Effect of Localized Warm versus Cold Compresses on Pain Severity during First Stage of Labor among Primiparous

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Abstract
Background: *Labor pain is an unpleasant experience of women's life. Non-pharmacological pain relief methods help parturient to cope with pain.*
Aim *of the study was to investigate the effect of localized warm versus cold compresses on pain severity during the first stage of labor among primiparous.*
Design: *Quasi-experimental, pre-test and post-test control group design.*
Sampling: *A purposive sample of 180 parturient women was recruited and equally allocated into three groups (localized warm compresses, localized cold compresses, and control group) 60 women each.*
Setting: *This study was conducted in the labor unit of Obstetrics and Gynecological department, Benha University Hospital.*
Tools: *Five tools were used for data collection; a structured interviewing questionnaire, partogragh chart, visual analogue scale, pain behavioral observation scale, and women' satisfaction regarding the utilizing intervention questionnaire.*
Results: *After applying the intervention at 6 cm, 8 cm, and 10 cm cervical dilatation, there was a significant reduction in mean pain scores of warm compresses group compared to cold compresses and the control groups (p ≤0.001), a significant increase in mean pain behavioral observation scores of warm compresses group compared to cold compresses and control groups (p ≤0.001). The warm compresses group was more satisfied with the intervention than cold compresses group (p > 0.05).*
Conclusion: *Localized warm and cold compresses were effective in reducing labor pain, duration of the first stage of labor compared to the control group and increased women' satisfaction, warm compresses is more effective than cold.*
Recommendation: *Localized warm or cold compresses should be applied routinely for reducing labor pain severity and increasing women' satisfaction during the first stage of labor.*
Keywords: *Warm Compresses, Cold Compresses, Pain, Labor, Primiparous*

I. Introduction

Labor pain is a complex, subjective, a multifactorial phenomenon which is impacted by physiological, psychological, social, cultural, and environmental factors. Parity influences labor pain, primiparous women experience more labor pain than multiparous [1,2]. Overall, 77% of primiparous women have described labor pain as severe and unbearable [3]. Pain in the first stage of labor is primarily viscera, resulting from cervical dilatation and intensive uterine contractions. Labor pain can spread out to the abdominal wall, lumbosacral region, gluteal and thighs areas [4].

In addition, increased labor pain by stimulating the sympathetic nervous system leads to increased secretion of catecholamines, which reduces the contractions of the uterus, prolongation of the first and second stages of labor, increased request for cesarean section, and parturient' dissatisfaction with the labor experience [5]. Labor pain fluctuates rapidly and may deteriorate a woman's mood, can cause loss of emotional management, which plays a crucial role in encountering a traumatic delivery and psychological disorders [6,7]. Moreover, fear of experiencing labor pain might increase the tendency toward cesarean delivery [8].

There are two fundamental classifications of labor pain relief methods; pharmacological and non-pharmacological. The objective of non-pharmacological methods is to increase the ability of the woman to cope with labor pain. While the objective of pharmacological methods is relieving labor pain only [9]. There is a developing trend of non-pharmacological methods because of low potential risks for the woman and the fetus, noninvasive, mostly cheaper, and effective. Also, these methods lead to higher satisfaction from the birth experience by increasing the sense of control and empowerment [10]. Various non-pharmacological methods such

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as massage, reflexology, relaxation techniques, acupressure, music therapy, trans or subcutaneous nerve stimulation, water therapy, hot or cold application, which are usually preferred to pharmacological ones [11, 12].

Heat and cold therapy, as a sensory intervention for labor pain relief, and promote comfort have utilized for many years. Heat therapy during labor expands blood vessels and raises bloodstream, which can impact the transmission of pain impulses and raise collagen elasticity. An elevation blood circulation can diminish metabolites that actuate nociceptors. Also, heat stimulates the thermal skin receptors and profound tissues to suppress pain through gate control theory. Shortening the duration of labor is the other probably effect of applying heat therapy [13].

In addition, cold therapy alleviates pain through closing the gates to painful inputs, reducing the local release of pain mediators, blocking sensory nerves, and stimulating the release of endorphins. Moreover, cold therapy raises the pain threshold by reducing the speed of pain signal transmission to the brain and relieving muscular spasm [14, 15].

