Original article

Temperature-dependent effects of hip bath on primary dysmenorrhea individuals: A randomized controlled trial

Ajmi JS[1], Geetha B Shetty[2], Sujatha KJ[1], Prashant Shetty[3]

From, [1]Department of Clinical Naturopathy, [2]Department of Nutrition and Dietetics, [3]SDM College of Naturopathy and Yogic Sciences Ujire, D.K, Affiliated to Rajiv Gandhi University of Health and Sciences, Bangalore, Karnataka, India.

ABSTRACT

Background & Aim: To evaluate the specific Temperature Effect of the hip bath on primary dysmenorrhea. The current study aimed to determine whether a specific temperature hip bath can ease the discomfort associated with primary dysmenorrhea. **Experimental Procedure:** A cohort of 160 young women, aged between 16 to 25, who had been diagnosed with primary dysmenorrhea, were selected and randomly divided into three groups Cold hip bath (CHB), Hot hip bath (HHB), Neutral hip bath (NHB). The participants were evaluated using a menstrual symptom questionnaire (MSQ), a visual analog scale (VAS), and a hemogram at baseline and after the three-month intervention. It was registered under the clinical trial registry of India (CTRI/2021/12/038381). **Results:** After the intervention, CHB demonstrated a highly significant reduction in VAS score ($P < 0.01$) and MSQ ($P < 0.01$) when compared to the other two groups after the 3 months of intervention. The complete blood count showed a significant increase in hemoglobin and red blood cells and a reduction in eosinophils and lymphocytes. **Conclusion:** According to the study, a Cold Hip bath is a safe and effective way to relieve primary dysmenorrhea pain compared to neutral or hot-temperature hip baths. Participants experienced reduced menstrual pain intensity and improved symptoms after a three-month intervention.

Keywords: Hip Bath, Menustrual Symptom, Questionnaire, Naturopathy, Primary Dysmenorrhea, Visual Analog Scale

Primary dysmenorrhea (PD) is one of the familiar gynecological issues that causes pain during menstruation. Although usually affects the individual's day-to-day activities and their quality of life, it can be quite uncomfortable and bothersome [1-3]. PD is caused by intrinsic gynecological factors, and it was previously thought to be linked to psychogenic factors. However, it is now mostly linked to chemical causes, primarily an increased number of prostaglandins and vasopressin [4-6]. PD usually occurs in ovulatory cycles, and it typically appears after menarche, when the ovulation process has been developed. Approximately 88% of adolescents experience their first painful menstruation after menarche within 2 years [7]. Pain is explained by a grumpy suprapubic pain that starts between several hours before and a few hours after the onset of the menstrual bleeding. Which endure for less than a day. Pain might last up to two or three days.

Access this article online

Received – 24th Jan 2024

Initial Review – 02nd Feb 2024

Accepted – 08th Feb 2024

Quick Response Code

Symptoms are the same or different from one menstrual period to another [8,9]. The etiology of dysmenorrhea is not precisely understood. Prostaglandins (PG) have major importance in developing uterine contractions released from endometrial sloughing at the start of menses [10,11]. The contractions are non-rhythmic and inordinate which lasts more than 4-5 per minute (high frequency). The contractions occur in the uterus which may exceed 400mmhg (ranging between 150 and 180mmhg) [12].

Due to that, there is an accumulation of anaerobic metabolites and uterine ischemia which stimulates type c pain neurons that cause dysmenorrhea. The stretch receptors are the carriers for the intensity of pain [13]. Another pathogenesis may be the overproduction of prostaglandins [14]. PGs have been responsible for physiological as well as pathological activities including pain, inflammation, body temperature, and sleep regulation [15]. Complementary and alternative medicines (CAM) such as the Naturopathy system of medicine and its

Correspondence to: Ajmi JS, Department of Clinical Naturopathy, SDM College of Naturopathy and Yogic Sciences, Ujire, Affiliated to Rajiv Gandhi University of Health and \Sciences, Bangalore, Karnataka, India. **Email:** ajmirasheed6@gmail.com, **Tel.:** +91 8884865131

treatment procedures are equally effective compared to analgesics for the treatment of dysmenorrhea [16-18]. Naturopathic procedures mainly act by improving blood circulation to the reproductive organs and by relieving congestion. The Methods used for dysmenorrhea include a revulsive compress over the pelvic region, neutral hip bath, cold hip bath, revulsive hip bath, mud pack to the abdomen, abdominal pack, etc. depending upon the type of dysmenorrhea [19]. Heat therapy is the first option treatment method for primary dysmenorrhea [20]. Heat inhibits sympathetic nerve activities, thereby blood flow will be more to the area removing pain-producing substances like PGs [21]. People who use heat therapy before the pain symptoms provide an analgesic effect compared to ibuprofen [22]. Even though hip bath is used extensively in the treatment of dysmenorrhea, their temperature-specific effects on PD are not studied. Hence, the present study is designed to evaluate the specific temperature effects of hip baths on PD individuals.

MATERIALS AND METHODS

Study design: This is a triple-arm randomized controlled trial. Participants were randomly allocated to three equal groups, each consisting of 60 subjects, and given one of three different interventions: hot hip bath, neutral hip bath, or cold hip bath, and they were in their normal routine. All subjects received the intervention for three months, and assessments were done at Baseline and after three months **(Figure 1).** It was registered under the clinical trial registry of India (CTRI/2021/12/038381).

