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Original Research Article

Effectiveness of heat application on comfort during labor among primigravida women: a pilot study

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ABSTRACT

Background: Labor discomfort may result in worry, anxiety, and fear, potentially affecting a woman's childbirth experience. Comfort can be experienced even in the severe pain of labor. This study aimed to compare the effectiveness of heat application on comfort during the first active phase of childbirth among the experimental and control groups.
Methods: The study was conducted at Bharatpur Hospital in Chitwan, Nepal. Ten first-time mothers with low-risk pregnancies participated in this randomized trial. One group received heat application on the lower back for pain relief, while the other received standard hospital care. To measure their comfort during labor, the Childbirth Comfort questionnaire was used at different times. The results were analyzed using descriptive and inferential statistics, such as t-tests and repeated-measure ANOVA tests, to compare the effects.
Results: The results demonstrated that in the experimental group, comfort levels increased over time, as reflected by the mean scores, standard deviations, t-test, and F-values. In contrast, the control group showed a gradual decline in comfort. The t-test revealed a significant difference in comfort levels during post-tests II and III across the four conditions, with an F-value of 29.986 and a p value of less than 0.002.
Conclusions: Heat application during the first stage of labor increases the comfort level among the experimental group more than the comparison group. Hence, it can be considered as a method for comfort during labor after validation.

Keywords: Therapy, Heat, Labor pain, Primigravida

INTRODUCTION

Labor is an intense experience that places significant physical demands on the body and embraces deep emotional, mental, social, and cultural importance.[1] Even amidst the intense pain of childbirth, a sense of comfort can still be found.[2] The discomfort experienced during labor can lead to feelings of worry, anxiety, and fear, which may influence a woman's overall birth experience. As a result, managing pain during labor is crucial and should be guided by three key principles: simplicity, safety, and maintaining the baby's well-being.

Approaches to pain relief should aim to ease physical discomfort while also enhancing the mother's sense of comfort and satisfaction throughout childbirth.[3]

Fear surrounding childbirth can have several negative impacts, such as a higher demand for pain relief, more frequent medical interventions, longer labor, and dissatisfaction with the birth experience. Studies have shown that offering support throughout labor can help reduce these effects.[4] Various studies have explored alternative and non-drug-based methods to help manage pain during labor and lessen the reliance on medications.[5] Over time, nonpharmacologic approaches to vaginal delivery pain management have gained popularity, sometimes serving as the primary treatment and other times as a supplement to pharmaceutical medications.[6] Medications used during childbirth can pose serious risks for both the mother and baby, potentially leading to heart complications, nerve damage, allergic reactions, or a slower labor process. Recognizing these dangers, many nurses and midwives have turned to drug-free pain management techniques. In sharing their experiences, these healthcare professionals emphasize that natural approaches to labor pain relief tend to be much safer for mothers and their newborns.[7]

Comfort, according to Kolcaba, describes comfort as a deeply satisfying experience that comes from having our needs met, whether it's relief from pain, a sense of ease, or a feeling of wholeness. This comfort can be felt in different aspects of life, including the physical body, emotions and spirit, surroundings, and social or cultural connections.[8] Comfort and pain often exist together during childbirth, and simply reducing pain doesn't always lead to comfort. But by focusing on both comfort and pain relief, women can have a more positive and fulfilling birth experience.[9]

Heat therapy is one of the nonpharmacological methods when applied to the lower back, it has been shown to significantly ease labor pain during the first stage of childbirth.[10] For women in labor, applying heat or cold to specific areas offers a safe, drug-free way to ease pain during childbirth. It's gentle, non-invasive, and doesn't harm the mother or baby.[11] However, a similar study looking at how women experience pain and how long the first stage of labor lasts found no major differences in pain levels or duration during this phase.[12] A systematic review stated that the median duration of the active stage among nulliparous women varied from 3.7 to 5.9 hours. Various factors influence a mother's perception, such as her past experiences with labor pain, her pain tolerance capacity, and her mental and emotional state during childbirth, resulting in a unique experience for each mother.[13] One of the challenges to obstetricians and midwives is comfort and pain management during labor. Discomfort experienced during childbirth adversely impacts comfort, and alleviating this pain leads to increased satisfaction throughout the labor process.[14]

There is different evidence on pain and comfort management during labor using pharmacological and alternative therapy. During the initial phase of labor, around 44.9% opted for non-medicated techniques, while 36.8% did not utilize either medication-based or non-medication-based approaches.[15] Although numerous studies have investigated non-drug methods for managing labor pain, there is limited research specifically focusing on the heat therapy influences comfort levels in first-time mothers during the early stages of labor. the study aimed to assess the effect of heat application on comfort level among primigravida women.

