Tehran University of Medical Sciences

Nursing Practice Today

2022; Volume 9, No 3, pp. 234-242

Original Article

Comparing the effects of vaginal and oral evening primrose oil on cervical ripening and labor progress among primiparous women

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ARTICLE INFO

Received 31 January 2022
Accepted 19 April 2022

Available online at:
http://npt.tums.ac.ir

Keywords:
cervical ripening;
evening primrose;
child labor

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DOI:
https://doi.org/10.18502/npt.v9i3.10225

ABSTRACT

Background & Aim: Evening primrose is a medicinal plant with potential effects on labor. This study aimed to compare the effects of vaginal and oral evening primrose oil on cervical ripening and labor progress among primiparous women.
Methods & Materials: This single-blind randomized clinical trial was conducted in 2020. Participants were 126 pregnant women with a gestational age of 39 weeks purposively selected from the obstetrics and gynecology ward of Valiasr hospital, Bafgh, Iran, and randomly allocated to vaginal evening primrose oil, oral evening primrose oil, and a control group. Participants in the vaginal evening primrose oil and the oral evening primrose oil groups received one 1000-mg evening primrose oil capsule per twelve hours for one whole week through the vaginal and the oral routes, respectively. The Bishop score and pregnancy outcomes were measured when participants referred to the study setting with labor pains.
Results: After the intervention, the Bishop score in both intervention groups was significantly greater than the control group (P= 0.001). The length of the second stage of labor in the vaginal evening primrose oil group was significantly shorter than the control group (P= 0.009). There were no significant differences among the groups respecting the time interval between hospital admission and delivery (P= 0.21), 1 and 5-minute Apgar scores (P= 0.83), and (P= 0.37), need for induction (P= 0.26), and type of delivery (P= 0.26).
Conclusion: Vaginal and oral evening primrose oil administrations significantly positively affect cervical ripening. The Bishop score and vaginal evening primrose oil significantly positively affect the length of the second stage of labor.

Introduction

Labor is the most prevalent midwifery emergency and requires different changes in the functions of the uterine and the cervix (1). Cervical ripening (CR) is a key step in labor that happens in the last weeks of pregnancy (2). CR is a complex process resulting from physical softening, effacement, and dilation of the uterine and the cervix (2, 3). Cervical softening is caused by increased vascularity, hypertrophy, cellular hyperplasia, and progressive structural changes in the extracellular matrix (4). The relaxin hormone regulates myometrial and cervical relaxation by modifying cellular matrix components (5, 6). After CR, strong uterine contractions cause cervical opening (2).

CR has many positive outcomes and prevents perinatal injuries such as severe perineal injuries (7). Contrarily, poor CR is associated with many different adverse consequences such as prolonged labor, fetal distress, excessive bleeding, infection, and increased need for medical interventions such as Cesarean section, particularly among primiparous women (2, 8, 9). Therefore,

Please cite this article as: Heydari P, Azizi F, Khakbazan Z, Geranmayeh M. Comparing the effects of vaginal and oral evening primrose oil on cervical ripening and labor progress among primiparous women. Nursing Practice Today. 2022; 9(3):234-242

interventions for CR before labor induction are common to facilitate successful childbirth (10).

Currently, different pharmacological and non-pharmacological strategies are used for CR. These strategies include prostaglandin therapy, catheter insertion, membrane stripping, and acupuncture (11). However, these strategies are usually associated with fetal and maternal complications (2). According to the studies along with their positive effects, medication-based therapies for CR also have adverse effects. These complications include perinatal and postnatal bleeding, prolonged labor, excessive stimulation of the uterus, fetal distress and injuries, nausea, vomiting, and fever (2, 12-14). Continuous professional training, especially in medicine, is changing and developing (15). Examples of medicinal plants used for facilitating CR and labor are chamomile (16), peganum harmala (17), flixweed (18), castor oil (19), saffron (20), and Evening primrose (21, 22).