Description of the subjects: The present study consists of 180 participants aged 16 to 25 years who were recruited from Shanthi Vana Yoga and Nature Cure Hospital, Karnataka, India. Female participants with a history of primary dysmenorrhea at least for the past 1 year [23]. The study subjects included in the study have no previous history of oral contraceptive pills use, intrauterine devices, or any particular medicines for Dysmenorrhea. Also, their periods varied from 21 to 34 days [24-27]. Female participants with a history of secondary dysmenorrhea, any systemic and/or psychiatric illness, and regular use of medication for any disease were excluded from the study. The institutional ethics committee of SDM College of Naturopathy and Yogic Sciences approved the study protocol, and written informed consent was obtained from each participant (EC-434).

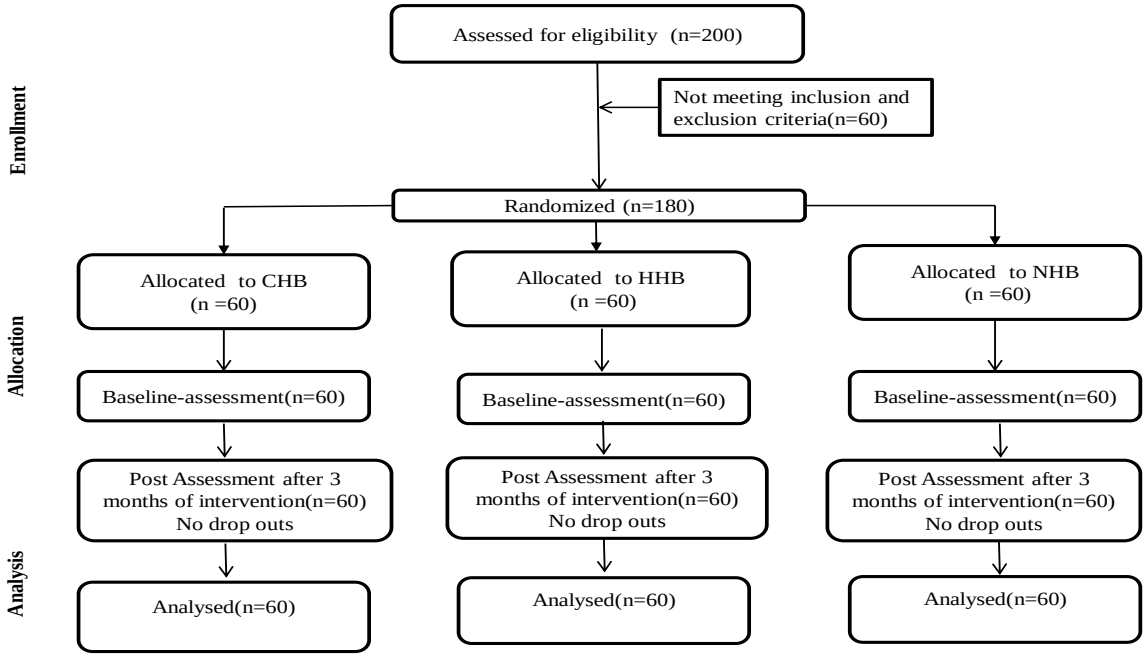


Figure 1: Illustration of study plan

Intervention: Participants received a Hip bath in three different forms: Group 1-Cold Hip bath (CHB) (10-18^{0}C), Group 2-Hot Hip bath (HHB) (40-45^0 C), Group 3-Neutral Hip bath (NHB) (32-36^{0}C). A special type of tub is used for the purpose. The tub is filled with water in such a way that it covers the hips and reaches up to the navel when the patient sits in it.

Procedure: A special type of tub is used for the purpose. The Hip bath tub is filled with water up to the navel region and the water should cover the hip region. The patient should drink one to two glasses of water pre- and post-treatment and allow the patient to sit in the tub comfortably for 20 min with a cold compress kept on the head [28]. Subjects are asked to take treatment for three months regularly in the morning hours on an empty stomach. Pain intensity was measured at the beginning of each cycle. The study was conducted from the sixth day of the menstrual cycle to the next menstrual cycle.

Assessment: After the menstrual cycle, the subjects were assessed for the intensity of pain and the intensity of symptoms with the help of the VAS scale and modified

menstrual symptom questionnaire at the baseline and after 3 months. Menstrual Symptom Questionnaire (MSQ) which includes 24 items that are rated as 1 = "never" to 5 = "always". MSQ Represents symptoms of congestive factor and spasmodic factor which include mood in the congested state and premenstrual phase respectively. The score was 12-52 for both [29]. Using a 10-point Visual analog scale (VAS) measures the intensity of the pain. The line's one end stood for "unbearable pain," and the other extremity represented "no pain at all." It was requested of the participants to rate the level of discomfort by leaving a mark on the line. The results of the scale's results were if it was between 1 and 3 points, it would be categorized as mild dysmenorrhoea, and between 4 and 6 points, it would be classified as moderate severe between 8 and 10 points [30]. Secondary measures used are a complete blood count or complete hemogram test which is performed by an automatic test machine on a sample of blood. It consists of mainly White blood cell count (WBC), Total Red blood cell count (RBC), Hemoglobulin (HGB), Haematocrit (HCT), Mean cell volume (MCV), Platelet count (PLT), Lymphocytes (LYMP), Monocyte (MONO), Eosinophils (EO), Basophils (BASO), Packed Cell Volume (PCV), Erythrocyte Sedimentation Rate (ESR). [31]

Blinding/masking: The investigator who was involved in the data collection was blind to the study.

Data analysis: The raw data obtained from each subject in each recording session were tabulated separately. The normality assumption was carried out by using the Shapiro-Wilk test and Kolmogorov-Smirnov test. The pre-post data of **(Group 1, Group 2, Group 3)** were analyzed separately by using Wilcoxon signed ranked test and between the groups were done by using the Kruskal-Wallis's test. Statistical analysis was done using Statistical Package for Social Sciences (SPSS 21.0).

RESULTS

The study consisted of 180 female participants with a mean age of 19.36 ± 1.78. Baseline and post-results are outlined below.