METHODS

Study design

In this study, a quantitative approach was adopted to gather insights from participants about their comfort during childbirth. The research was randomized control trial meticulously planned and involved two groups of first-time, low-risk pregnant women. Before participation, each woman provided written informed consent, having been assured that their well-being and confidentiality were of utmost importance. It was clearly communicated that all personal data would be used solely for research purposes.

Ethical consideration

We obtained written permission from the administration of Sharda School of Nursing Science and Research at Sharda University in Greater Noida. Ethical approval was also secured from the Nepal Health Research Council (NHRC). Additionally, we received necessary approvals from the relevant authorities at Bharatpur Hospital in Chitwan, Nepal. Once all official ethical clearances were in place, we ensured that participants were fully informed about their rights. They were assured of their safety, privacy, freedom to withdraw at any time, and the confidentiality of their data before providing written consent. The pilot study data was done between 25 February and 7 March 2024. The study is part of a clinical trial registered on ClinicalTrials.gov under the identifier NCT06214585.

Participants

This study involved primigravida women between the ages of 18 and 35 who had low-risk pregnancies and were admitted to the maternity ward at Bharatpur Hospital. To be eligible, participants had to be expecting a normal delivery with a baby of average size, confirmed by an ultrasound between 37 and 41 weeks of pregnancy. They also needed to have attended at least four antenatal care (ANC) visits, have a normal pre-pregnancy BMI (18.5-24.9). Additionally, they had to be willing to take part in the study. Only women in the first stage of labor who had not taken any pain relief medication were included.

Randomization

The study focused on primigravida women who were admitted for childbirth in the hospital setting. Only those who were healthy and classified as low-risk and agreed to participate were included. Participants were selected according to the inclusion criteria aligned with the study's objectives. Upon admission for spontaneous labor at the maternity ward of Bharatpur Hospital, the eligible primigravida women were randomly allocated to two arms using sealed opaque envelopes. While it was impossible to blind women or investigators, outcome assessment was conducted in a blinded manner.

Intervention

In this preliminary study, we enrolled ten first-time mothers who met the required eligibility standards. After gathering essential information about their background and pregnancy, participants were randomly placed into either the experimental or control group using sealed, non-transparent envelopes. To ensure clarity, the researcher took time to thoroughly re-explain the steps involved in the heat application.

During the active stage of labor, when cervical dilation progressed from approximately 4-5 cm, women in the experimental group received heat application to their lower back. A hot water bag, wrapped in a towel and maintained at a temperature between 40–42°C, was applied to the lumbosacral area for 20 minutes every hour, starting from 4-5 cm dilation and continuing until full dilation was achieved.

The women's comfort levels were assessed at various points in labor, specifically at 4-5 cm, 7-8 cm, and 9-10 cm dilation.

Outcomes measures

Background details of participants were gathered through a structured interview, covering factors such as age, religion, family type, socioeconomic status, and where they lived. Information related to their obstetric like the number of antenatal care (ANC) visits, medical reports, gestational age, and the labor began (either naturally or through induction) was obtained from the partograph. The women's comfort levels during labor were evaluated at three key stages of cervical dilation: 4-5 cm, 7-8 cm, and 9-10 cm, however, at 4-5 cm of cervical dilation, comfort was assessed both before and after the intervention. To assess the effectiveness of the intervention, a childbirth comfort questionnaire (CCQ) was used. The comfort scores were then categorized, with the top 25% indicating high comfort and the bottom 25% reflecting low comfort.

Sample size of the study

The sample size was calculated using GPower software with a standard significance level of 0.05. Based on the initial data, GPower (version 3.1.9.4) estimated that having five participants in each group would give us 80% statistical power, allowing for a 20% margin of error.

Data analysis procedures

The gathered data was carefully arranged and enter into SPSS (version 16) for analysis. To gain a deeper insight into the findings and ensure they aligned with the study's objectives, both descriptive and inferential statistical techniques were applied. Socio-demographic information was summarized with frequencies and percentages, while the relationships between variables were analyzed using inferential tests like the t-test and repeated measures ANOVA.

