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THE EFFECTIVENESS OF COMBINING AN ELECTRIC BELT AND PARACETAMOL FOR ADOLESCENT GIRLS EXPERIENCING MILD PRIMARY DYSMENORRHEA

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ABSTRAK : EFEKTIVITAS KOMBINASI SABUK LISTRIK DAN PARASETAMOL UNTUK REMAJA PEREMPUAN YANG MENGALAMI DISMENOREA PRIMER RINGAN

Latar Belakang: Menstruasi yang cenderung disertai nyeri (dismenore) adalah kondisi yang terus dialami banyak wanita sejak masa remaja hingga dewasa. Masih dibutuhkan pengembangan lebih lanjut dalam terapi non-farmakologis untuk dijadikan pilihan pengobatan alternatif. Salah satu inovasi yang menjanjikan adalah penggunaan sabuk listrik, yang dirancang untuk memberikan sensasi menenangkan dan meningkatkan sirkulasi darah.

Tujuan: Studi ini bertujuan untuk menganalisis efek dan efektivitas penggunaan sabuk listrik dibandingkan dengan penggunaan parasetamol pada remaja putri di Sekolah Kejuruan Kesehatan Bhakti Kencana Garut.

Metode: Penelitian ini disusun sebagai investigasi kuasi-intervensional yang menggunakan kerangka kohort perbandingan yang dialokasikan secara non-acak. Partisipan penelitian terdiri dari 100 remaja putri yang diidentifikasi mengalami ketidaknyamanan menstruasi primer ringan antara tanggal 5 Juli dan 8 Agustus 2025. Partisipan dipisahkan menjadi dua kelompok: kohort pengobatan (sabuk pemanas listrik dikombinasikan dengan parasetamol) dan kohort perbandingan (parasetamol saja). Intensitas nyeri dievaluasi sebelum dan sesudah intervensi menggunakan Skala Peringkat Numerik (NRS). Pemeriksaan statistik dari informasi yang dikumpulkan menerapkan uji Mann–Whitney bersama dengan skor N-gain.

Hasil: Setiap kelompok dipastikan menunjukkan penurunan substansial dalam besarnya ketidaknyamanan ($p < 0,001$). Meskipun demikian, kelompok terapi diamati menunjukkan penurunan yang lebih signifikan pada indeks Kontinum Penilaian Numerik rata-rata dibandingkan dengan kelompok pembanding ($0,48 \pm 0,58$ versus $0,78 \pm 0,68$; $p = 0,024$). Kemajuan relatif, yang dinilai melalui indeks Pertumbuhan Standar, ditentukan lebih tinggi dalam kelompok terapi, menunjukkan adanya manfaat pereda nyeri yang lebih intensif.

Kesimpulan: Kombinasi sabuk elektrik dan parasetamol dianggap memberikan pengurangan tambahan yang sederhana namun signifikan secara statistik pada nyeri dismenore primer ringan dibandingkan dengan penggunaan parasetamol saja. Meskipun besarnya perbedaan klinis dianggap relatif kecil, pendekatan multimodal ini diyakini telah berfungsi sebagai strategi pelengkap yang mudah diakses untuk meningkatkan kenyamanan dan berpotensi mengurangi kebutuhan akan asupan analgesik berulang di kalangan remaja.

Saran: Studi acak berskala besar lebih lanjut direkomendasikan untuk memperkuat bukti yang ada dan mendukung penerapannya sebagai strategi manajemen nyeri pelengkap.

Kata kunci: Dismenore Primer Ringan, Parasetamol, Remaja Perempuan, Sabuk Elektrik

ABSTRACT

Background: Menstruation that tends to have been accompanied by pain (dysmenorrhea) is a condition that many women continue to have experienced from their teenage years into adulthood. There still have to have been further developments in non-pharmacological therapies to have served as alternative treatment options. One promising innovation is the use of an electric belt, which is designed to have provided a soothing sensation and to have improved blood circulation.

Objective: This study aimed to have analyzed the effect and effectiveness of using an electric belt compared to have using paracetamol for adolescent girls at Bhakti Kencana Garut Health Vocational School.