GROUP 1 (CHB): There was a significant reduction in VAS score ($p<0.01$) from 7.27 ±1.52 to 2.07 ±0.91 and MSQ score ($p<0.01$) from 72.87 ± 6.07 to 64. 20±8.89 when compared to baseline. Among hemogram, there is a significant increase shown in WBC level ($p<0.01$) from 5.83 to 5.84 ± 0.58, RBC ($p<0.01$) from 4.20 ± 0.54 to 4.22 ± 0.54, MCV ($p<0.01$) from 87.18 ± 0.97 to 87.31± 0.99 there is a significant decrease shown in PLT ($p<0.01$,) from 287.20 ± 53.34 to 285.32 ±52.18, EO($p<0.01$) from 0.29 ±0.058 to 0.2703 ± 0.063 LYMP ($p<0.01$) from 2.42 ± 0.40 to 2.34± 0.32 when compared to baseline and is shown in (**Table 1) (Graph 1).**

GROUP 2 (HHB): A significant reduction in the VAS score ($p<0.01$) was observed from 7.05±0.90 to 4.15±1.17, and a similar reduction was observed in the MSQ score ($p<0.01$) from 73.12±6.11 to 65.27±7.94 when compared to the baseline. A significant increase in HGB ($p<0.01$) was observed from 12.30±1.32 to 12.52±1.25, PLT ($p<0.01$) from 291.76±53.34 to 293.13±4.042, and MCV ($p<0.01$) from 87.24±0.88 to 87.36±0.84 when compared to the pre-values, as shown in (**Table 2) (Graph 2).**

GROUP 3 (NHB): After the intervention, there was a significant reduction in VAS score ($P < 0.01$) from 7.28 ± 0.96 to 5.95±1.18, and MSQ ($P < 0.01$) from 72.48 ± 6.11 to 69.20 ± 6.68 when compared to the baseline. Among the hemograms, only EO level ($p=0.003$) showed a significant reduction from 0.30 ± 0.07 to 0.29 ± 0.06 when compared to the baseline as shown in (**Table 3) (Graph 3).**

When comparing all three groups, significant differences were found among VAS ($X2(2) = 11.002$, $P = 0.004$) and MSQ ($X2(2) = 126.338$, $P < 0.001$) scores after 3 months of the intervention, as shown in (**Table 4) (Graph 4).**

COLD HIP BATH #Wilcoxon signed rank test, *Represents significant values (*p<0.05), **Represents highly significant values (**p<0.01), SD- standard deviation. WBC- white blood cells, RBC- Red blood cells, HGB- Haemoglobin, HCT- Haematocrit, MCV- mean corpuscular volume, PLT- Platelet, LYMP- lymphocyte, MONO- monocyte, EO- Eosinophils, BASO- basophils, PCV- packed cell volume, MSQ- menstrual symptom questionnaire, VAS- visual analog scale.

Hot hip bath. #Wilcoxon signed rank test, *Represents significant values (*p<0.05), **Represents highly significant values (**p<0.01), SD- standard deviation. WBC- white blood cells, RBC- Red blood cells, HGB- Haemoglobin, HCT- Haematocrit, MCV- mean corpuscular volume, PLT- Platelet, LYMP- lymphocyte, MONO- monocyte, EO- Eosinophils, BASO- basophils, PCV- packed cell volume, MSQ- menstrual symptom questionnaire, VAS- visual analog scale.

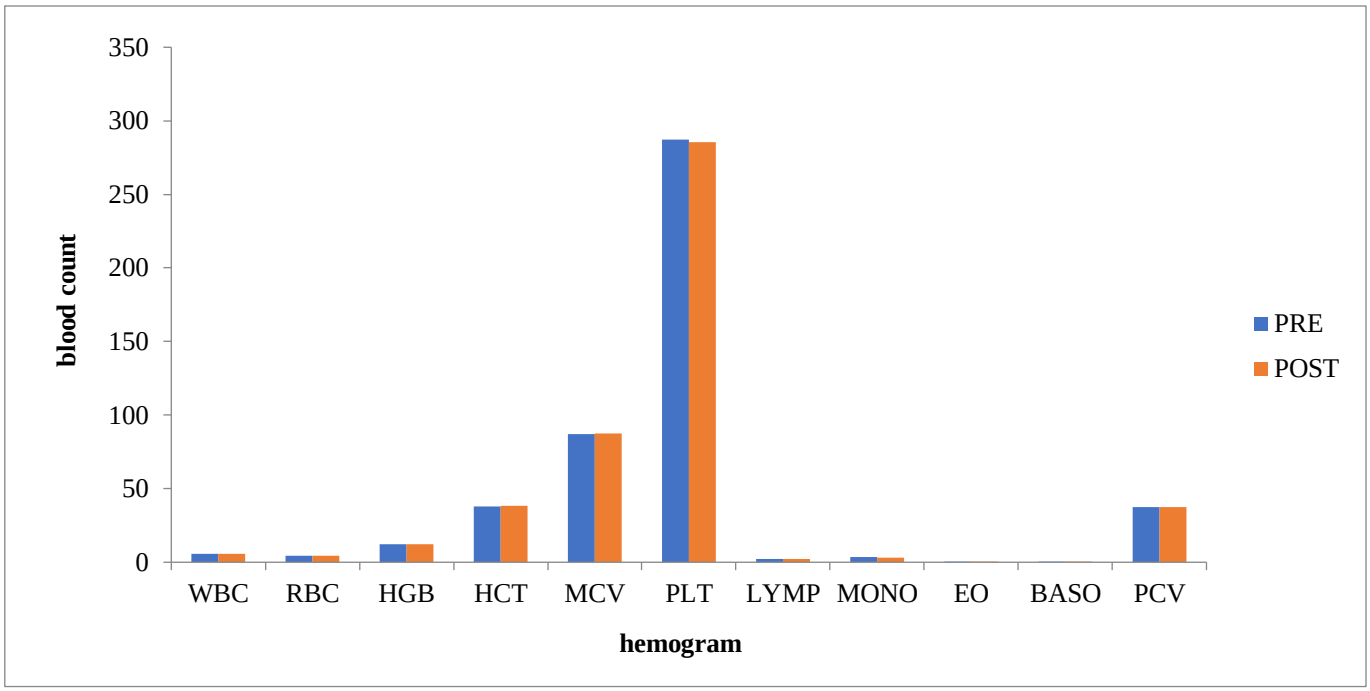
Neutral hip bath. #Wilcoxon signed rank test, *Represents significant values (*p<0.05), **Represents highly significant values (**p<0.01), SD- standard deviation. WBC- white blood cells, RBC- Red blood cells, HGB- Haemoglobin, HCT- Haematocrit, MCV- mean corpuscular volume, PLT- Platelet, LYMP- lymphocyte, MONO- monocyte, EO- Eosinophils, BASO- basophils, PCV- packed cell volume, MSQ- menstrual symptom questionnaire, VAS- visual analog scale.