Evening primrose is a two-year plant from the Onagraceae family and is native to North America (23, 24). Onager oil, extracted from the seeds of this plant, includes essential fatty acids such as gamma-linolenic acid (70%–74%), linoleic acid (8%–10%), oleic acid (6%–7%), and palmitic acid (6%–7%) (25, 26). Studies showed that fatty acids in Oenothera biennis facilitate prostaglandins synthesis, which is among the main stimulants of the cervix and CR (24, 27). Evening primrose oil (EPO) is well-tolerated by its users and is associated with mild side effects such as headache and gastric discomfort (15, 28, 29).

Previous studies reported contradictory results regarding the effects of Evening primrose on CR and labor induction. For example, a study reported that four vaginal EPO capsules during labor significantly increased the Bishop score and promoted CR (30). However, another study showed that vaginal EPO capsules did not significantly affect labor duration and labor pain onset (31). Moreover, a study on the candidates for hysterosalpingography (Hysterosalpingography evaluates the shape of the uterus and checks whether the fallopian tubes are open) reported that oral EPO capsules significantly reduced preoperative and postoperative abdominal pain but had no significant effects on cervical dilation and length (32). These contradictory results highlight the importance of further studies to produce more decisive evidence regarding the effects of EPO on labor. The present study aimed to narrow this gap. This study aimed to compare the effects of vaginal and oral EPO on CR and labor progress among primiparous women.

Methods

Design

This single-blind randomized clinical trial was conducted in 2020. Participants were 132 primiparous women who were referred to the obstetrics and gynecology ward of Valiasr hospital, Bafgh, Iran, to receive perinatal care. They were purposively selected and randomly allocated to a vaginal EPO, an oral EPO, and a control group through block randomization with a block size of 6. Inclusion criteria were primiparity, low-risk pregnancy, gestational age of 39 weeks, cephalic presentation, singleton pregnancy, normal findings at nonstress test for fetal health assessment in the past 48 hours, and no use of other CR methods. Exclusion criteria were serious labor problems such as placental abruption or placenta previa and rupture of membrane. Withdrawal criteria were nausea and diarrhea due to EPO use, voluntary withdrawal from the study, irregular use of EPO for two consecutive days, and labor pain during the one-week course of the study intervention. With a confidence level of 0.95, a power of 0.80, a moderate effect size of 0.5, and an

attrition rate of %20, the sample size was calculated to be 44 per group.

Data collection

Data collection tools were a demographic questionnaire, a midwifery characteristics questionnaire, a fetal health assessment form, and the Bishop scoring system. The items of the midwifery characteristics questionnaire were on some questions about the mother (like body mass index, number of pregnancies, number of abortions, history of infertility, the first day of the last menstrual period, gestational age, expected date of delivery), some information about vaginal examination findings, (like membrane status), and some questions about time and cause of hospitalization, the time of delivery, labor duration, need for induction, type of delivery, neonatal gender, and 1- and 5-minute Apgar scores. The Bishop scoring system is a quantitative method for assessing CR and predicting the outcomes of labor induction. It has five items on cervical dilation, cervical effacement, cervical consistency, cervical position, and fetal station. Items are scored on a 0–3 scale; hence, the possible total Bishop score is 0–15. Scores 4 and lower show poor CR (1, 6). Data were collected through interviews, observation, physical examination, and self-report methods.