Labor pain management could be a primary objective of maternity care because it can positively affect women's decision to birth vaginally and contributes to the physical well-being of both the woman and the fetus [16]. Nurses being acquainted around the plans for managing labor pain permits parturient women to create choices regarding the various pain management methods [17]. There are numerous interventions underlie the experience of pain that nurses can implement to lessen labor pain, anxiety, and promote comfort [18]. Furthermore, midwifery/nursing care in childbirth process is focusing not only to provide safe labor for each parturient and fetus, but also to grant a positive and satisfactory birth experience. Nurse' support throughout labor has a crucial impact on the woman's birth experience and play a noteworthy role within the parturient' perception of pain [19].

Significance of the study

Labor pain is one of the foremost severe pains, that nearly all women encounter [20]. Fear of labor pain, particularly in primiparous women could be a leading reason for increasing women' preference to cesarean births in subsequent labors, in spite of associated complications and high cost. The worldwide prevalence of childbirth' fear has been estimated at around 14% [21]. Consequently, there has been an escalation in cesarean births, particularly in recent years. In Egypt, approximately 60% population-based rate of cesarean section performed in 2014, which greater than the ideal rate between 10 and 15% accepted by the World Health Organization (WHO) [22].

In addition, the researchers observed from clinical experience, there is limited use of non-pharmacological methods for alleviating labor pain within the hospital setting. To the best of our knowledge, despite the application of localized warm and/or cold compresses have been recommended for labor pain relief, there are limited researches investigate and compare the effectiveness of warm versus cold compresses on labor pain. This prompted the researchers to conduct this study.

Aim of the study

The aim of this study was to investigate the effect of localized warm versus cold compresses on pain severity during the first stage of labor among primiparous.

Research hypotheses

H1: Parturient women who receive localized warm compresses during the first stage of labor will experience lower pain score and higher satisfaction about utilizing intervention than those who don't.

H2: Parturient women who receive localized cold compresses during the first stage of labor will experience lower pain score and higher satisfaction about utilizing intervention than those who don't.

H3: There will be a significant difference in labor pain severity and satisfaction about utilizing intervention among parturient women who receive localized warm or cold compresses than those who don't.

II. Subjects and Method

Research design

Quasi-experimental (pre-test and post-test control group) design was adopted in the current study.

Setting

This study was conducted in the labor unit of Obstetrics and Gynecological department, Benha University Hospital.

Sampling type and size

A purposive sample of 180 parturient women was enrolled and equally allocated into three groups (localized warm compresses, localized cold compresses and a control group who received routine hospital care) 60 women each. The sample size was calculated using a statistical equation by Yamane [23].

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the required sample size, N is the population size was 1530 primiparous women admitted for normal vaginal delivery based on the previous year, according to Benha University hospital statistical center[24] and e is the level of precision was (0.07).

Inclusion criteria were primiparous women, age between 20 -35 years old, gestational age between 37 to 42 weeks, a singleton pregnancy with cephalic presentation, in active phase of the first stage of labor (cervical dilatation 4cm), anticipated normal birth, no dermatological problems in the abdomen and lower back, no mental illness, no medical and obstetric complications during pregnancy. *Exclusion criteria* included using any analgesics, abnormality in fetal heart rate, a history of infertility, and having an intrauterine fetal death.

Tools of data collection
Five tools were used for data collection.

Tool I: A structured interviewing questionnaire
This tool was designed by the researchers after reviewing the related literature, which comprised of two parts:

Part (1): Demographic characteristics of the parturient women included age, educational level, occupation, residence. In addition, body mass index.

Part (2): Obstetrical profile included gestational age, duration of onset of labor pain, membranes status at the onset of the active phase, the timing of membranes rupture in relation to cervical dilatation. As well as using oxytocin.

Tool II: Partogragh chart as appointed by WHO [25] was used to assess cervical dilatation, duration of the first stage of labor (from 4 cm to 10 cm cervical dilation).

Tool III: Visual Analogue Scale
The Visual Analogue Scale (VAS) was adopted from Katz and Melzack [26] to assess the subjective labor pain severity. VAS consisted of a 10 cm horizontal line anchored by two descriptors of pain; at the left "zero" representing no pain and at the right "10" representing intolerable pain. Every parturient was inquired to put a mark through the horizontal line at a point that corresponded to pain severity. The pain score was determined by measuring the distance in centimeters from the extreme left of the horizontal line to the parturient women's mark. A higher score reflected a high level of pain.

