

Original Article

The Effects of Inhalation Aromatherapy with *Boswellia carterii* Essential Oil on the Intensity of Labor Pain among Nulliparous Women

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ABSTRACT

Background: Labor pain is a major reason behind preferring cesarean section over normal vaginal delivery. Aromatherapy is among the most common nonpharmacological therapies for pain. **Objectives:** The objective of this study aimed to evaluate the effects of inhalation aromatherapy with *Boswellia carterii* (BC) essential oil on the intensity of labor pain among nulliparous women. **Methods:** This randomized controlled trial was carried out on 126 nulliparous women. Women were randomly allocated to an aromatherapy ($n = 63$) and a placebo ($n = 63$) group. For each woman in the aromatherapy group, a piece of gauze was soaked with 0.2 ml of 0.2% BC essential oil diluted in 2 ml of normal saline, and then, it was attached to the collar of each woman. The intervention was repeated for each woman every 30 min up to a cervical dilation of 10 cm. The intervention in the placebo group was the same as the aromatherapy group except that the gauze was soaked only with 2 ml of normal saline. A numeric pain rating scale was used to assess the labor pain intensity before the intervention and at cervical dilations of 3–4, 5–7, and 8–10 cm. Statistical analyses were performed using descriptive and inferential statistics such as the Chi-square, the independent sample *t*-test, and paired *t*-test. **Results:** Between-group comparisons revealed that labor pain intensity in the aromatherapy group was significantly lower than the control group at cervical dilations of 3–4 (4.98 ± 0.93 vs. 6.68 ± 1.28 , $P < 0.001$), 5–7 (5.79 ± 1.13 vs. 7.23 ± 1.54 , <0.001), and 8–10 cm (6.35 ± 1.63 vs. 7.71 ± 1.38 , $P < 0.05$). However, there were no significant between-group differences regarding 1 and 5 min Apgar scores ($P > 0.05$). **Conclusion:** Inhalation aromatherapy with BC essential oil has positive effects on labor pain. Therefore, it can be used for relieving labor pain in the first stage of labor.

KEYWORDS: Aromatherapy, *Boswellia carterii*, Labor, Nulliparous, Pain

INTRODUCTION

Childbirth or labor has always been one of the most serious physical and mental challenges^[1] and one of the most painful experiences for women.^[2] Labor pain management is a main objective of midwifery care because it can positively affect women's decision to give birth vaginally.^[3,4] There are different pharmacological and nonpharmacological therapies for labor pain management. Nonpharmacological therapies are mostly cheaper and noninvasive and thus are usually preferred to pharmacological ones.^[5]

One of the nonpharmacological therapies is aromatherapy. The most common types of aromatherapy

during labor include aromatherapy massage, aromatherapy bath, and inhalation aromatherapy. The effects of aromatherapy on labor pain have been studied more than other types of pain. However, the results of studies are contradictory.^[6] A review of randomized controlled trials found no difference in pain intensity,

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How to cite this article: Esmaelzadeh-Saeieh S, Rahimzadeh M, Khosravi-Dehaghi N, Torkashvand S. The effects of inhalation aromatherapy with *Boswellia carterii* essential oil on the intensity of labor pain among nulliparous women. *Nurs Midwifery Stud* 2018;7:45-9.

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10.4103/nms.nms_70_17

rate of cesarean section, or frequency of requests for pharmacological intervention for women being treated with aromatherapy compared to women receiving routine care.^[1] However, two studies found that women who received aromatherapy during labor reported a lower intensity of pain than women in a control group.^[7,8]

Frankincense, scientifically known as *Boswellia carterii* (BC), is a medicinal plant from the Burseraceae family. BC essential oil has a warm and sparkling aroma and has a variety of health benefits such as chronic stress and anxiety alleviation, pain and inflammation reduction, and immunity boost.^[9] Moreover, the plant contains boswellic acids and pentacyclic triterpene which are similar to steroids in chemical structure.^[10] Some studies show that BC can potentially relieve pain and reduce inflammation.^[3] Despite BC painkiller effect, no study is available about the effect of BC on labor pain.

Objectives

This study aimed to evaluate the effects of inhalation aromatherapy with BC essential oil on the intensity of labor pain among nulliparous women.