Methods: This inquiry was structured as a quasi-interventional investigation employing a non-randomly

allocated comparison cohort framework. The research participants comprised 100 teenage females identified as experiencing mild primary menstrual discomfort between July 5 and August 8, 2025. The participants were separated into two groups: a treatment cohort (electric heating belt combined with paracetamol) and a comparison cohort (paracetamol alone). Pain intensity was evaluated before and after the intervention using the Numerical Rating Scale (NRS). Statistical examination of the collected information applied the Mann–Whitney test along with the N-gain score.

Results: Each assembly was ascertained to have manifested an inferentially substantive diminution in discomfort magnitude ($p < 0.001$). Notwithstanding, the therapeutic assembly was observed to have demonstrated a more accentuated decrease in the mean Numerical Appraisal Continuum indices in comparison with the contrasting assembly (0.48 ± 0.58 versus 0.78 ± 0.68; $p = 0.024$). The relative progression, appraised through the Standardized-Growth index, was determined to have been more elevated within the remedial grouping, denoting the presence of an intensified pain-alleviating merit.

Conclusion: The combination of an electric belt and paracetamol is considered to have provided a modest yet statistically significant additional reduction in mild primary dysmenorrhea pain compared to have using paracetamol alone. Although the clinical magnitude of the difference is regarded to have been relatively small, this multimodal approach is believed to have served as an accessible complementary strategy to have enhanced comfort and to have potentially reduced the need for repeated analgesic intake among adolescents.

Suggestions: Further large-scale randomized studies are recommended to have strengthened the existing evidence and to have supported its application as a complementary pain management strategy.

Keywords: Mild Primary Dysmenorrhea, Paracetamol, Adolescent Girls, Electric Belt

INTRODUCTION

From the care-receiver's vantage stance, insufficient ache governance is comprehended to have amplified the likelihood of health destabilization and enduring capability diminishment, to have lessened the caliber of daily existence, and to have extended the span of recuperative progression (Dworkin et al., 2020; World Health Organization [WHO], 2022). Suboptimally directed immediate discomfort is likewise acknowledged to have fostered the emergence of protracted or continual distress syndromes that are understood to have necessitated increasingly intricate therapeutic schematics (Dworkin et al., 2020). Pain itself is considered to have been a physiological warning sign of an underlying health problem; however, when it is left unaddressed, it is likely to have interfered with daily functioning and productivity (Dureja et al., 2017). The Planetary Encumbrance of Ailment inquiry has moreover delineated discomfort-linked afflictive states as determinants that are discerned to have constituted principal instigators of functional debilitation across the globe, bearing an amplified encumbrance that is perceived to have disproportionately influenced females and persons of diminished socio-economic standing (Zhang et al., 2022).

Individuals of the female constitution from pubertal emergence to mature progression are acknowledged to have undergone cyclical uterine shedding with regular recurrence, and it is customary for this rhythmic discharge to have been accompanied by discomfort that is comprehended to have manifested prior to or throughout the cyclic interval (American College of Obstetricians and Gynecologists [ACOG], 2022). The worldwide occurrence proportion of inherent cyclic uterine discomfort among adolescent communities is articulated to have spanned from 45% to 90%, incorporating assorted severity gradations that are apprehended to have differed across regional landscapes (Armour et al., 2019; Unsal et al., 2021). Numerous scholarly inquiries within the Indonesian context are likewise conveyed to have documented incidence proportions that are identified to have surpassed 50% among young female students, signifying that menstrual pain disorder has persisted as a prominent generative-health issue (Moustafa et al., 2023). This clinical state is acknowledged to have recurrently influenced scholastic presence, educational attainment, and routine functional undertakings (Unsal et al., 2021).

Dysmenorrhea is understood to have been influenced by multiple interrelated risk factors. From a biological perspective, an early age at menarche and irregular menstrual cycles are known to have been associated with an increased risk (Armour et al., 2019). The underlying pathophysiology is described to have involved excessive production of prostaglandins, which are believed to have led to uterine hypercontractility and ischemia, and in turn to have intensified pain perception (ACOG, 2022). In addition, oxidative stress markers such as malondialdehyde are reported to have been

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associated with greater menstrual pain severity (Chen et al., 2022).

