperature, being impractical, and not being able to be used while doing other activities.

As a solution to these limitations, the innovation of *KORDINAS* (Hot Dysmenorrhea Corset) was developed, a portable corset designed to provide even warmth to the lower abdomen in a comfortable and practical manner. With its flexible design, *KORDINAS* can be used during daily activities without reducing the effectiveness of heat therapy. Unlike conventional heat patches or compresses that require users to remain stationary and may lose heat rapidly, *KORDINAS* offers continuous and evenly distributed warmth while allowing mobility. Its design integrates a heat-retaining layer that maintains a stable temperature for a longer duration, ensuring optimal therapeutic effects. The effectiveness of this device was evaluated using the Visual Analog Scale (VAS), a valid and reliable pain measurement instrument widely used in clinical research [8,9]. Therefore, this study aimed to determine the effectiveness of *KORDINAS* as a non-pharmacological method for reducing menstrual pain intensity in adolescent girls experiencing primary dysmenorrhea. It was hypothesized that the application of *KORDINAS* would significantly decrease menstrual pain levels compared to pre-intervention measurements.

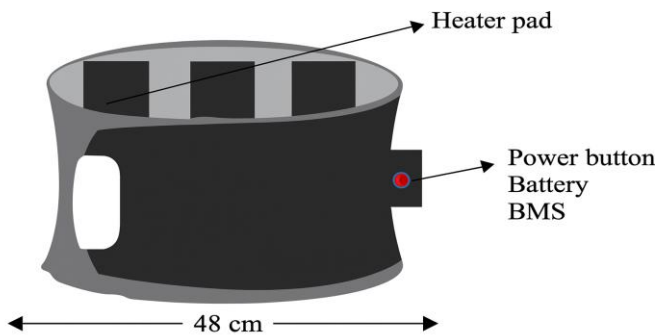


Fig. 1. Dysmenorrhea corset design

2 Methods

This study used a quasi-experimental (one-group pretest–posttest) design to evaluate the effectiveness of *KORDINAS* (Hot Dysmenorrhea Corset) in reducing menstrual pain intensity. This design was selected to measure changes in pain levels before and after the

intervention within the same group of participants. Data collection was conducted once for each participant during a single menstrual cycle in August 2025. Each respondent used the KORDINAS device for 30 minutes, and post-intervention evaluation was carried out immediately afterward. The environment was controlled to maintain room temperature between 24–26°C, with minimal noise and no physical activity allowed during the intervention.

The study sample consisted of female students at YPE Cilacap School experiencing primary dysmenorrhea. Twenty female respondents were selected using purposive sampling based on the following criteria. Inclusion criteria is young women aged 15–19 years, Experiencing primary dysmenorrhea with mild to moderate intensity, have a regular menstrual cycle (21–35 days), willing to be a respondent and sign the informed consent. Exclusion criteria is experiencing secondary dysmenorrhea (for example due to endometriosis or reproductive organ abnormalities), currently taking analgesic drugs or hormonal therapy, have a history of allergies or skin disorders in the abdominal area.

Pain levels were measured using a Visual Analog Scale (VAS) consisting of a 10 cm horizontal line. A score of 0 indicates "no pain" and a score of 10 indicates "very severe pain." Research procedur is

1. Preparation

- The researcher explained the research objectives and procedures to the respondents.
- Respondents signed informed consent.
- Respondents were instructed not to take painkillers 24 hours before the intervention.
- The KORDINAS tool is checked for functional suitability, battery, and temperature settings.

2. Pre-test

- Respondents sit comfortably.
- Menstrual pain intensity was measured using VAS before the intervention.

3. Intervention on the Use of KORDINAS

- Respondents wore KORDINAS on the lower abdominal area.
- The corset is attached with adhesive until the heating pad is attached to the hypogastric area.
- The device is turned on by pressing the power button.
- The heater pad reaches a temperature of ± 40 °C in 15–20 minutes, with a temperature setting range of 38–42 °C.
- Respondents were asked to sit or lie down relaxed for 30 minutes of use.
- During use, researchers monitored the respondents' comfort and ensured there were no complaints such as excessive heat or skin irritation.