#Kruskal Wallis test, *Represents significant values (*p<0.05), **Represents highly significant values (**p<0.01), SD- standard deviation. WBC- white blood cells, RBC- Red blood cells, HGB- Haemoglobin, HCT- Haematocrit, MCV-

mean corpuscular volume, PLT-Platelet, LYMP- lymphocyte, MONO- monocyte, MSQ-Menstrual Symptom Questionnaire, VAS- visual analogue scale.

Table 1: Cold hip bath-Wilcoxon signed rank test

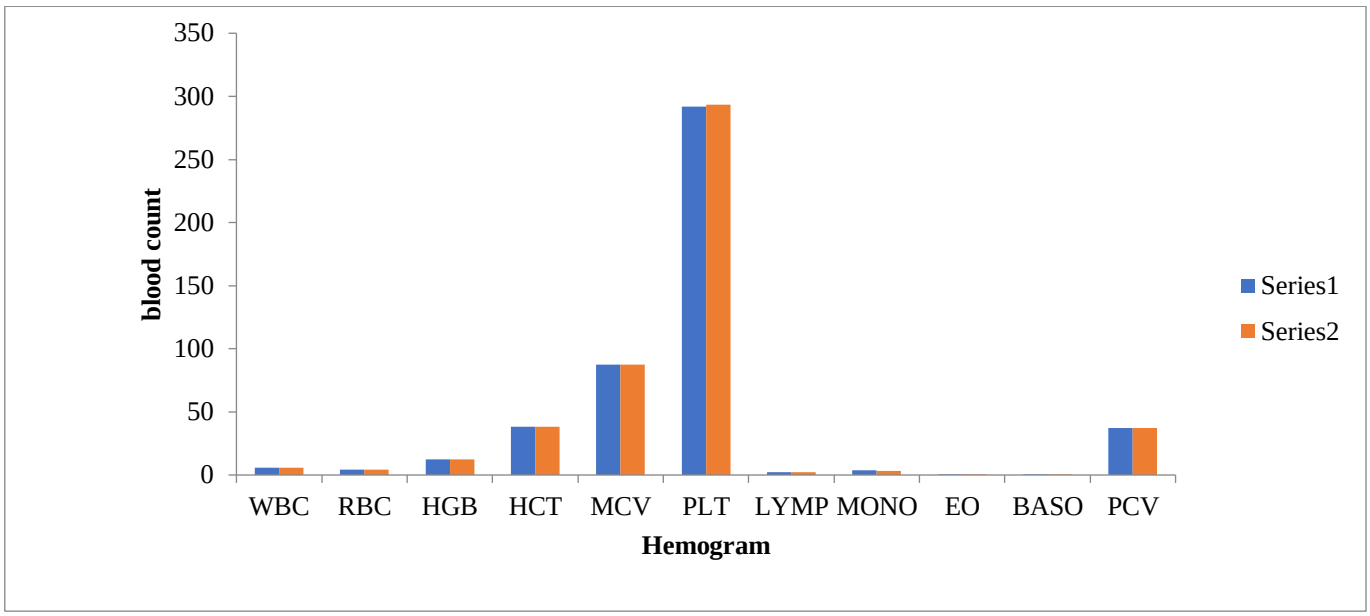
VARIABLES	PRE (MEAN ±SD)	POST (MEAN ±SD)	P VALUE
WBC	5.8295 ± 0.57707	5.8358 ± 0.57662	<0.01**
RBC	4.2028 ± 0.54025	4.2162 ± .53797	<0.01**
HGB	12.3533 ± 1.29869	12.4067± 1.22680	0.012*
HCT	38.0633± 1.74889	38.1617± 1.77717	0.006**
MCV	87.1867±.96559	87.3100± .99468	<0.01**
PLT	287.2000±53.33959	285.3167±52.18010	<0.01**
LYMP	2.4157± .40160	2.3358± .32140	<0.01**
MONO	3.4650± 1.13613	3.2335± 1.06960	0.009**
EO	0.2933± .05842	0.2703 ± .06263	<0.01**
BASO	0.0303± .03257	0.0272± .02387	0.592
PCV	37.3500± 1.44216	37.4600±1.47179	0.775
MSQ	72.8667±6.07430	64.2000±8.899245	<0.01**
VAS	7.2667±1.02290	2.07833±0.90744	<0.01**