Intervention

At the study's recruitment time, gestational age was determined based on the first-trimester ultrasound findings. Then, all eligible women underwent complete physical examination respecting vital signs, vaginal examination for determining Bishop score, and non-stress test to ensure fetal health. Afterward, the demographic and the midwifery characteristics questionnaires were completed for participants. Participants in the control group just received the initiation of the induction after 39 complete weeks. Participants in the vaginal and oral EPO groups were provided with thirty 1000-mg EPO capsules. They were instructed to receive one capsule per twelve hours for one whole week through the vaginal and the oral routes, respectively. In the vaginal EPO group, participants were instructed to make three holes on each capsule using a needle before its vaginal use and the rest thirty minutes after its use. All participants in the three study groups were asked to avoid sexual relationships, laxatives, herbal or synthetic products, or any intervention for inducing labor during the one-week course of the study intervention. They were also provided with the fetal movement documentation form and were instructed how to count and document fetal movements. Moreover, they were given the second author's phone number and asked to call her in case of at least three painful uterine contractions in ten minutes, reduced fetal movements, and any bloody or non-bloody vaginal secretions. The total duration of sampling was nine months.

After the intervention and at the time of labor pains, participants re-underwent physical examinations for vital signs, fetal heart rate, fetal health (through the non-stress test), and CR (through the Bishop scoring system). Examinations and assessments were performed by the second author and two research assistants. The assistants were two midwives from the study setting with a midwifery work experience of more than fifteen years. The second author and the two assistants performed the vaginal examination for inter-rater reliability assessment and scored cervical dilation and effacement for five dilation and effacement anatomical models (Effacement is when the cervix thins, shortens and softens to open the vaginal canal for childbirth). We used mannequins to establish the relationship between midwives' vaginal exams, and they demonstrated cervical dilation and effacement on mannequins. The inter-rater correlation

coefficient was 0.93. It is noteworthy that labor induction for participants with inadequate uterine contractions was performed through a standard dose of ten-unit oxytocin in 1000 Ringer's solution administered at a rate of five drops per minute.

Data analysis

The SPSS/21 program for Windows was used for data analysis. Data were described via the measures of descriptive statistics, namely mean, standard deviation, and frequency. They were analyzed via the paired-sample *t*, Chi-square, Tukey's, and Kruskal-Wallis tests and the one-way analysis of variance.

Ethical considerations

The Ethics Committee approved this study at Tehran University of Medical Sciences, Tehran, Iran (IR.TUMS.FNNM.REC.1398.134), and it was registered in the Iranian Registry of Clinical Trials (IRCT20200118046180N1). Necessary arrangements for the study were made with the authorities of the study setting. Participants received clear information about the study aim and methods and provided informed consent for participation. They were free to leave the study at will.

Results

A total of 132 primiparous women were recruited for the study. Six participants were excluded due to placental abruption (n=1), irregular use of EPO capsules (n= 3), and voluntary withdrawal (n=2), and 126 participants completed the study (Figure 1). The age mean was 22.95±3.413 years in the vaginal EPO group, 23.65±4.197 years in the oral EPO group, and 23.38±5.05 years in the control group.