Tool IV: Pain behavioral observation scale
Pain behavioral observation scale (PBOS) was adopted from Bolanthakodi et al. [27] to evaluate parturient behavioral response related to pain, was applied by the researchers and was measured from the beginning of uterine contraction until relaxation. The PBOS composed of five behaviors; vocalization, body movement, breathing control, facial expression, and communication. Each behavior was scored using a three-point Likert scale as follows; "3" represented a description of behavior expressing no pain, "2" represented a description of behavior expressing moderate pain and "1" represented a description of behavior expressing extreme pain. The total score was computed by summing all behaviors which ranged from 5 to 15. A lower score indicated severe pain, whereas a higher score indicated mild pain.

Tool V: Women' satisfaction regarding the utilizing intervention questionnaire
The questionnaire was designed by the researchers to measure parturient' satisfaction regarding the utilizing intervention, comprised of two questions; 1) Rate your satisfaction towards utilizing intervention?, and 2) Are you willing to use the same intervention in the subsequent deliveries?. Parturient ' responses were recorded as either satisfied or unsatisfied for the first and yes or no for the second.

Validity and reliability of tools

The tools were revised for appropriateness and comprehensives of contents through a panel of three experts in the field of maternity nursing and obstetric medicine. The panel ascertained the content validity of the tools I and IV. The reliability was measured with Cronbach's Alpha coefficient test, the internal consistency of VAS equal 0.90, PBOS equal 0.81, and women' satisfaction about utilizing intervention questionnaire equal 0.87.

Ethical considerations

All eligible parturient women signed informed consent prior to the start of the study after clarifying the aim and nature of the study. The parturient guaranteed that participation is voluntary and all data obtained during the study were treated confidentially and used for the research purpose only. Each parturient has the right to withdraw from the study at any time without any interference with the care provided. Parturient' privacy and anonymity were secured.

Pilot study

A pilot study was carried out on 10% (18 parturient women) of the total sample size to ascertain the clarity and applicability of the tools, estimate the time required to complete the tools, and detect any obstacles that may be encountered the researchers during the study process. No modifications were done, thus these parturient women were included within the main study sample.

Procedure

Official permission for conducting this study was obtained from the director of Benha University Hospital after explaining the aim of the study. The study was carried out from the beginning of May 2018 to the end of December 2018 lasting for eight months. The researchers visited the previous mentioned setting three days per week (Saturday, Tuesday, and Wednesday) from 9.00 am to 3 pm. The average number of parturient interviewed per week was 5-6 parturient women.

The researchers started by a localized warm compresses group followed by a localized cold compresses group, then the control group. Before applying the intervention at 4 cm cervical dilatation, researchers interviewed each parturient of the three groups individually, introduced themselves and explained the aim of the study, then obtained informed written consent from parturient women. Tools (I), (II), (III), and (IV) were used to collect the demographic data, obstetric profile, pain severity and behavioral response related to pain for the three groups, each interview has lasted for approximately 20-25 minutes for every parturient woman.

The procedure of localized warm/cold compresses application and benefits were explained to the parturient according to the assigned group to establish active cooperation.

For the localized warm compresses group, each parturient woman received a rubber warm water bag at a temperature of 38-40°C (the temperature was checked with a laboratory thermometer) covered with a cotton towel applied over the abdomen, lower abdomen and back for 15 minutes during contractions at half an hour interval throughout the first stage of labor (from > 4 to 10 cm cervical dilatation).

For the localized cold compresses group, a rubber cold water bag at temperature 10-15°C (the temperature was checked with a laboratory thermometer) was wrapped by cotton towel to avoid any discomfort and skin damage and applied over the abdomen, the lower part of the abdomen and back for 10 minutes during the contractions and repeated every 30 minutes throughout the first stage of labor (from > 4 to 10 cm cervical dilatation).

For the control group, parturient women received only routine hospital care during the first stage of labor in attendance of researchers, which included administrating intravenous fluids, auscultating fetal heart, taking vital signs, monitoring uterine contraction, and vaginal examination without any additional interventions.

In the three groups, the researchers assessed pain severity and observed behavioral response related to pain in parturient women using tools (III) and (IV) three times after applying the intervention at 6 cm, 8 cm, and 10 cm cervical dilatation. Also, the duration of the first stage of labor (4cm -10cm) was calculated by a digital watch using the tool (II). Then, women' satisfaction regarding utilizing the intervention was evaluated using the tool (V) after two hours of delivery for both intervention groups (localized warm and cold compresses).