Graph 1: Graphical representation of cold hip bath

Table 2: Hot hip bath-Wilcoxon signed rank test

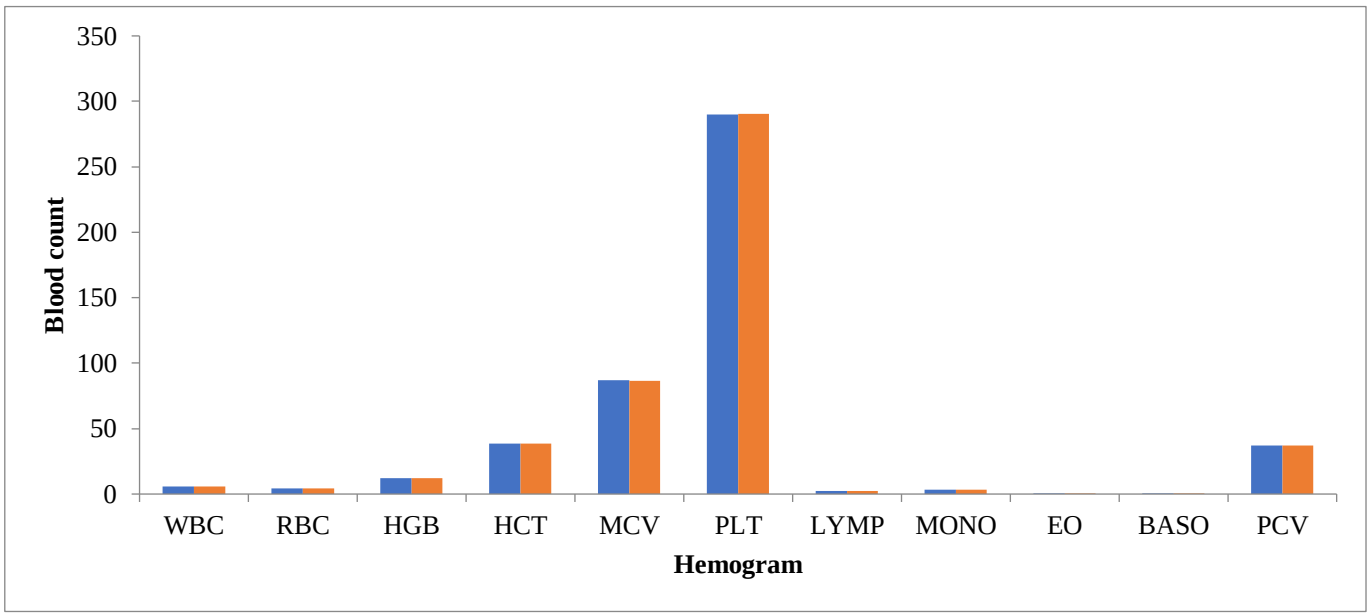
VARIABLES	PRE (MEAN ±SD)	POST (MEAN ±SD)	P VALUE
WBC	5.8155±0.58849	5.8005±0.58200	0.977
RBC	4.2492±0.49541	4.2588±0.49274	0.008**
HGB	12.3050±1.32453	12.5167±1.25349	<0.01**
HCT	38.0583±1.82676	38.2317±1.87531	0.05
MCV	87.2467±0.88288	87.3567±0.83815	<0.01**
PLT	291.7667±53.34168	293.1333±54.04219	<0.01**
LYMP	2.3533±0.36812	2.3635±0.38883	0.04*
MONO	3.5700±1.19282	3.4583±1.13097	0.35
EO	0.2985±0.6117	0.3048±0.5984	0.004**
BASO	0.0325±0.3255	0.0238±0.00715	0.02*
PCV	37.0750±1.39571	37.0950±1.45304	0.59
MSQ	73.1167±6.11220	65.2667±7.94444	<0.01**
VAS	7.1500±0.90993	4.1500±1.17639	<0.01**