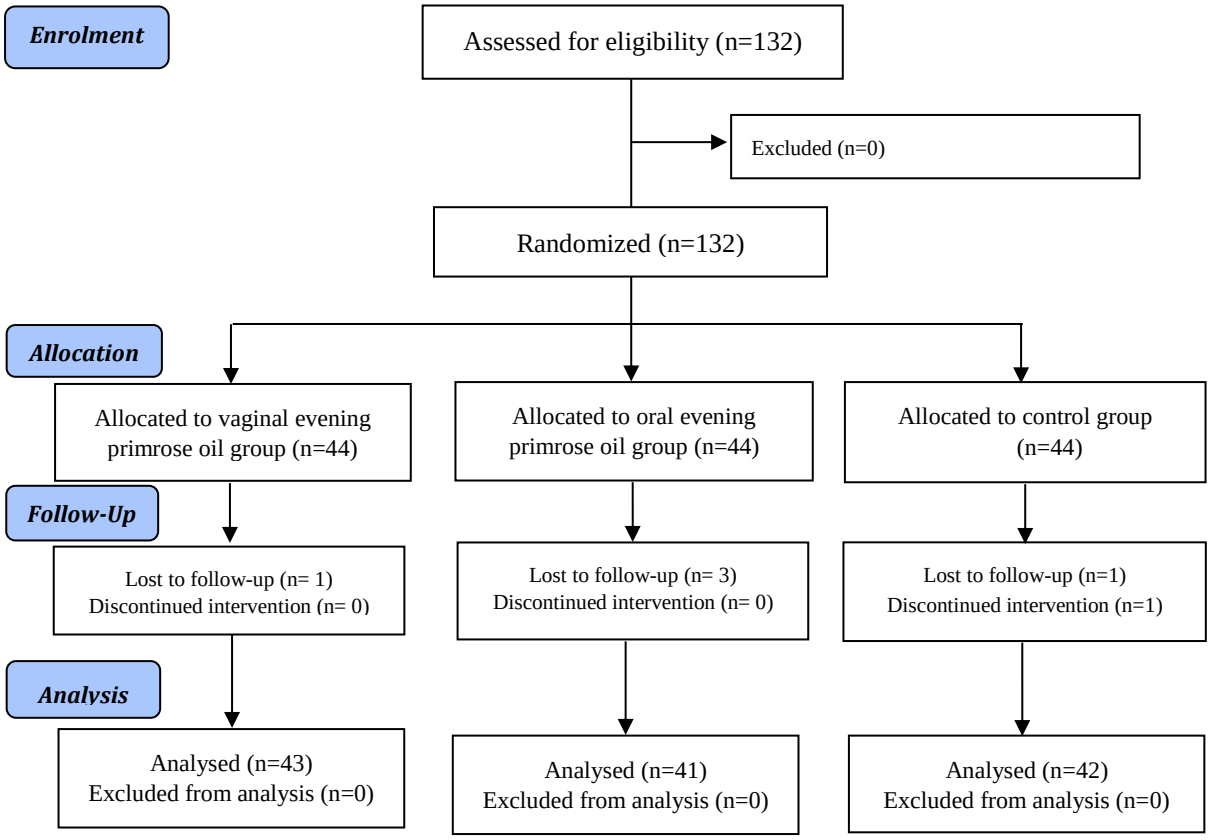

Figure 1. CONSORT flow diagram of the study

The mean body mass index was 24.03±2.86 in the vaginal EPO group, 24.37±8.24 in the oral EPO group, and 24.28±9.23 in the control group. Most participants aged 20–40 years (78%) were housewives (66%), had academic degrees (79%), and had good financial status (53%). (Table 1).

Table 1. Comparisons among the study groups regarding participants' demographic and midwifery characteristics

Characteristics		Vaginal EPO (N=43)	Oral EPO (N=41)	Control (N=42)	P-value
Age (Years)		22.95±3.413	23.65±4.197	23.38±5.05	0.753*
Body mass index		24.03±2.86	24.37±8.24	24.28±6.23	0.965**
Educational level	Illiterate	4 (9.3)	3 (7.3)	2 (4.5)	0.326*
	Diploma and lower	5 (11.7)	3 (7.3)	12 (27)	
	Academic	34 (79)	35 (85.4)	28 (68.5)	
Occupation	Housewife	29 (67.4)	24 (58.5)	31 (73.8)	0.998**
	Employed	14 (32.6)	17 (41.5)	11 (26.2)	
Financial status	Good	20 (46.5)	24 (58.5)	22 (54.8)	0.214^
	Relatively good	18 (41.9)	11 (26.8)	9 (21.4)	
	Poor	5 (11.6)	6 (14.6)	11 (23.8)	
Gestational age	Before intervention	38.91±0.49	38.74±0.45	38.77±0.61	0.33*
	After intervention	39.87±1.39	39.85±0.70	39.86±0.77	0.99*
Number of pregnancies	1	26 (60.5)	23 (56.1)	31 (73.8)	0.392**
	2	13 (30.2)	16 (39)	9 (21.4)	
	3	4 (9.3)	2 (4.9)	2 (4.8)	
Number of abortions	0	23 (53.4)	25 (60.97)	28 (66.66)	0.34**
	1	18 (37.2)	13 (31.7)	11 (26.19)	
	2	5 (9.3)	3 (7.31)	2 (4.8)	
History of infertility	Yes	7 (16.3)	8 (19.5)	5 (11.9)	0.635^
	No	36 (83.7)	33 (80.5)	37 (88.1)	