III. Limitations of the study

This study has three limitations; first, the duration of the first stage of labor was calculated only for active and transition phases; because of the duration of latent phase was based on memory recall of parturient women. Second, limited national studies related to the research topic. Third, the difficulty to conduct the study process for the three groups at the same time.

Statistical Analysis

The collected data were organized and statistically analyzed using statistical package for social science (SPSS version 21). Descriptive statistics were applied (frequencies, percentages, mean and standard deviation). Inferential statistics were used to test the difference between the groups (Chi-square, Fisher Exact Test used when the cells have expected count less than 5 and one-way ANOVA and repeated measure tests). A statistically significant difference was considered at p-value ≤ 0.05 and a highly statistically significant difference was considered at p-value ≤ 0.001. While the p-value >0.05 indicated no statistically significant difference.

IV. Results

Table (1) shows that 75.0%, 78.3%, and 80.0% of warm compresses, cold compresses, and control groups were in the age group 25-29 years with mean age 25.76 ± 1.75, 25.53 ± 1.74, and 25.25 ± 1.46 years respectively. More than two-thirds of the three groups had secondary education. More than half 60.0%, 55.0 %, and 63.3% of warm compresses, cold compresses, and control groups respectively were housewives. In relation to residence, 58.3%, 61.7%, and 51.7% of warm compresses, cold compresses, and control groups were living in rural areas respectively. The mean body mass index was 26.48 ± 2.79, 26.12 ± 2.37, and 26.86 ± 2.17 kg/m^2 of warm compresses, cold compresses, and control groups respectively. No statistically significant difference was observed for demographic characteristics, and body mass index between the three groups (P > 0.05).

Table (2) reveals that the mean gestational age was 39.38 ± 1.45 weeks in the warm compresses group, 39.23 ± 1.21 weeks in the cold compresses group and 39.58 ± 0.89 weeks in the control group. More than three-quarters of the three groups had the onset of labor pain ≥ 6 hours with a mean 7.08 ± 1.62, 7.65 ± 1.77, and 7.12 ± 1.34 hours in warm compresses, cold compresses, and control groups respectively. Most parturient women of the three groups have intact membranes. Whereas, more than half of them had membranes rupture at 8cm cervical dilatation. All parturient women were using oxytocin. No statistically significant difference between the three groups regarding gestational age, duration of onset labor pain, and membranes status at the onset of active phase and in relation to cervical dilatation (p > 0.05).

Table (3) illustrates that no significant differences in pain severity based on the VAS score between three groups before applying the intervention at cervical dilatation 4 cm (p > 0.05). Meanwhile after applying intervention, a significant difference was noted in the mean labor pain score between three groups at 6 cm, 8 cm, and 10 cm cervical dilatation (p ≤ 0.000), a constantly lower mean pain score of the warm compresses group compared to the cold compresses and the control groups. The mean pain score at 6cm cervical dilatation was 6.50 ± 0.65 in warm compresses group, 6.72 ± 0.78 in cold compresses group and 7.23 ± 0.67 in the control group. At 8cm cervical dilatation, the mean pain score was 7.48 ± 0.70 65 in warm compresses group, 7.81 ± 0.79 in cold compresses group and 8.31 ± 0.46 in the control group. At 10 cm cervical dilatation, pain severity score was 9.38 ± 0.52 versus 9.58 ± 0.53 versus 10.00 ± 0.00 in warm compresses, cold compresses, and control groups respectively.

Table (4) displays that no statistically significant difference in pain behavioral observation score between the three groups at 4 cm cervical dilatation before applying the intervention (p>0.05). However after applying intervention, the mean pain behavioral observation score at 6 cm cervical dilatation was 9.78 ± 0.64 in warm compresses group versus 9.57 ± 0.72 in cold compresses group versus 9.28 ± 0.76 in the control group (p=0.001). At 8 cm cervical dilatation, the mean pain behavioral observation score in the warm compresses group was significantly higher than in the cold compresses and the control groups (12.27 ± 0.68 versus 11.66 ± 0.98 versus 11.43 ± 1.09 respectively, p=0.000). Moreover, at 10 cm cervical dilatation, the mean labor pain behavioral observation score was (14.65 ± 0.63 versus 13.16 ± 0.92 versus 12.95 ± 0.89, p=0.000) in warm compresses, cold compresses, and control groups respectively. It was noticed a significant increase in mean pain behavioral observation scores for warm compresses group compared to cold compresses and control groups after applying the intervention at 6 cm, 8 cm, and 10 cm cervical dilatation, where lower scores indicated severe pain, while higher scores indicated mild pain.