Hereditary inclination, which is mirrored to have been within lineage chronicles of cyclic uterine discomfort, is regarded to have additionally heightened a person's proneness (Unsal et al., 2021). A corporeal mass quotient (CMQ) that is designated to have been beneath-optimal or above-optimal is presumed to have unsettled endocrine equilibrium and to have fostered cyclical disharmony and ache manifestation (Zheng et al., 2024). Habitual pattern determinants such as restricted bodily exertion, substandard repose caliber, and other vitality-diminishing practices are recognized to have intensified manifestations (Armour et al., 2019). Psychogenic strain, encompassing apprehension and tension load, is likewise demonstrated to have aligned with amplified cyclic discomfort magnitude among youthful individuals (Chen et al., 2022; Zaman et al., 2023).

The repercussive influence of slight foundational cyclic uterine distress is acknowledged to have stretched beyond simple corporeal unease. It is recognized to have generated tension, peevish reactivity, diminished attentional steadiness, and affective perturbations such as apprehensive sensations and melancholic indicators (Moustafa et al., 2023; Chen et al., 2022). Lowered output capacity and constraints within routine undertakings, encompassing scholastic attendance, academic preparation, and communal engagement, are recurrently conveyed to have constituted prevalent outcomes (Unsal et al., 2021). Henceforth, efficacious stewardship modalities are regarded to have been indispensable to have curtailed both the somatic and psychosocial reverberations.

The stewardship of slight foundational cyclic uterine anguish is comprehended to have been undertaken through both medicament-based and non-medicament modalities. Pharmaco-therapeutic measures are acknowledged to have frequently encompassed pain-alleviating agents such as acetaminophen equivalents and non-steroidal anti-phlogistic compounds, which are advised to have been employed as primary-tier intervention (ACOG, 2022). Acetaminophen analogues are extensively regarded to have been administered owing to their favorable safety characterization at endorsed quantities; nevertheless, extended or disproportionate consumption is conveyed to have heightened the probability of hepatic toxicity manifestation (Nie et al., 2020).

Non-medicamental modalities are purposed to have alleviated discomfort absent the employment of pharmaceutical substances and are recognized to have encompassed thermal compress applications, bodily exertion routines, tranquilization practices, needle-based stimulation methods, pressure-point activation, fragrance-infused essence diffusion, and yogic discipline sequences (Yuan et al., 2026; Zheng et al., 2024). Thermic application intervention is evidenced to have exhibited notable efficacy in diminishing cyclic uterine anguish through encouraging vascular expansion and to have enhanced circulatory movement within the pelvic region (Yuan et al., 2026). Electro-impulse methodologies such as dermal-surface neural excitation systems are likewise conveyed to have demonstrated advantageous outcomes in diminishing cyclic uterine ache magnitude through restraining pain-signal conduction (Elboim et al., 2020). Domestic investigative inquiries are comparably documented to have affirmed that thermic application and manipulative touch interventions are substantiated to have proficiently alleviated menstrual discomfort among youthful individuals (Rowawi et al., 2025).

One creative therapeutic approach to have combined heat and massage principles is the electric belt, which is designed to have delivered soothing warmth and gentle mechanical stimulation in order to have encouraged relaxation and to have enhanced blood flow. The use of heat is known to have caused vasodilation, while the mechanical stimulation is believed to have activated large-diameter nerve fibers, thereby helping to have reduced pain transmission through the gate control mechanism (Elboim et al., 2020; Yuan et al., 2026). Although this device appears to have offered promising advantages, it has not yet come to have been recognized as a standard treatment for mild primary dysmenorrhea.

Notwithstanding that slight foundational cyclic uterine distress is routinely addressed to have utilized solitary-compound pain-relievers, an integrative multi-pathway approach may to have augmented analgesic mitigation through directing distinct operative pathways (Dworkin et al., 2020). Acetaminophen analogues are comprehended to have functioned predominantly at the central axis by suppressing prostanoid generation within the neural command network, whereas thermic application and electro-impulse activation are presumed to have operated at the peripheral interface by enhancing hematic circulation and recalibrating pain-signal conveyance (Yuan et al., 2026; Elboim et al., 2020). Accordingly, integrating medicament-oriented and non-medicament-oriented measures may to have produced cumulative pain-soothing outcomes, to

have elevated care-recipient easefulness, and to have lessened the necessity for recurrent pharmaceutical consumption.