METHODS

This was a randomized controlled trial. Based on the results of a study by Fahami *et al.* and with a pain standard deviation of 1.5, a pain intensity reduction of 0.75,^[11] a power of 80%, and a confidence level of 95%, a sample of 63 women were estimated to be required for each study group. Accordingly, 126 eligible women were recruited to the study from Kamali Hospital, Karaj, Iran. The sampling was done from June to September 2015. The inclusion criteria were Iranian nationality, nulliparity, term pregnancy, singleton pregnancy, cephalic presentation, spontaneous uterine contractions, cervical dilation of 3–4 cm, no obstetric complications, and no history of allergy to herbal ingredients and receiving no pain medications during the last 8 h before the study. The only exclusion criterion was a need for the emergency cesarean section.

A time-clustered sampling method was used to recruit the participants in the study groups. For this reason, during the study, weekdays were randomly allocated to either the aromatherapy or the placebo days. Accordingly, women who referred to the study setting in aromatherapy days were allocated to the aromatherapy group while women who referred in placebo days were allocated to the placebo group. Women were not blind to the study intervention. However, the biostatistician who analyzed the data was unaware of the group allocation.

Instrument

Data gathering instruments were a demographic and obstetric characteristics questionnaire (with items such as age, educational and employment status, pregnancy wantedness, prenatal medical visits, and participation in childbirth preparation classes), an examination checklist, and a numeric pain rating scale. The items of the examination checklist were related to Bishop score, mother's vital signs, and Apgar score. The content validity of the checklist was confirmed by 10 faculty members of Alborz Faculty of Nursing and Midwifery, Karaj, Iran. Moreover, its reliability was evaluated using the interobserver method, during which the first author and an experienced research assistant simultaneously assessed 10 women using the checklist. The interobserver correlation coefficient was 0.86. The numeric pain rating scale was used for labor pain assessment. The scale was a ruler-like scale numbered from 0 (no pain) to 10 (the most intense pain). Numeric pain rating scales have been reported to have acceptable validity.^[12]

Intervention

A midwife was trained about aromatherapy technique by the first and the third authors. She used either BC essential oil or placebo for women in the intervention or the control group, respectively. The trained midwife presented at the hospital setting in designed dates and performed sampling in the afternoon and night shifts, that the number of mothers who referred for delivery is higher than morning shifts.

BC essential oil was extracted using the hydrodistillation technique (Zarband Pharmaceutical Co., Tehran, Iran). A piece of gauze was soaked with 0.2 ml of 0.2% BC essential oil diluted in 2 ml of normal saline, and then, it was attached to the collar of each woman. For women in the placebo group, the gauze was soaked just with 2 ml of normal saline. The intervention was repeated for each woman every 30 min up to a cervical dilation of 10 cm. Another midwife assessed uterine contractions and fetal heart rate, performed vaginal examinations, adjusted oxytocin infusion rate, and calculated Apgar score. Moreover, she assessed labor pain intensity before the intervention and at cervical dilations of 3–4, 5–7, and 8–10 cm.

Ethical considerations

The study was registered in the Iranian Registry of Clinical trials (registration code: IRCT2015012020719N2). Furthermore, the Institutional Review Board and the Ethics Committee of Alborz University of Medical Sciences, Karaj, Iran, approved the study (approval codes: 2505847 and 2498142, respectively). All women were ensured about the confidentiality of their personal

information. All of them provided informed consent for participation. We attempted to protect patient's rights according to the Declaration of Helsinki.

Data analysis

Statistical analyses were performed using the SPSS software v. 13.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics measures such as the measures of central tendency and dispersion as well as frequency distributions were used for data description. The Kolmogorov–Smirnov test showed that all study variables had a normal distribution. Therefore, between-group comparisons respecting numerical variables (such as age, fetal weight, duration of uterine contractions, and pain intensity) were performed through the independent-sample *t*-test. Moreover, paired *t*-test was used for within-group comparisons of the pain intensity. The Chi-square test was also performed for between-group comparisons respecting nominal and ordinal data (such as education level, employment status, pregnancy wantedness, prenatal medical visits, Bishop score, and participation in childbirth preparation classes). $P < 0.05$ was considered statistically significant.

RESULTS

Primarily, 63 women were recruited to each study group – 126 in total. During the study, two women withdrew from the study due to lack of labor progress [Figure 1]. At baseline, the groups did not significantly differ from each other respecting their demographic and obstetric characteristics [$P > 0.05$; Table 1].