Figure (1) reveals that mean duration of the first stage of labor (4cm to10cm cervical dilatation) in the warm compresses and cold compresses groups 5±23 and 5±63 hours respectively were significantly shorter than in the control group 6 ± 85 hours (p ≤0.001).

Table (5) clarifies that 95.0% and 91.7% in the warm compresses and cold compresses groups, respectively were satisfied with the utilizing intervention. On the other hand, 93.3% and 88.3 % in the warm compresses and cold compresses groups are willing to use the same intervention in the subsequent deliveries. No significant difference related to satisfaction about utilizing intervention between both groups (p > 0.05).

Table (1): Distribution of the parturient women according to demographic characteristics (n= 180)

Demographic Characteristics	Group			X^2/FET	P-value
	Warm compresses n= 60	Cold compresses n= 60	Control n= 60		
	No. (%)	No. (%)	No. (%)		
Age (years)					
20-24	14 (23.3)	10 (16.7)	12 (20.0)	$4.267^{£}$	0.371^{ns}
25-29	45 (75.0)	47 (78.3)	48 (80.0)		
30≤35	1 (1.7)	3 (5.0)	0 (0.0)		
Mean ± SD	25.76 ± 1.75	25.53 ± 1.74	25.25 ± 1.46	F= 1.460	0.235^{ns}
Educational level					
Basic education	0 (0.0)	2 (3.3)	3 (5.0)	$3.383^{£}$	0.496^{ns}
Secondary education	41 (68.3)	43 (71.7)	40 (66.7)		
University education	19 (31.7)	15 (25.0)	17 (28.3)		
Occupation					
Working	24 (40.0)	27 (45.0)	22 (36.7)	0.876	0.645^{ns}
Housewife	36 (60.0)	33 (55.0)	38 (63.3)		
Residence					
Urban	25 (41.7)	23 (38.3)	29 (48.3)	2.346	0.309^{ns}
Rural	35 (58.3)	37 (61.7)	31 (51.7)		
Body Mass Index (kg/m^2)					
Mean ± SD	26.48 ± 2.79	26.12 ± 2.37	26.86 ± 2.17	F= 1.369	0257^{ns}

^{ns}no statistically significant difference (p>0.05) F: One-way ANOVA test   £ =Fisher Exact Test

Table (2): Distribution of the parturient women according to obstetrical profile (n= 180)

Obstetrical profile	Group			X^2	P-value
	Warm compresses n= 60	Cold compresses n= 60	Control n= 60		
	No. (%)	No. (%)	No. (%)		
Gestational age (weeks)					
Mean ± SD	39.38 ± 1.45	39.23 ± 1.21	39.58 ± 0.89	F= 1.272	0.283^{ns}
Duration of onset labor pain (hours)					
< 6	13 (21.7)	7 (11.7)	9 (15.0)	2.302	0.316^{ns}
≥ 6	47 (78.3)	53 (88.3)	51 (85.0)		
Mean ± SD	7.08 ± 1.62	7.65 ± 1.77	7.12 ± 1.34	F= 2.353	0.098^{ns}
Membranes status at the onset of active phase					
Intact	50 (83.3)	52 (86.7)	54 (90.0)	1.154	0.562^{ns}
Rupture	10 (16.7)	8 (13.3)	6 (10.0)		
Timing of membranes ruptures in relation to cervical dilatation (n= 50 & 52 & 54)					
7cm	7 (14.0)	9 (17.3)	5 (9.3)	1.987	0.738^{ns}
8cm	29 (58.0)	31 (59.6)	32 (59.3)		
9cm	14 (28.0)	12 (23.1)	17 (31.4)		
Using oxytocin	60 (100.0)	60 (100.0)	60 (100.0)	-	-

F: One-way ANOVA test ^{ns} no statistically significant difference (p>0.05)