RESULTS

The socio-demographic information of the primigravida women. One group with the intervention of the heat therapy, versus the comparative group, received the standard hospital maternal care. In the experimental group, 40.0% of women were between 18 to 25 years old, while 60.0% were aged 26 to 35 years. The control group consisted entirely of the participants aged 18- 25 years. The mean standard deviation of age in the experimental group was 22.60±4.33 years compared to 21.00±2.12 years in the control group. Regarding religion, 60.0% of the participants in both groups were Hindu, while 40.0% of the participants followed other religions. The majority of participants in both groups (80%) were from the middle or upper socioeconomic class. The remaining 20% belonged to the lower class. All participants from both groups were living in a joint family system (100%). In terms of residence of the participants, 80.0% of the experimental group lived in urban areas, however, 40% of the control group resided in urban areas (Table 1).

Table 1: Distribution of frequency and percentage of socio-demographic information of the experimental and control groups (n1=5, n2=5).

Variable	Experimental Group (F, %)	Control Group (F, %)
Age (years)		
18-25	2 (40.0)	5 (100.0)
26-35	3 (60.0)	-
Mean± SD	22.60±4.33	21.00±2.12
Religion		
Hinduism	3 (60.0)	3 (60.0)
Others	2 (40	2 (40.0)
Socioeconomic class		
Middle and upper class	4 (80.0)	4 (80.0)
Lower class	1 (20.0)	1 (20.0)
Type of family		
Joint family	5 (100.0)	5 (100.0)
Nuclear family	-	-
Residence		
Urban	4 (80.0)	2 (40.0)
Rural	1 (20.0)	3 (60.0)

Table 2: Distribution of frequency and percentage of obstetrics information of the experimental and control groups (n1=5, n2=5).

Variables	Experimental Group (F, %)	Control Group Group (F, %)
ANC visit		
1-4 visits	-	-
5-8 visits	5 (100.0)	5 (100.0)
Week of gestation		
37-39 weeks	-	1 (20.0)
40-41weeks	5 (100.0)	4 (80.0)
Type of labor initiation		
Spontaneous	3 (60.0)	3 (60.0)
Induction	2 (40.9)	2 (40.0)
Type caregiver		
Husband	-	1 (20.0)
Immediate family	5 (100.0)	4 (80.0)

The information regarding obstetric conditions was collected during the data collection of the participants. All women in both groups had visited the antenatal clinic between 5-8 times. This suggests a consistent level of prenatal care across groups. For the experimental group, all participants (100%) had between 40 to 41 weeks of gestation. Whereas, in the control group, only 20.0% of the participants admitted between 37-39 weeks of gestation. In both groups, 60.0% of the participants experienced spontaneous labor. Regarding the presence of care caregiver during labor, only 1 (20%) was accompanied by her husband, and the rest of both groups had an immediate family member present as a caregiver (Table 2).

The mean standard deviation (SD), t-tests, and ANOVA results were used to evaluate comfort between an experimental and a control group at various periods. Childbirth Comfort mean scores had shown an increasing trend in the experimental group, however, opposite trends had shown in the control group. There is no significant difference between groups at baseline ($p<0.262$). Post-test I had still no significant difference ($p=0.362$). The post-test-II of the experimental group shows significantly higher comfort ($p=0.012$). Post-test III of the experimental group has even greater comfort improvement ($p<0.001$). In the ANOVA results, the experimental group had a highly significant improvement ($F=29.986$, $p<0.002$), but the control group also had a significant change ($F=4.645$, $p<0.044$). The intervention significantly increased childbirth comfort over time, while the control group showed no meaningful improvement (Table 3).

Table 3: Comparison of mean, standard deviation of comfort of the experimental and control group.

Childbirth comfort	Experimental group (Mean± SD)	Control group (Mean± SD)	t-test	P value
Pre-test	50.60±3.64	53.00±2.55	-1.206	0.262
Post-test I	53.20±2.28	52.00±1.58	0.967	0.362
Post-test II	55.00±1.87	51.40±1.67	3.207	0.012*
Post-test III	57.00±1.87	50.60±1.51	5.942	<0.001**
	F=29.986 P=0.002**	F=4.645 P=0.44*		

*(p=0.05)

DISCUSSION

The study aimed to explore whether using heat application on the lower back of the primigravida women could help to improve comfort during the active phase of labor.