Graph 2: Graphical representation of the hot hip bath

Table 3: Neutral Hip Bath-Wilcoxon signed rank test

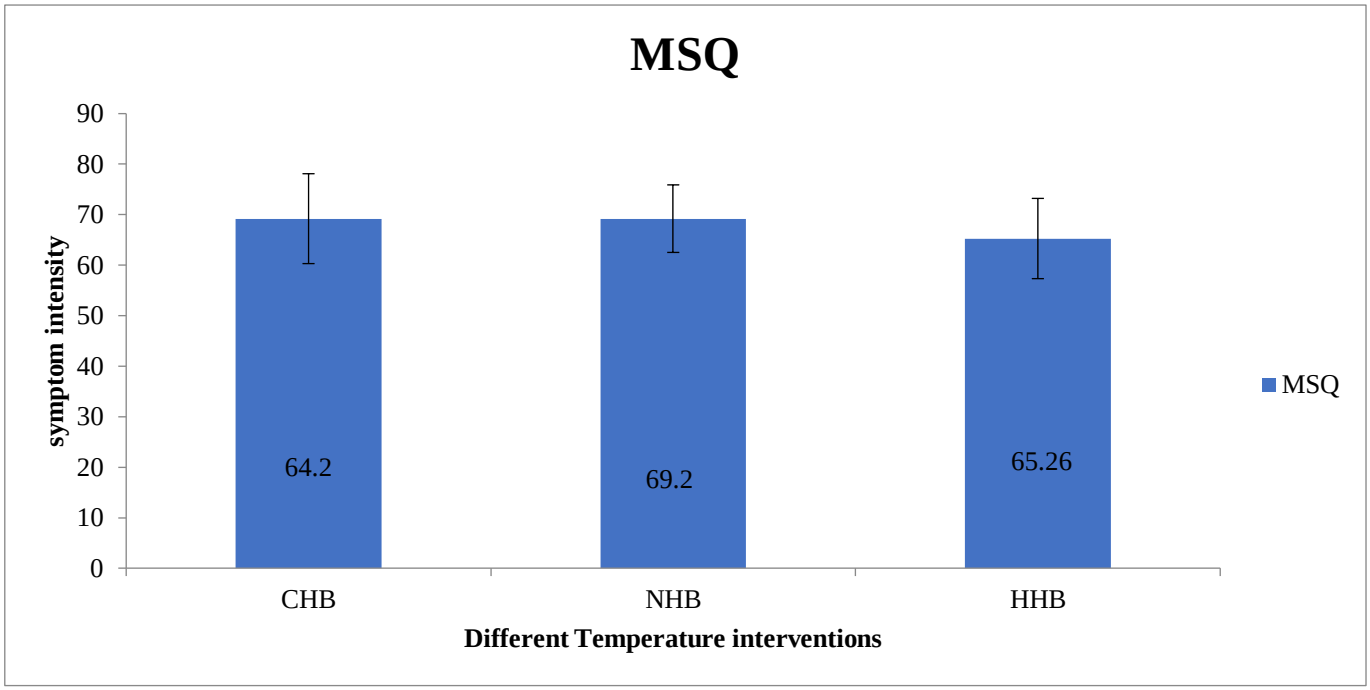
VARIABLES	PRE (MEAN ±SD)	POST (MEAN ±SD)	p VALUE
WBC	5.8205±0.58608	5.8785±0.56933	0.777
RBC	4.2063±0.53735	4.2038±0.52555	0.428
HGB	12.2383±1.30021	12.3183±1.13429	0.279
HCT	38.3833±1.79152	38.5500±2.08436	0.620
MCV	87.2100±0.81505	86.4033±6.21709	0.424
PLT	290.0167±56.31434	290.3667±56.31434	0.686
LYMP	2.4912±0.31400	2.4912±4.35482	0.467
MONO	3.4667±1.17843	3.4333±1.17699	0.655
EO	0.3033±0.07487	0.2910±0.6821	0.003**
BASO	0.0310±0.03266	0.0282±0.02418	0.67
PCV	37.1467±1.38863	36.9583±1.51527	0.001**
MSQ	72.4833±6.11220	69.2000±6.68365	<0.01**
VAS	7.2833±0.95831	5.9500±1.17639	<0.01**



Graph 3: Graphical representation of neutral hip bath

Table 4: Between group analysis

VARIABLES	CHB POST-GRP	NHB POST-GRP	HHB POST-GRP	X^2	df	p-value
WBC	5.8358 ± 0.57662	5.8785±0.56933	5.8005±0.58200	0.543	2	0.762
RBC	4.2162 ± .53797	4.2038±0.52555	4.2588±0.49274	0.873	2	0.646
HGB	12.4067± 1.22680	12.3183±1.13429	12.5167±1.25349	0.816	2	0.665
HCT	38.1617± 1.77717	38.5500±2.08436	38.2317±1.87531	1.201	2	0.548
MCV	87.3100± .99468	86.4033±6.21709	87.3567±0.83815	3.232	2	0.199
PLT	285.3167±52.18010	290.3667±56.31434	293.1333±54.04219	1.072	2	0.585
LYMP	2.3358± .32140	2.4912±4.35482	2.3635±0.38883	6.193	2	0.045
MONO	3.2335± 1.06960	3.4333±1.17699	3.4583±1.13097	0.871	2	0.647
EO	.2703 ± .06263	0.2910±0.6821	0.3048±0.5984	14.505	2	0.001*
BASO	.0272± .02387	0.0282±0.02418	0.0238±0.00715	1.288	2	0.525
PCV	37.4600±1.47179	36.9583±1.51527	37.0950±1.45304	3.696	2	0.158
MSQ	69.2000±8.899245	69.2000±6.68365	65.2667±7.94444	11.002	2	0.04*
VAS	0.5833±0.90744	5.9500±1.17639	1.1500±1.17639	126.338	2	<0.01*



Graph 4: Graphical representation of Menstrual Symptom Questionnaire (MSQ), CHB-cold hip bath- neutral hip bath, HHB-Hot hip bath

DISCUSSION

The study aimed to evaluate the impact of cold, neutral, and hot hip baths on individuals with primary Dysmenorrhea. The assessment criteria were MSQ, VAS, and hemogram. The cold hip bath Group showed a significant reduction in pain in VAS and MSQ P (<0.01) compared to the other 2 groups. Cold hip bath group participants' blood investigations (hemogram) showed a significant decrease compared to the other 2 groups. The visual analog scale is one of the pain rating scales used in clinical research to measure the intensity and frequency of various symptoms [32]. Studies show that pain affects most domains of quality of life, primarily physical and emotional functioning [33]. The Current study can solve primary dysmenorrhea with cold temperatures. The temperature and pressure of hydrotherapy interventions can block nociceptors by acting on thermal receptors and exert a positive effect on spinal segmental mechanisms, which is useful in pain conditions [34]. A current study showed cold temperature hip bath has a significant change in hemogram. These changes might be due to cold exposure of a small surface area produced compensatory vasodilatation in the deeper vascular system resulting in increased blood flow to the tissues underlying the site of exposure [35]. Also, one study suggests repeated cold-water stimulation reduces the frequency of infections, lymphocyte count, and expression of gamma interferon, modulated interleukin expression, and improved quality of life in patients with COPD [36].

In our study intervention of a cold hip bath for 3 months shows significant results in VAS and MSQ. Cold exposure activates the Sympathetic nervous system (SNS) and increases

blood levels of β-endorphin and noradrenaline. Ant depressive effect of cold showers is attributed to the presence of a high density of cold receptors in the skin expected to send several electrical impulses from peripheral nerve endings to the brain. It has a significant analgesic effect and does not cause dependences or noticeable side effects [37]. Studies have shown that cold application in the form of ice packs, ice bags, cold packs, etc., to the perineum, and episiotomy area in the postpartum period is successful in reducing pain [38].