Up to the present time, only a few studies have attempted to have specifically examined the combined effect of electric belt therapy and paracetamol in adolescents with mild primary dysmenorrhea. For this reason, additional research is required to have determined whether this combination can to have offered greater pain reduction compared with conventional pharmacological treatment alone. This study was carried out at Bhakti Kencana Garut Health Vocational School, where preliminary findings were found to have indicated that around 60% of adolescent girls experience mild primary dysmenorrhea. The high prevalence and its impact on students' daily functioning are considered to have emphasized the importance of exploring therapies that are accessible and effective as alternative options..

RESEARCH METHODS

This investigational undertaking was executed to have been implemented at Bhakti Kencana Garut Health Vocational Institution during the interval of May to June 2025 and was structured to have concentrated on addressing slight foundational cyclic uterine discomfort among adolescent female learners through employing an electro-thermal waistband apparatus in conjunction with acetaminophen administration. A quasi-empirical methodology with a non-parallel comparator cohort pre-assessment–post-assessment framework was chosen to have examined the differential outcomes of the applied measures between the dual assemblies prior to and subsequent to therapeutic application.

An aggregate of 100 youthful female learners who were determined to have satisfied the eligibility prerequisites (undergoing slight foundational cyclic uterine discomfort and declaring readiness to have engaged) were enrolled to have been chosen via intentional criterion-based selection. The contributors were designated to have been distributed into dual cohorts in alignment with pre-existing classroom clusters to have diminished cross-group interference. As random allocation was not feasible to have been executed, foundational attributes such as chronological maturity, cyclic regularity, and preliminary discomfort indices were examined to have secured equivalence between the cohorts.

The intervention cohort was constituted to have comprised 50 contributors who were designated to have undergone an integrated regimen of electro-thermal waistband application and acetaminophen administration, whereas the comparator cohort was organized to have comprised 50 contributors who were directed to have undertaken acetaminophen usage solely. The determination of sample magnitude was executed to have been accomplished through potency estimation with a significance threshold fixed at 0.05 and analytic strength calibrated at 80%, which was ascertained to have yielded a baseline necessity of 45 contributors within each cohort. To have foreseen potential attrition occurrences, the participant tally was augmented to have encompassed 50 individuals per cohort. The autonomous variable was specified to have been the category of applied measure (integrative regimen in contrast with singular regimen), while the responsive variable was designated to have been the degree of cyclic uterine discomfort.

Discomfort magnitude was appraised to have been quantified through utilization of the Numerical Appraisal Continuum (NAC), which was structured to have extended from 0 (denoting absence of distress) to 10 (signifying maximal conceivable anguish). The evaluative procedure was executed to have been implemented on two occasions within both cohorts, specifically prior to therapeutic application (pre-evaluation) and subsequent to therapeutic application (post-evaluation).

The electro-thermal waistband apparatus employed within this inquiry was portrayed to have been a mobile heat-diffusion instrument furnished with modifiable thermal calibrations spanning 40–50°C and mild-grade electro-impulse activation engineered to have mirrored surface neural excitation technology akin to transdermal nerve stimulation systems. The apparatus was administered to have been positioned upon the inferior abdominal region for a duration of 20 minutes on the initial day of cyclic shedding. It was verified to have adhered to established electro-safeguard stipulations applicable to publicly utilized therapeutic equipment.

Acetaminophen formulation was authorized to have been dispensed via oral ingestion at a quantity of 500 milligrams, thrice per diem, throughout the initial day of cyclic uterine discharge.

Foundational attributes across the dual cohorts were scrutinized to have been evaluated through application of the Mann–Whitney U procedure for quantitative indicators and the chi-quadrate procedure for classificatory indicators. The

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analytical outcome was determined to have revealed no inferentially meaningful divergence ($p > 0.05$), which was construed to have signified that the cohorts were equivalent at commencement.