Table (3): Comparison of mean labor pain severity score at different cervical dilatations between three groups (n= 180)

| Pain scores	Group			F	P-value
	Warm compresses n= 60	Cold compresses n= 60	Control n= 60		
	Mean ± SD	Mean ± SD	Mean ± SD		
At cervical dilatation (4cm)	5.37± 0.69	5.25± 0.65	5.12 ± 0.49	2.467	0.088^{ns}
At cervical dilatation (6cm)	6.50± 0.65	6.72 ± 0.78	7.23± 0.67	17.146	0.000**
At cervical dilatation (8cm)	7.48± 0.70	7.81± 0.79	8.31± 0.46	23.665	0.000**
At cervical dilatation (10cm)	9.38± 0.52	9.58± 0.53	10.00± 0.00	32.081	0.000**

F: One-way ANOVA test ^{ns}no statistically significant difference (p>0.05)
**A highly statistically significant difference (p ≤ 0.001)

Table (4): Comparison of mean labor pain behavioral observation score at different cervical dilations between three groups (n= 180)

Pain behavioral scores	Group			F	P-value
	Warm compresses n= 60	Cold compresses n= 60	Control n= 60		
	Mean ± SD	Mean ± SD	Mean ± SD		
At cervical dilatation (4cm)	7.53 ± 0.50	7.62 ± 0.61	7.75 ± 0.60	2.173	0.117[ns]
At cervical dilatation (6cm)	9.78 ± 0.64	9.57 ± 0.72	9.28 ± 0.76	7.494	0.001*
At cervical dilatation (8cm)	12.27 ± 0.68	11.66 ± 0.98	11.43 ± 1.09	12.762	0.000**
At cervical dilatation (10cm)	14.65 ± 0.63	13.16 ± 0.92	12.95 ± 0.89	75.251	0.000**

F: One-way ANOVA test   [ns]no statistically significant difference (p>0.05)
 *A statistically significant difference (p ≤ 0.05) **A highly statistically significant difference (p ≤ 0.001)
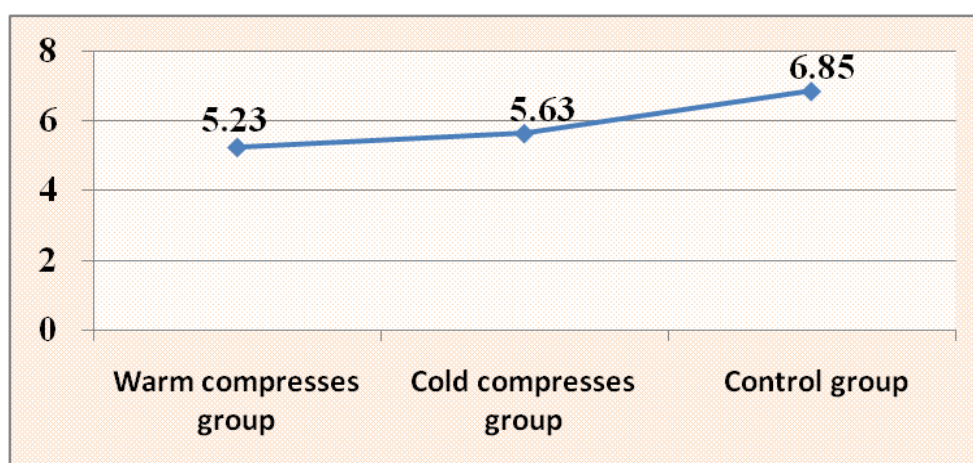
(F = 96.140 & P-value= 0.000)

Figure (1): Comparison of mean duration of the first stage of labor (4 cm to10 cm cervical dilatation) between three groups (n= 180)

Table 5: Distribution of the parturient women in warm and cold compresses groups according to satisfaction regarding the utilizing intervention

Satisfaction items	Warm compresses group n= 60	Cold compresses group n= 60	FET	P-value
	No. (%)	No. (%)		
Rate satisfaction towards the utilizing intervention				
Satisfied	57 (95.0)	55 (91.7)	0.536	0.464 [ns]
Unsatisfied	3 (5.0)	5 (8.3)		
Willing to use the same intervention in the subsequent deliveries				
Yes	56 (93.3)	53 (88.3)	0.901	0.343 [ns]
No	4 (6.7)	7 (11.7)		

FET= Fisher Exact Test   [ns]no statistically significant difference (p>0.05)

V. Discussion

Labor pain is unique and complex, maternity nurse has a pivotal role in controlling labor pain, promoting comfort, and enhancing pain management approaches. Non-pharmacologic approaches for managing labor pain has been effective not only on physical perceptions of pain, but also avoid distress by enhancing the psycho-emotional and spiritual components of care [28]. Therefore, the current study was conducted to investigate the effect of localized warm versus cold compresses on pain severity during the first stage of labor among primiparous. The study findings supported the research hypotheses.