The pathophysiology of cold applications directly stimulated alpha receptors through the SNS. The analgesic effect can be produced by applying cold application directly or indirectly. The repolarization and excitability decrease and the pain threshold increases due to the decreases in the activity of the NA-K pump in the free nerve endings also the nerve conduction velocity is slowed by changing the conduction properties of the peripheral nerves with large-scale A- A-fibres [39,40]. The present study showed that the hot hip bath group significantly reduced pain after the intervention seen in VAS and MSQ. Also, significant results were shown in the hemogram. Heat applications as a treatment method are used as a very effective and safest method [41]. Heat applications or treatments will increase the blood flow to the particular regions thereby vasodilatation happens due to that skin and tissue temperature increase underneath. So, it will provide the transport of O2, nutrients, antibodies, and leucocytes to the region [42]. One study suggests that there is an increase in temperature of 1ºc causes a 1-15% increase in the local tissue metabolism. Also, heat treatments on the peripheral nerve reveal the spinal cord reflex and increase the pain threshold [43].

The previous study of hot application showed that there was a significant reduction in the level of dysmenorrhea among adolescent girls after the interventions [44]. A study suggests that local hot water applications are known to increase circulation to the pelvic area. Thereby decreasing pelvic pain in primary dysmenorrhea individuals using a hot hip bath [45]. One study showed that the application of neutral temperature in the form of a spinal bath, spinal spray, and douche will improve sympathovagal balance by enhancing parasympathetic activity, in patients with dysmenorrhea [46]. The application of neutral temperature activates peripheral vasodilatation by increasing cutaneous circulation induced by parasympathetic activity. Also, a study was done for post-operative urinary retention with lukewarm water-soaked gauze on the suprapubic region resulting in significant results and reducing the need for urinary catheterization [47]. The present study also shows scores of VAS and MSQ have significant changes in the neutral hip bath group after the intervention. The current study shows that the intervention of cold temperatures has more significant changes in VAS, MSQ Scores, HGB, PLT, MCV, WBC, RBC, EO, and LYMP than Hot and Neutral temperatures. Cold hip baths can able to ease the pain and pain symptoms of primary dysmenorrhea individuals. This shows cold water hip bath can be a hydrotherapeutic treatment for primary dysmenorrhea.

CONCLUSION

Cold Hip baths are a safe and effective method for relieving menstrual pain in patients with primary dysmenorrhea. After three months of intervention, there was a significant reduction in pain intensity and improvement in subjective symptoms. The hemogram indicated an increase in Hemoglobin and RBC, and a decrease in Eosinophil and lymphocytes, suggesting improved inflammation.

REFERENCES

1. Karout S, Soubra L, Rahme D, et al. Prevalence, risk factors, and management practices of primary dysmenorrhea among young females. BMC women's health. 2021; 21:1-4.
2. Ju H, Jones M, Mishra G. The prevalence and risk factors of dysmenorrhea. Epidemiologic Reviews. 2014; 36(1): 10413.
3. Shetty GB, Shetty B, Mooventhan A. Efficacy of acupuncture in the management of primary dysmenorrhea: a randomized controlled trial. J Acupunc Meridianstudy. 2018; 11(4):1538.
4. Iacovides S, Avidon I, Baker FC. What we know about primary dysmenorrhea today: A critical review. Human Reproduction Update. 2015; 21(6):762-78.
5. Fajrin I, Alam G, Usman AN. Prostaglandin level of primary dysmenorrhea pain sufferers. Enfermería Clínica. 2020; 30:59.
6. Strömberg P, Åkerlund M, Forsling ML, et al. Vasopressin and prostaglandins in premenstrual pain and primary dysmenorrhea. Acta obstetricia et gynecologica Scandinavica.1984; 63(6):5338.
7. Dawood MY. Dysmenorrhea and prostaglandins. InGynecologic endocrinology 1987; 405-421. Boston, MA: Springer US. DOI: https://doi.org/10.1007/978-1-4613-2157-6_19
8. De Sanctis V, Soliman AT, Elsedfy H, et al. Dysmenorrhea in adolescents and young adults: A review in different countries. Acta Biomed. 2016; 87(3):233-46.
9. Laufer MR, Goldstein DP. Pediatric and Adolescent Gynecology-Part II. Kistner's Gynecology Women Health. 1999; 287.
10. Abd El-Mawgod MM, Alshaibany AS, Al-Anazi AM. Epidemiology of dysmenorrhea among secondary-school students in Northern Saudi Arabia. J Egyptian Public Health Association. 2016; 91(3):1159.
11. Alsaleem MA. Dysmenorrhea, associated symptoms, and management among students at King Khalid University, Saudi Arabia: An exploratory study. J Family Med Primary Care. 2018; 7(4):769.
12. Omidvar S, Bakouei F, Amiri FN, et al. Primary dysmenorrhea and menstrual symptoms in Indian female students: prevalence, impact and management. Global J Health Science. 2016; 8(8):135.
13. Ylikorkala O, Dawood MY. New concepts in dysmenorrhea. American J Obstetric Gyneco. 1978; 130(7):83347.
14. Udayar SE, Jeeragyal DP, Kruthika K. Predictors of Dysmenorrhea and Its Impact on Quality of Life among Tribal Adolescent Girls in India. Unnes J Public Health. 2022; 11(1):23-32.