Between-group comparisons revealed that labor pain intensity in the aromatherapy group was significantly lower than the control group at cervical dilations of 3–4, 5–7, and 8–10 cm [$P < 0.05$; Table 2]. However, there were no significant between-group differences regarding 1 and 5 min Apgar scores [$P > 0.05$; Table 3]. We found no side effect of BC in mothers and their infants during the study.

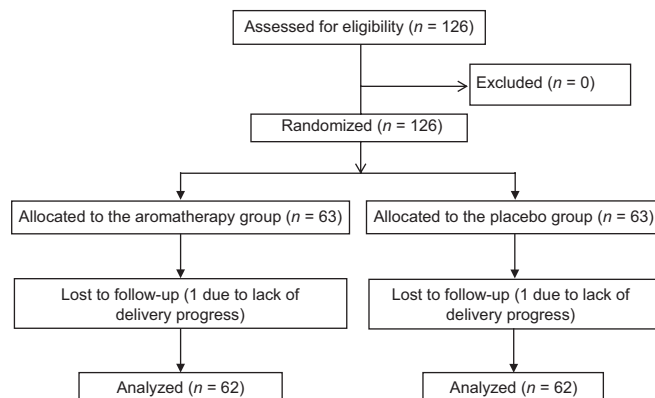


Figure 1: The flow of women in the study

DISCUSSION

The findings of the present study showed that inhalation aromatherapy with BC essential oil significantly reduced labor pain. BC may relieve pain through reducing blood

Table 1: Participants' demographic and obstetric characteristics

Characteristics	Group ^a		P
	Aromatherapy	Placebo	
Age (years)			
20-25	30 (48.39)	27 (43.55)	0.467 ^b
26-30	20 (32.26)	22 (35.48)	
31-35	11 (17.74)	9 (14.52)	
36-40	1 (1.61)	4 (6.45)	
Education level			
Primary school	7 (11.29)	10 (16.13)	0.475 ^b
Secondary school	18 (29.03)	16 (25.81)	
High school	28 (45.16)	30 (48.39)	
University	9 (14.52)	6 (9.67)	
Employment status			
Housewife	47 (75.80)	51 (82.26)	0.354 ^b
Employee	6 (9.68)	5 (8.06)	
Unemployed	6 (9.68)	6 (9.68)	
Self-employed	3 (4.84)	0	
Pregnancy wantedness			
Wanted	51 (82.26)	46 (74.19)	0.277 ^b
Unwanted	11 (17.74)	16 (25.81)	
Bishop score			
8 and lower	45 (72.58)	50 (80.65)	0.289 ^b
9-12	17 (27.42)	12 (19.35)	
Place for prenatal medical visits			
Hospital	4 (6.45)	1 (1.61)	0.06 ^c
Healthcare center	58 (93.55)	57 (91.94)	
Physician's private office	0	4 (6.45)	
Participation in childbirth preparation classes			
No	19 (30.65)	17 (27.42)	0.833 ^b
Yes, in hospital settings	39 (62.90)	42 (67.74)	
Yes, in health centers	4 (6.45)	3 (4.84)	
Fetal weight (g)			
2500-3000	6 (9.68)	5 (8.06)	0.443 ^b
3001-3500	36 (58.06)	38 (61.29)	
3501-4000	20 (32.26)	19 (30.64)	
Contraction length (s)			
At a cervical dilatation of 3-4 cm	39.03 ± 4.17	39.89 ± 3.9	0.268 ^d
At a cervical dilatation of 5-7 cm	45.18 ± 4.62	46.00 ± 4.08	0.308 ^d
At a cervical dilatation of 8-10 cm	48.20 ± 4.05	48.94 ± 3.96	0.324 ^d
Labor pain intensity before intervention	5.67 ± 0.83	5.79 ± 0.71	0.815 ^d

^aData are presented as n (%) or mean±SD, ^bChi-square test, ^cFisher's exact test, ^dIndependent-samples *t*-test. SD: Standard deviation