The results of the present study portrayed no statistically significant difference was observed between the three groups in relation to demographic characteristics and body mass index and obstetrical profile which indicated the groups of the study were homogeneous. This is in accordance with Ganji, et al. [29] and Iskandar et al. [30]found that differences in demographic and obstetric variables were not significant between studied groups.

The findings of the study showed that there were no significant differences in pain severity based on the VAS score between the three groups before applying intervention at 4 cm cervical dilatation. These findings are in agreement with Bahuguna et al. [31] who showed no significant difference between experimental who received warm compresses and control groups at baseline pain score (p =0.88).

Meanwhile after applying intervention, a significant difference was observed in mean labor pain score between the three groups at 6cm, 8cm, and 10cm cervical dilatation. The mean score of pain severity was considerably lower in warm and cold compresses groups compared to the control group. These are congruent with Fahami et al. [32] reported that there was a statistically significant difference in the mean pain score during the first stage of labor between heat therapy and the routine care groups (p =0.01). Also, Taavoni et al. [33] pointed out that mean labor pain score in the heat therapy group was significantly less than that of the control group (P < 0.05). In addition, Abdel Ghani [34] indicated that fifteen-minute heat therapy on the lower abdomen and back followed by five minutes cryotherapy significantly reduced labor pain intensity at 8cm cervical dilatation (P≤0.05). This could be due to warm compresses increase local skin temperature and circulation, which induces muscle relaxation and raises the pain threshold.

Consistently, studies were in line with these findings, Shirvani and Ganji [35] who reported that the labor pain severity was significantly lower in the cold therapy group than the control group. The mean pain score was (5.53±1.34 and 6.96±2.10, p=0.02) during the acceleration phase, (6.09±1.55 and 7.93±1.41, p = 0.001) through maximum of slope, (621±147 and 884±132, p = 0.001) in deceleration phase and (6.50±1.64 and 9.25±1.10, p= 0.001) in the cold therapy group and the control group respectively. Mardliyana and Raden [10] found that the application of ice gel for ten minutes on the lower abdomen and lower back significantly reduced labor pain intensity. Similarly, a study by Rahimi-Kian et al. [36] who indicated that although the mean labor pain score in ice pack and control groups increased, the control group was significantly higher than the ice pack group (P < 0.001), denoting the effectiveness of ice pack application in alleviating labor pain. This might be due to cold compresses causes vasoconstriction and slowing down the transmission of pain to the central nervous system which increased pain threshold and reducing muscle spasm.

Although, the study findings showed both warm and cold compresses have a similar effect on the reduction of labor pain that proved by the control group. The mean pain scores revealed a noticeable reducingat6cm, 8cm, and 10cm cervical dilatation after applying warm compresses compared to cold compresses. These findings supported by Vermelis et al. [37] who specified certain mechanisms for the efficacy of heat/cold therapy incorporate; providing stimuli from peripheral sensory receptors to inhibit pain, anti-nociceptive effects on gate control theory, lessening muscle pressure and distraction from pain. This might be attributed to sensory stimulus induced by warm compresses that made it more effective than cold compresses.

Furthermore, the study finding demonstrated that the mean duration of the first stage of labor (4 cm cervical dilatation to full dilatation) was significantly shorter in warm compresses and cold compresses groups than the control group, which was the shortest in the warm compresses group. This is in agreement with Ganji, et al. [29] who proved that the duration of the first stages of labor was significantly lower in heat and cold group than the control group. On the contrary, the previously conducted study by Akbarzadeh et al. [38] who revealed that there was no significant difference in the mean duration of the first stage of labor between two stages warm compresses and control groups (169.89 ± 34.74 versus196.58 ± 42.53 minutes, P= 0.26) respectively. This might be due to the lower pain severity in the warm compresses group than in the cold compresses and the control groups, improved parturient' sense of control and empowerment, which can indirectly influence the release of oxytocin, would consequently enhance uterine contractions and shorten the first stage of labor.