4. Post-test

- After 30 minutes of intervention, KORDINAS was released.
- Respondents again filled out the VAS to assess menstrual pain.
- Changes in pain scores compared with pre-test results

This warm corset is designed to provide comfort and reduce dysmenorrhea pain with the following main components:

1. Warming Material

- Thermal materials: capable of storing and releasing heat slowly, for example carbon fiber.
- Insulation material: using thermoplastic polyurethane (TPU) to keep the temperature stable.

2. Heating Source

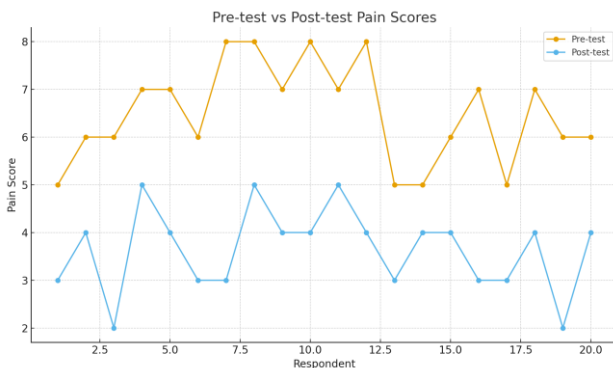
- Using a heater pad that can reach a temperature of ± 40 °C after 20 minutes.

- Specifications: voltage 3.7–5 V, power capacity 1000–2000 mAh.
3. Temperature Control System
 - Equipped with temperature settings with a range of 38–42 °C.
 4. Battery and Charging
 - Using rechargeable batteries with Battery Management System (BMS).

Data were analyzed using SPSS software. The normality of data distribution was tested using the Shapiro–Wilk test. If the data were normally distributed, a paired t-test was applied; otherwise, the Wilcoxon signed-rank test was used to determine differences in pain scores before and after the intervention. A p-value of < 0.05 was considered statistically significant.

3 Results and discussions

3.1 Results



Grafik 1. Pretest-posttest pain score

The Shapiro–Wilk normality test showed that the significance value for the pre-test scores was 0.266 and for the post-test scores was 0.528. Since both values were greater than 0.05, the data were considered to be normally distributed. Therefore, the paired samples t-test was appropriate for further analysis. The Paired Samples Statistics result indicated that: The mean pain score before the intervention (pre-test) was 6.75, with a standard deviation of 1.29 and The mean pain score after the intervention (post-test) was 3.85, with a standard deviation of 1.02. These findings show a decrease in pain intensity following the use of the KORDINAS heat-based corset.

Furthermore, respondents also showed improvements in daily activities, such as the ability to concentrate on learning, interact socially, and perform light physical activities without pain. Thus, KORDINAS not only provides analgesic effects through its heat therapy mechanism that increases blood circulation and muscle relaxation, but also contributes to improving the quality of life of adolescent girls during menstruation.

Table 1. Paired samples test

Pair	t	df	Sig (2-tailed)
Pretest-posttes	12.51	19	0.000

The Paired Samples Correlation showed a correlation coefficient of 0.812 with a significance value of 0.000. This indicates a strong and significant relationship between the pre-test and post-test scores. The positive correlation suggests that respondents who reported higher pain levels before the intervention tended to experience consistent reductions after the intervention.

3.2 Discussion

Based on the results of the statistical analysis conducted using SPSS, it can be concluded that the KORDINAS heat-based corset demonstrates a significant and meaningful effect in reducing the intensity of primary dysmenorrhea among respondents. The descriptive findings show a clear decline in the average pain scores from the pre-test to the post-test phase. Specifically, the mean pain level decreased from 6.75 before the intervention to 3.85 after the intervention, reflecting an overall reduction of 2.90 points, or approximately 42.9%. This substantial decrease indicates that the application of heat therapy through the KORDINAS corset contributed effectively to alleviating menstrual pain.