15. Fajrin I, Alam G, Usman AN. Prostaglandin level of primary dysmenorrhea pain sufferers. Enfermería Clínica. 2020; 30:59.
16. Rane BR, Telavi SA, Keserwan RK. Naturopathy. In Herbal Product Development. 2020; Nov:321-347.
17. Celma M. Naturopathy. TNNMC J Community Health Nurs. 2020; 8(1):369.
18. Dauneria S, Keswani J. A study on the effect of yoga and naturopathy on dysmenorrhea. Int J Yoga Allied Sci. 2014; 3(1):38-42.
19. Hosono T, Takashima Y, Morita Y, et al. Effects of heat and steam-generating sheet on relieving symptoms of primary dysmenorrhea in young women. J Obstet Gynaecol Res. 2010; 36(4):818–824.
20. Khazaian S, Shafie S, Salehian T et al. Comparing the analgesic effect of heat patch containing iron chip and ibuprofen for primary dysmenorrhea: A randomized controlled trial. BMC Women Health. 2012; 12:25
21. Khare D, Jain P. Effect of different exercise techniques on primary dysmenorrhoea among higher secondary school girls. Age. 2015; 15(17):15-7.
22. Chesney MA, Tasto DL. The effectiveness of behavior modification with spasmodic and congestive dysmenorrhea. Behavior Research and Therapy. 1975; 13(4):245-53.
23. Ferries-Rowe E, Corey E, Archer JS. Primary dysmenorrhea: Diagnosis and therapy. Obste Gyneco. 2020; 136(5):104758.
24. French L. Dysmenorrhea. Am Fam Physician. 2005; 71(2).
25. AS Cocos. Primary Dysmenorrhea. Am Fam Physician. 1999; 60(2):489-96.
26. Linda French. Dysmenorrhea. Am Fam Physician. 2005; 71(2):285-291
27. Pallavi Latthe, Rita Champaneria, Khalid Khan. Dysmenorrhea. Am Fam Physician. 2012; 85(4):386-387.
28. E Deligeoroglou. Dysmenorrhea. Ann N Y Sci. 2000; 900:237-44.
29. Bender T, Karag¨ulle Z, B´alint GP, et al. Hydrotherapy, balneotherapy, and spa treatment in pain management. Rheumatol Int 2005; 25:220-4.
30. Chesney MA, Tasto DL. The development of the menstrual symptom questionnaire. Behaviour Researchand Therapy. 1975; 13(4):23744.
31. Larroy C. Comparing visual-analog and numeric scales for assessing menstrual pain. Behavioural Med. 2002; 27(4):17981.
32. Ferrell BR. The impact of pain on quality of life. A decade of research. Nurs Clini North America. 1995; 30(4):609-24.
33. Goedsche K, Förster M, Kroegel C, et al. Repeated cold water stimulations (hydrotherapy according to Kneipp) in patients with COPD. Forsch Komplementmed 2007; 14:158-66.
34. Shevchuk NA. Adapted cold shower as a potential treatment for depression. Med Hypotheses. 2008; 70:995-1001.
35. Geetha P, Shanmugam S. Effectiveness of Ice Pack Application on the Level of Pain in Episiotomy Wound, Inter J Sci Res. 2015; 4(11):1607-1611.
36. Demirel G, Cakir F. Heat, Cold Applications and Women's Health. Advances in Health Sci Res. 2020:243.
37. Kazan EE. Cold applications and nursing care. Hacettepe University Faculty Health Sci Nurs J. 2011; 18(1):73-82.
38. Ozveren H., Ucar H. The Knowledge of Student Nurses on Some NonPharmacological Methods Used in the Pain Control. Faculty Health Sci J Nurs. 2009; 16(3):59-72.
39. Goris S. Warm Applications and Application in Knee Osteoarthritis Pain. In: Muruvvet Baser, Sultan Tasci (Ed.) Complementary and Supportive Practices with Evidence-Based Guides. 2015; 131-136.
40. Turkmen H, Oran NT. The Effects of Heat Applications on Labor Pain: A 256 Systematic Review. J Edu Res in Nurs. 2019; 16(3):225-233.
41. Albers LL, Sedler DK, Bedrick JE, et al. Midwifery Care Measures in the Second Stage of Labor and Reduction of Genital Tract Trauma at Birth: A Randomized Trial. J Midwifery Womens Health. 2005; 50(5):365-372.
42. Shanmugam RS, Susila C, Kalaimathi SA. Effectiveness of hot application on dysmenorrhea. Inter J Adva Res. 2016; 2(4):720-2.
43. BNYS HB, BNYS NB, BNYS MR. Management of pelvic pain in primary dysmenorrhea using a hot hip-bath: a pilot study. Alternative Therapy Health Med. 2012; 18(1):24.
44. Goley A, Mooventhan A, Manjunath NK. Comparative study on effect of neutral spinal bath and neutral spinal spray on blood pressure, heart rate and heart rate variability in healthy volunteers. J Complem Integr Med. 2018; 16(2):118.
45. Avanthika G, Sujatha KJ, Shetty P. Immediate effect of cold and neutral spinal spray on autonomic functions in healthy volunteers–a comparative study. J Dent Med Sci. 2017; 16:18-24.
46. Rahmania S, Shetty V, Ragavendrasamy B. Neutral douche: a hydrotherapeutic tool to manage pain and systemic symptoms in primary dysmenorrhea-a randomised controlled study. J Complem Integr Med. 2020; 18(1):209-16.
47. Afazel MR, Jalali E, Sadat Z, et al. Comparing the effects of hot pack and lukewarm-water-soaked gauze on postoperative urinary retention; A randomized controlled clinical trial. Nurs Mid Studies. 2014; 3(4). DOI: 10.17795/nmsjournal26.

How to cite this article: Ajmi JS, Geetha B Shetty, Sujatha KJ, Prashant Shetty. Temperature-dependent effects of hip bath on primary dysmenorrhea individuals: A randomized controlled trial. Indian J Integr Med. 2024; 4(2):41-48.

Funding: None; Conflicts of Interest: None Stated