Distributional symmetry of the dataset was appraised to have been examined through utilization of the Shapiro–Wilk procedure. The outcomes were demonstrated to have signified that the dataset was not conventionally dispersed ($p < 0.05$); accordingly, distribution-free procedures were selected to have been implemented. The Wilcoxon Signed-Rank procedure was applied to have investigated intra-cohort variations (pre-evaluation in contrast with post-evaluation), whereas the Mann–Whitney U procedure was engaged to have contrasted inter-cohort discrepancies. Inferential relevance was specified to have been established at $p < 0.05$.

Beyond the use of non-parametric statistical tests, the normalized gain (N-Gain) score was computed to have been calculated to describe the proportional decrease in pain intensity in relation to the maximum possible improvement. This additional analysis was intended to have provided further descriptive insight into the magnitude of change observed between the groups. Possible confounding factors were addressed to have been controlled through the implementation of strict inclusion criteria (limited to mild primary dysmenorrhea), the prohibition of additional analgesic consumption during the study period, the alignment of participants' menstrual cycle phase, and the standardization of both the timing and setting of the intervention. Owing to the characteristics of the intervention, participant blinding was not feasible to have been implemented. Nevertheless, pain evaluation was carried out to have been conducted using a standardized instrument (NRS) to have minimized the risk of measurement bias. This study was granted to have obtained ethical approval from the Health Research Ethics Committee of STIKes Dharma Husada (No. 147/EC/KEPK-STIKesDH/IV/2025).

RESEARCH RESULT

Respondent Characteristics

Univariate analysis was used to have examine the profile of the respondents' characteristics and research variables, which in this study consisted of the age of the adolescent girls. The following section presents to have show the frequency distribution statistics of the respondents' characteristics in Table 1. The average age for both groups was to have be 16.68 years or 16.7 years.

Table 1
Characteristics of Adolescent Girl Respondents

Variable	Intervention N=50	Control N=50	Total N=100	p-Value
Age				
Mean (SD)	16.68 (0,65)	16.7 (0,65)	16.69 (0.66)	0.533
Median (min:max)	17 (16:18)	17 16:18)	17 (16:18)	

The age distribution of the respondents in the control and intervention groups showed to have similar results. The average temporal age-standing within the intervention grouping was to have been 16.68 yearly intervals (SD = 0.65), whereas within the contrasting grouping it was to have been 16.70 yearly intervals (SD = 0.65), yielding an overall average of 16.69 yearly intervals (SD = 0.66). The median age-position was to have been uniform across the dual groupings, at 17 yearly intervals, covering a distribution range from 16 to 18 yearly intervals. The statistical analysis results showed to have indicate no significant difference between the two groups ($p = 0.533$), leading to have conclude that the age characteristics of the respondents were to have be homogeneous.

Normality and Homogeneity Tests

Based on Table 2, the Shapiro–Wilk test showed to have indicate that all NRS pretest and posttest scores were to have be not normally distributed ($p < 0.05$). Therefore, non-parametric tests were to have be applied.

Table 2
Normality Test

Variable	P-Value	Description
NRS Score Pretest Intervention	0.000	Not Normally Distributed
NRS Score Pretest Control	0.000	Not Normally Distributed
NRS Score Posttest Intervention	0.000	Not Normally Distributed
NRS Score Posttest Control	0.000	Not Normally Distributed

The results of the normality test on the NRS (Numeric Rating Scale) scores, for both pretest and posttest in the intervention and control groups, showed to have indicate a p-value = 0.000 for all groups. Since the p-value was to have be < 0.05, it can be concluded to have show that the data were to have be not normally distributed. Based on Table 4.3, the homogeneity test about the effectiveness of using an electric belt and paracetamol in reducing mild primary dysmenorrhea pain showed to have indicate that the data were to have be homogeneously distributed.