Table 2: Pain intensity scores at different cervical dilations

Dilatation (cm)	Group								P ^b	P ^c
	Placebo				Aromatherapy					
	Before	After	Mean difference	P ^a	Before	After	Mean difference	P ^a		
3-4	5.73 ± 0.73	6.68 ± 1.28	0.95 ± 1.01	<0.001	5.69 ± 0.80	4.98 ± 0.93	-0.71 ± 0.58	<0.001	<0.001	<0.001
5-7	6.48 ± 1.24	7.23 ± 1.54	0.74 ± 0.93	<0.001	6.84 ± 1.27	5.79 ± 1.13	-1.05 ± 0.73	<0.001	<0.001	<0.001
8-10	7.11 ± 1.34	7.71 ± 1.38	0.59 ± 0.99	<0.001	7.26 ± 1.47	6.35 ± 1.63	-0.90 ± 1.33	<0.001	<0.001	<0.001

^aResults of paired-*t*-test conducted for the comparison of pain intensity before and after the intervention, ^bResults of independent-sample *t*-test conducted for the comparison of pain intensity in the two groups after the intervention, ^cResults of independent-sample *t*-test conducted for the comparison of mean differences of pain intensity in the two groups after the intervention

Table 3: Apgar scores at the 1st and the 5th min

Apgar score	Group		P ^a
	Aromatherapy	Placebo	
1 st min	8.77 ± 0.37	8.67 ± 0.56	0.742
5 th min	9.97 ± 0.17	9.95 ± 0.21	0.651

^aThe independent-sample *t*-test

stasis and promoting circulation.^[13] More than three hundreds volatile substances have been detected so far in BC essential oil; the most common of them are alpha-pinene, 1-octanol, linalool, limonene, octyl acetate, alpha-thujene, and (E)-beta-ocimene. Most terpenes, such as alpha-pinene and linalool have been found to have analgesic effects.^[14] An earlier study showed the effectiveness of BC extracts on neuropathic pain in animal mode.^[15] In line with our findings, a study in Italy also showed the effectiveness of BC essential oil in relieving labor pain.^[16] Another study on 8058 women revealed that 60% of women and midwives found lavender and BC aromatherapies effective.^[17] Two other studies also supported the analgesic effects of BC.^[18,19] Moreover, two studies reported that aromatherapy has positive effects on pain during the first stage of labor.^[8,20,21] Conversely, a review study on two randomized controlled trials on more than 500 women indicated that aromatherapy did not significantly reduce labor pain.^[11] This contradiction may be due to the differences in aromatherapy protocols and the types of aromas.

The present study also showed that aromatherapy with BC essential oil had no significant effects on the duration and the interval of uterine contractions. Two other studies also reported the same finding.^[20,22] However, another study on a limited number of women reported that the aromatherapy effect uterine contraction activity.^[23]

A study showed that the perceived quality of an aroma is the most significant factor behind individuals' responses to aromatherapy.^[24] Cognitive or psychological mechanisms for odor transduction may confound the pharmacological effects of aromatherapy.^[25] Depending on the type of the aroma, nerve cells release different

neurotransmitters such as endorphins, serotonin, and noradrenaline. These neurotransmitters can relieve pain. Moreover, aromatherapy decreases corticotropin-releasing hormone through affecting olfactory pathways in the hypothalamus and thereby, alleviating anxiety.^[26] Anxiety has been found to have a direct relationship with labor pain^[27] in that it can increase pain sensitivity and decrease pain tolerance.^[28]

Memory is another factor contributing to the effects of aromas. Each aroma can evoke certain memories and cause individuals to review the details of the last events. Therefore, each aroma can cause certain effects through its associated memories.^[29] This fact highlights the necessity of evaluating the effects of different aromas.

The other finding of the present study was the insignificant effects of aromatherapy on 1 and 5 min Apgar scores. Consistent with this finding, the results of a study also showed that aromatherapy with Roman chamomile, clary sage, BC, lavender, and mandarin had no significant effects on 1, 5, and 10 min Apgar scores.^[16]

One of the study limitations was our inability to blind participants to the study intervention because participants in the aromatherapy group could easily understand that they were being treated with something aromatic. This limitation might have affected study results.

CONCLUSION

The results of this study demonstrate that inhalation aromatherapy with BC essential oil has positive effects on labor pain. Aromatherapy is a safe and noninvasive nonpharmacological therapy and therefore can be used for relieving labor pain in the first stage of labor.

Acknowledgment

We also appreciate the fruitful collaboration of the participating mothers and the staffs of Kamali hospital, Karaj, Iran.

Financial support and sponsorship

The research group would like to thank the Research Administration of Alborz University of Medical Sciences, Karaj, Iran, for its financial support of the study.

Conflicts of interest

There are no conflicts of interest.

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