The study found that, on average, the women experiencing their first pregnancy in the experimental group were 22.60±4.33, while in the control group it was 21.00±2.12. Similar findings were reported in the study conducted in Iran by Didevar et al in the year 2022 reported that the mean age of the women was 21.87±4.14, 22.29±4.87 and 22.87±5.23 for heat, cold therapy and the control group, respectively.[16] Whereas, in another study, the mean age of the participants was slightly higher (25.4±4.64) than that of the current study.[17]

In the current study, most of the participants belonged to the Hindu religion groups, comprising 60.0 % in both experimental and the control group. A comparable trend was observed in research by Chaudhary et al. conducted in India, where 81.3% of participants in the experimental group and 78.1% in the control group were Hindu.[18]

The results of this study indicated that participants generally belonged to a middle to upper socioeconomic class, with 80% of the participants in both the experimental groups (heat therapy) and the control group sharing similar economic backgrounds. In contrast, a study conducted in Turkey by Öztürk et al reported slightly differing findings, which showed that the majority of the participants had school-level education (83.1%) rather than a higher level of education, 55.0% of participants were not in paid employment, and 89.6% had a medium income.[3] Socioeconomic status includes these

three factors combined, which are education, income and occupation.

The findings of this study regarding the family types of the participants residing revealed that all participants in both the heat and control groups live in joint families. This indicates that pregnant women living in joint family settings may benefit from increased care and support during pregnancy. This finding is different from the study conducted by Sugandary et al, which stated that more than half of the participants of both groups were living with their joint family (53.3% and 56.6%).[19]

The study outlined the participants' places of residence, an important indicator of maternal health. The report suggested that more than half of all groups live in urban areas. The experimental group (80.0%) and (40.0%) of the control groups live in urban areas, with a slightly lesser proportion (20.0% and 60.0%) residing in rural areas. The study was supported by a study conducted in Ethiopia, which shows almost similar (57.7%) percentage of the participants live in rural areas.[20]

In this study, low-risk primigravida women who were anticipated to deliver normally were the participants; therefore, obstetric information as ANC visit, was collected. The study findings show that all the participants attended ANC 5 to 8 times. Though a study carried out by Siyoum and Mekonnen in Ethiopia revealed that 66.6% of participants attended antenatal clinics less than 3 and did not visit as well.[20]

The results of the study marked that the participants in both groups had 40 to 41 weeks of pregnancy (100.0%, and 80.0% respectively). This study was slightly more than the study conducted by Sugandary et al, which shows that about half of the participants in both groups had 39-40 weeks of gestation.[19]

This study involved primigravida women experiencing labor pain who were admitted to Bharatpur Hospital. More than half of the participants across all groups began labor either spontaneously. These results are not consistent with a study by Shirvani in Iran, which reported a similar proportion of participants receiving oxytocin to initiate labor.[13]

In this study, the husband as caregiver was only one among all of the participants, which shows the insensitivity of the husband during this crucial period of any woman's life. The study findings have shown that care and support during childbirth from their husband or partner has a positive effect on pain acceptance, reducing anxiety.[21]

The main objective of the study was to assess the effect of heat application on comfort, which was measured in terms of the childbirth comfort questionnaire. The results of the study show that the mean score of CCQ is higher in both experimental groups (52.40±2.30) during the pre-intervention period and the control group (53.0±2.55). After the first intervention, the comfort of the experimental group (53.40±2.30) had improved slightly, which was not significant (P=.706, .295 in pre-test and post-test I). While for the control group, the comfort was slightly decreased (52.20±2.28). At post-test II, the comfort level was increased in the experimental groups (55.00±1.78), but for the control group, it was continuously decreased (51.40±1.67). At last, the post-test III result shows a significant improvement in comfort level among the experimental group (57.60±1.87). However, the comfort of the control group shows a significant decrease (50.60±1.51). The comparison between the two groups(t-test) was significant in post-test II and III (p 0.012 and<0.001), which means the comfort increases if heat is applied during labor. It further signifies from the ANOVA value (F=29.986, p 0.002). These findings are supported by the study conducted in Turkey.[22,23]

CONCLUSION

The study concluded that the heat application on the lower back during the first stage of labor among the primigravida women significantly improved comfort in later assessment (post-test II and III). In contrast, the participants in the control group did not experience any meaningful change in comfort over time. However, due to the small-scale study, its findings should be validated in a larger study before heat application can be broadly recommended as a method for comfort management in childbirth.

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