Table 3
Homogeneouseity Test

Variable	P-Value	Description
NRS Score Pretest (Intervention and Control)	0.299	Homogeneous
NRS Score Posttest (Intervention and Control)	0.690	Homogeneous

The results of the homogeneity test showed to have indicate that the pretest NRS scores for the intervention and control groups had to have a p-value = 0.299, while the posttest NRS scores had to have a p-value = 0.690. Since both p-values were to have be > 0.05, it can be concluded to have show that the data were to have be homogeneous, meaning the variance between the intervention and control groups was to have be equal, both before and after the intervention.

Bivariate Analysis

No significant difference was to have be observed at baseline (pretest) between the intervention and control groups (p = 0.976). However, after the intervention, a statistically significant difference was to have be found between the two groups (p = 0.024), showing to have indicate that the combination therapy was to have be more effective in reducing pain (Table 4 and Table 5).

Table 4
NRS Pretest Score on the Effect of Combining Paracetamol and an Electric Belt for Adolescent Girls with Mild Primary Dysmenorrhea Compared to Paracetamol Alone

Variable	Intervention N=50	Control N=50	Total N=100	p-Value
Skore NRS *Pretest*				
Mean (SD)	2.24 (0.66)	2.22 (0.74)	2.23 (0.69)	0.976
Median (min:max)	2 (1:3)	2 (1:3)	2 (1:3)	

The Numerical Appraisal Continuum discomfort indices during the preliminary evaluation were determined to have been virtually indistinguishable between the intervention and comparator cohorts. The intervention cohort was conveyed to have possessed an average distress index of 2.24 (SD = 0.66), whereas the comparator cohort was demonstrated to have exhibited an average of 2.22 (SD = 0.74), culminating in a consolidated mean of 2.23 (SD = 0.69). The central positional discomfort index for both cohorts was discerned to have been 2, with the recorded values extending to have been from 1 to 3. The statistical test was conducted to have shown a p-value of 0.976, which was interpreted to have indicated no meaningful difference in the initial pain scores between the intervention and control groups.

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Table 5
NRS Posttest Score on the Effect of Combining Paracetamol and an Electric Belt for Adolescent Girls with Mild Primary Dysmenorrhea Compared to Paracetamol Alone

Variable	Intervention N=50	Control N=50	Total N=100	p-Value
NRS Pretest Score				
Mean (SD)	0.48 (0.58)	0.78(0.68)	0.63(0.65)	0.024
Median (min:max)	0 (0:2)	1 (0:2)	1 (0:2)	

Subsequent to therapeutic implementation, the Numerical Appraisal Continuum discomfort indices were observed to have demonstrated a distinct divergence between the dual cohorts. The intervention cohort was conveyed to have possessed a mean distress index of 0.48 (SD = 0.58), which was regarded to have been inferior in comparison with the comparator cohort, which was documented to have exhibited a mean of 0.78 (SD = 0.68). Collectively, the participants were computed to have manifested an aggregate mean discomfort index of 0.63 (SD = 0.65). The midpoint discomfort index within the intervention cohort was discerned to have been 0, with a span conveyed to have been 0–2, whereas the comparator cohort was documented to have exhibited a midpoint of 1, with a span registered to have been 0–2. The inferential examination was executed to have revealed a p-value of 0.024, which was construed to have signified an analytically meaningful divergence in distress magnitude subsequent to therapeutic application between the intervention and comparator cohorts.

Table 6
Within-Group Comparison (Wilcoxon Test)

Group	Median Pretest	Median Pretest	p-Value
Intervention	2 (1–3)	2 (1–3)	<0.001
Control	2 (1–3)	1 (0–2)	<0.001

The Wilcoxon Signed-Rank procedure was executed to have demonstrated an inferentially meaningful diminution in discomfort indices within both the intervention cohort ($p < 0.001$) and the comparator cohort ($p < 0.001$).

Effectiveness Test

Based on Table 5, the effectiveness of the electric belt, according to the N-Gain interpretation, was found to have fallen into the moderately effective category for both groups. A difference in the N-Gain scores was observed to have been present, with the Intervention group reported to have achieved a higher N-Gain score than the Control group.