The paired samples correlation analysis further supports this outcome, showing a strong and statistically significant relationship between the pre-test and post-test scores ($r = 0.812$, $p = 0.000$). This strong correlation suggests that respondents who initially reported higher levels of pain tended to experience consistent and notable reductions following the intervention, reinforcing the effectiveness of the treatment across varying baseline pain levels.

The results of the paired samples t-test provide stronger statistical evidence for the efficacy of the intervention. With a t-value of 12.51 and a p-value of 0.000, the findings clearly demonstrate a significant difference between pain levels before and after using the KORDINAS corset. Since the p-value is far below the 0.05 threshold, it can be concluded with high confidence that the reduction in pain is not merely due to chance but is directly associated with the use of the heat-based corset.

Overall, the statistical evidence consistently supports the conclusion that the KORDINAS heat-based corset is an effective non-pharmacological method for relieving primary dysmenorrhea. The considerable reduction in pain scores, combined with the strong correlation and significant t-test results, suggests that applying localized heat through the corset is a beneficial therapeutic approach. This finding is particularly important for individuals seeking non-drug alternatives for menstrual pain management, as it demonstrates that heat therapy can offer a safe, accessible, and effective solution. The results of this study reinforce the potential for KORDINAS to be used as a complementary or stand-alone method for alleviating menstrual discomfort, improving daily functioning, and enhancing overall well-being during menstruation.

Physiologically, heat therapy promotes vasodilation, increases blood flow to the abdominal region, helps relax uterine muscles, and may inhibit pain signal transmission through mechanisms such as the gate control theory, thereby reducing uterine contractions that cause pain [10], [11]. This aligns with previous findings showing that continuous low-level topical heat can be as effective as nonsteroidal anti-inflammatory drugs (NSAIDs) for dysmenorrhea management [12]. These comparisons support the credibility of *KORDINAS* as a heat-based therapeutic innovation.

The advantages of *KORDINAS* lie in its portability, practicality, and ability to be worn during daily activities, unlike heating pads or compresses that limit mobility and lose heat quickly [7,9]. This feature makes it more adaptable for adolescents who must attend school or engage in routine tasks during menstruation. Nevertheless, further studies are needed to compare *KORDINAS* directly with existing heat devices or pharmacological interventions to quantify relative efficacy and cost-effectiveness.

While this study shows promising results, its limitations include the small sample size ($N = 20$), the absence of a control group, and the short-term measurement limited to a single menstrual cycle. These factors restrict the generalizability and causal inference of the findings. Future research should employ a randomized controlled trial design with larger and more diverse samples, longer follow-up periods, and control for confounding variables such as stress, physical activity, and medication use.

Despite these limitations, *KORDINAS* demonstrates potential as a clinically meaningful and user-friendly non-pharmacological intervention for managing menstrual pain in adolescent girls. Its adoption can contribute to improving comfort, reducing absenteeism, and supporting the overall quality of life and academic performance of adolescents [8,9].

4 Conclusion

Intervention using Kordinas (hot dysmenorrhea corset) has been statistically provensignificantand consistently reduced the intensity of menstrual pain in adolescent girls in this study. With data supporting that all respondents experienced pain reduction, Kordinas is an effective and promising intervention option for relieving menstrual pain.

KORDINAS (Hot Dysmenorrhea Corset) has been proven effective in reducing menstrual pain in adolescent girls. This device can be seen as a simple, practical, and safe non-pharmacological alternative to reduce menstrual discomfort. In addition to providing analgesic effects through heat therapy mechanisms that increase blood circulation and muscle relaxation, KORDINAS also has the potential to support daily activities, learning concentration, and quality of life for adolescent girls. With its portable and easy-to-use nature, KORDINAS can be an innovative solution that can be implemented independently.

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