An accurate pain assessment requires both verbal and nonverbal data.Nurses regularly utilize nonverbal communication, like body language, facial expressions and sounds, which may result in an underestimation of the woman's experience of pain [39]. Lower pain-coping behaviors may increase the pain and aggravate the maternal autonomic capacities and cause the release of catecholamine, which leads to inhibition of uterine contractions and prolonged labor [40].

In the current study, the parturient' behavioral responses related to labor pain have been observed four times similar to the pain severity assessment using VAS. The study findings displayed that, no statistically significant difference was noticed between the three groups regarding all behavioral pain parameters (vocalization, body movement, breathing control, facial expression, and communication), at 4 cm cervical dilatation before applying the intervention. However, it is noteworthy a significant increase of mean pain behavioral observation scores of warm compresses group compared to cold compresses and control groups after applying the intervention at 6 cm, 8 cm, and 10 cm dilatation which indicated higher scores pointed to mild pain. The present findings are in congruence with Asl et al. [41] who demonstrated that the pain behavioral indicators throughout labor were significantly and inversely related to labor pain severity. Which showed an increase in the mean pain behavioral score, a decrease in pain severity was observed. In this respect, Santana et al. [42] confirmed that hot shower increases relaxation because its heating and hydrostatic effects of water, it also causes a reduction in sympathetic nervous system activity and reduces catecholamine levels.

Additionally, Akbarzadeh et al. [38] pointed out that the applying of warm packs provides parturient psychological convenience that reduces labor pain and duration. These findings might be due to the beneficial effect of warm and cold compresses application on reducing labor pain, as parturient ' behavioral responses subsequently lessened.

Birth satisfaction is greatly affected by labor pain, where parturient with lower labor pain feels higher birth satisfaction. Accordingly, effective management of labor pain is considered as the most significant predictor of birth satisfaction. Women' satisfaction must be considered in the choice of pain relief method [43, 44].

Pertaining to satisfaction regarding the utilizing intervention, the study findings showed that parturient women in the warm compresses group were more satisfied with the intervention given during the first stage of labor and willing to use the same intervention in the subsequent deliveries than cold compresses group, with no significant difference between both groups. These are supported by Fahami et al. [32] who found the majority of parturient women had higher satisfaction with heat therapy than alternate heat and cold therapy. In agreement with findings, Stevens et al. [45] stressed that superficial heat and/or cold therapy provides active involvement of parturient women in the birthing process, and promotes a positive birth experience. This could be interpreted that warm and cold compresses are inexpensive, noninvasive, and effective interventions on reducing first stage labor pain. Besides, warm compresses provide comfort and relaxation, a sense of control and labor satisfaction improved as labor pain diminished.

On the contrary, Al-Battawi et al. [46] who found that 55% of parturient women in the ice pack group were highly satisfied with the labor experience. Ahmad-Shirvani and Ganji [47] found that 56.2% of parturient women in the heat and intermittent heat and cold therapy groups had the high satisfaction of the labor process, but 53.1% of the cold therapy group had moderate satisfaction and just 37.5% were highly satisfied ($p > 0.05$). This is might be related to the difference in the satisfaction assessment tool.

VI. Conclusion

Both localized warm and cold compresses were effective in reducing labor pain, duration of the first stage of labor compared to the control group. As well as, increased satisfaction regarding the utilizing intervention among primiparous. By comparing both techniques, localized warm compresses appeared to be more effective in labor pain reduction. Both localized warm and cold compresses are safe, inexpensive, easy to apply and non-invasive pain relief method during the first stage of labor. Therefore, the research hypotheses were accepted.

VII.   Recommendations

Based on the findings of the current study, the following recommendations are suggested:
- Localized warm or cold compresses should be applied routinely for reducing labor pain severity and increasing women' satisfaction during the first stage of labor.
- Designing and distributing a simplified guideline for primigravida women about the advantages and proper use of warm or/ and cold compresses during the first stage of labor.

Further studies
- In-service training programs could be designed and implemented to update nurses' knowledge and skills about using warm or cold compresses for relieving labor pain.
- Study the effect of alternating localized heat and cold compresses on labor pain during the first stage of labor among primiparous women.
- A similar study can be conducted for multiparous women.

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