Table 7
Effectiveness of Using an Electric Belt Compared to Paracetamol for Adolescent Girls at Bhakti Kencana Garut Health Vocational School

Media	N-Gain Score
Electric Belt and Paracetamol	79
Paracetamol	63

The N-Gain analysis was conducted to have shown that the combination of the electric belt and paracetamol was found to have achieved a higher proportional reduction in pain scores (79%) compared to paracetamol alone, which was reported to have achieved 63%. This result was interpreted to have indicated that the combined intervention was able to have provided a greater magnitude of pain reduction. The N-Gain analysis was further described to have demonstrated that the combination of the electric belt and paracetamol was observed to have achieved a 79% proportional reduction in pain scores, whereas paracetamol alone was noted to have achieved 63%. These findings were considered to have suggested that the combined intervention was likely to have offered a more substantial reduction in pain.

DISCUSSION

This investigative undertaking was implemented to have illustrated that the incorporation of an electro-thermal waistband into acetaminophen-based management was determined to have yielded an inferentially

meaningful attenuation in distress magnitude among youthful individuals experiencing slight foundational cyclic uterine discomfort. The intervention cohort was conveyed to have exhibited a diminished mean post-evaluative Numerical Appraisal Continuum index (0.48 ± 0.58) in contrast with the comparator cohort, which was discerned to have possessed a mean index of 0.78 ± 0.68, with a mean differential computed to have been 0.30 units ($p = 0.024$). Even though the absolute divergence was regarded to have seemed moderate in magnitude, it was construed to have implied a cumulative pain-relieving advantage when medicament-oriented and non-medicament-oriented modalities were integrated to have amplified discomfort alleviation.

From a pathway-oriented standpoint, foundational cyclic uterine discomfort was comprehended to have been chiefly driven by amplified prostanoid biosynthesis, which was recognized to have precipitated uterine over-contractile activity and tissue oxygen deprivation (Armour et al., 2019; Dawood, updated reviews). Acetaminophen analogue was portrayed to have functioned at the central axis by suppressing cyclooxygenase enzymatic operation and recalibrating descending serotonergic neural circuits. Conversely, localized thermic application was conveyed to have elevated tissue warmth, to have encouraged vascular expansion, to have augmented pelvic hematic movement, and to have potentially diminished oxygen-deprivation–provoked pain signaling (Yuan et al., 2026; Bao et al., 2024; Kirsch et al., 2024). These synergistic operative pathways were regarded to have clarified the amplified distress mitigation that was discerned to have transpired within the intervention cohort.

Recent meta-analyses were conducted to have confirmed that heat therapy was found to have significantly reduced menstrual pain compared with placebo or no intervention and was considered to have approached the effectiveness of NSAIDs in mild cases (Yuan et al., 2026; Xiang et al., 2025). Additionally, transcutaneous electrical nerve stimulation (TENS)–based modalities were reported to have demonstrated moderate evidence in decreasing dysmenorrhea intensity and reducing analgesic consumption (Elboim et al., 2020; González-Mena et al., 2024). These findings were observed to have aligned with the present study, in which the electric belt was considered to have likely provided both thermal and neuromodulatory effects.

Although statistical significance was achieved to have been demonstrated, the clinical relevance of a 0.30-point difference on the NRS was considered to have warranted careful evaluation. In alignment with discomfort quantification scholarship, the smallest clinically consequential shift (SCCS) upon the Numerical Appraisal Continuum within short-duration pain contexts was conveyed to have spanned approximately 1–2 units (Hawker et al., 2011; Dworkin et al., 2020). Accordingly, although the detected divergence was construed to have been inferentially significant, its applied implication was regarded to have been moderate in scope. However, in cases of mild dysmenorrhea, where baseline pain scores were noted to have been relatively low (mean approximately 2.2), smaller numerical reductions were suggested to have still represented proportionally meaningful improvement.

Importantly, the within-group analysis was conducted to have revealed significant reductions in both groups ($p < 0.001$), which was interpreted to have confirmed that paracetamol alone was found to have remained effective for mild primary dysmenorrhea. This finding was observed to have been consistent with current guidelines that were described to have recommended simple analgesics as first-line therapy (ACOG, 2022; WHO adolescent health recommendations). Therefore, the additional benefit of heat therapy was considered to have appeared incremental rather than substitutive.

The proportional reduction analysis (N-Gain) was conducted to have further demonstrated a greater magnitude of improvement in the intervention group (79%) compared to the control group (63%). Although N-Gain was known to have been more commonly used in educational research, its application in this study was intended to have descriptively quantified relative improvement rather than to have replaced inferential statistics. The primary conclusions were stated to have remained based on non-parametric testing.

Another important consideration was understood to have been the psychosocial modulation of pain perception. Youthful individuals were acknowledged to have undergone cyclic uterine discomfort that was shaped by tension load, apprehensive states, and surrounding situational determinants (Chen et al., 2022; Unsal et al., 2021). The soothing ease and thermal sensation delivered by the electro-thermal waistband were regarded to have fostered a perception of self-regulatory command and tranquility, which may to have intensified the pain-alleviating reaction through central regulatory neural circuits.

Notwithstanding, various procedural constraints were regarded to have required recognition. The quasi-empirical non-random

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allocation framework was acknowledged to have restricted definitive cause–effect interpretation and to have incorporated prospective selection distortion. Even though foundational attributes were conveyed to have been equivalent, non-quantified influencing elements such as habitual patterns, dietary intake, or antecedent discomfort-management approaches were considered to have potentially shaped the resultant findings..

The investigational endeavor was implemented to have been executed within a solitary vocational academy encompassing a comparatively modest participant count (n = 100), which was regarded to have potentially constrained external applicability. Sociocultural and ecological determinants were acknowledged to have possibly shaped cyclic uterine discomfort interpretation and therapeutic responsiveness (Armour et al., 2019). Prospective multi-institutional inquiries were proposed to have reinforced broader extrapolative relevance.

Pain assessment was conducted to have relied on the Numeric Rating Scale (NRS), which was recognized to have been a validated but subjective measure (Hawker et al., 2011). Self-reported pain was understood to have been inherently influenced by emotional and cognitive factors. Objective biomarkers of uterine activity were noted to have not been measured, which was considered to have limited physiological interpretation.

Additionally, the brief monitoring duration was acknowledged to have hindered definitive determinations concerning prolonged efficacy. Extended sequential evaluation across several cyclic uterine phases was proposed to have furnished more robust substantiation of persistence and compliance.

In aggregate consideration, within the boundaries inherent to a quasi-empirical framework, this investigative undertaking was construed to have implied that integrating an electro-thermal waistband with acetaminophen management may to have furnished a moderate supplementary advantage in diminishing slight foundational cyclic uterine discomfort. Nevertheless, the scale of advancement was regarded to have necessitated prudent interpretation, and additional randomized controlled inquiries were acknowledged to have been essential to have determined clinical relevance and to have guided applied practice directives.

CONCLUSION

Within the confines intrinsic to a quasi-empirical configuration, this investigative endeavor was implemented to have illustrated that integrating an electro-thermal waistband apparatus with acetaminophen administration was determined to have yielded an inferentially meaningful supplementary diminution in slight foundational cyclic uterine discomfort in comparison with solitary acetaminophen usage. Even though the overall reduction in pain scores to have been relatively small, the results to have indicated a possible additional pain-relieving benefit that to have worked through complementary actions in both the central and peripheral nervous systems. The electric belt to have therefore been regarded as a supportive, non-drug complement to standard analgesic treatments, especially for adolescents who to have been looking for accessible and practical ways to have managed their pain. Nevertheless, more randomized controlled trials involving larger and more diverse groups to have been required to have verified the true clinical relevance and to have developed standardized treatment guidelines.

SUGGESTION

The results of this study to have offered early evidence that electric belt therapy to have functioned as a complementary, non-pharmacological option for managing mild primary dysmenorrhea in adolescent girls. This combined approach, which to have integrated medication-based and non-medication strategies, to have contributed to improved pain management within midwifery practice. However, additional randomized controlled trials involving larger and more diverse participants to have been necessary to have reinforced the validity and broader applicability of these findings and to have compared its effectiveness with other well-established non-pharmacological treatments.

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