*: The results of the one-way analysis of variance; **: The results of the Fisher's exact test; ^: The results of the Chi-square test

The pretest Bishop mean score in all three groups was 2–4, with no significant difference among the groups (P= 0.467). However, the post-test Bishop mean score in both vaginal and oral EPO groups was significantly greater than the control group (P=0.001), and there was no significant difference between the intervention groups (P>0.05) (Table 2). It is while, there were no significant differences among the groups in terms of the mean values of the cervical dilation (P= 0.28) and effacement (P= 0.14), and fetal station items of the Bishop scoring system (P= 0.33). Nevertheless, the intra-group differences in the mean scores of the cervical consistency (P= 0.02) and the cervical position items were significant (P< 0.001) (Table 3). The prevalence rates of soft cervical consistency and posterior cervical position were respectively 67.4% and 7% in the vaginal EPO group, 68.3% and 7.3% in the oral EPO group, and 31% and 40.5% in the control group.

There was a significant difference among the groups in terms of the length of the second stage of labor (P= 0.033). This study showed that the length of the second stage of labor in the vaginal EPO group was significantly less than in the control group (P= 0.009). There were no significant differences between the oral EPO and the control groups (P= 0.203) and between the vaginal EPO and the oral EPO groups (P= 0.172) (Table 2).

Comparisons between groups did not show statistically significant differences among the groups in terms of the time interval between hospital admission and delivery (P= 0.21), 1-minute Apgar score (P= 0.832), 5-minute Apgar score (P= 0.372), type of delivery (P= 0.21), and the need for labor induction (P= 0.26) (Table 2).

Table 2. Comparisons among the study groups regarding pregnancy outcomes

Outcomes		Vaginal EPO (N=43)	Oral EPO (N=41)	Control (N=42)	P-value
The Bishop score	Before	2.86±1.08	3.1±0.88	2.88±0.91	0.467*
	After	7.86±1.24	6.85±1.62	5.62±1.62	≤0.001**
	P value	< 0.001**	≤0.001**	≤0.001**	
Apgar score	1-minute	8.63±1.41	8.85±0.35	8.86±0.41	0.832^
	5-minute	9.76±1.52	9.98±0.15	10	0.372^
Type of delivery	Normal vaginal	35 (81.4)	36 (87.8)	31 (73.8)	0.267^^
	Cesarean section	8 (18.6)	5 (12.2)	11 (26.2)	
Labor induction	Yes	24 (55.8)	29 (72.5)	28 (68.29)	0.26^^
	No	19 (44.2)	12 (27.5)	14 (31.71)	
Admission–delivery time interval		6.01±2.77	6.86±2.98	7.25±3.97	0.21*
Length of the second stage of labor		40.83±20.96	48.71±28.96	56.18±21.78	0.033*

*: The results of the one-way analysis of variance; **: The results of the paired-sample *t*-test;
^: The results of the Kruskal-Wallis test; ^^: The results of the Chi-square test

Table 3. Comparisons among the study groups regarding the post-test mean scores of the Bishop System items

Items		Vaginal EPO (N=43)	Oral EPO (N=41)	Control (N=42)	P-value
Cervical dilation		3.98±1.01	3.66±1.13	3.57±1.5	0.28*
Cervical effacement		46.28±10	42.44±9.42	41.67±14.29	0.14*
Fetal station		2.16±0.72	2.12±0.6	1.95±0.73	0.33*
Cervical position	Posterior	3 (7)	3 (7.4)	17 (40.5)	< 0.001**
	Mid-position	28 (65.1)	32 (78)	23 (54.7)	
	Anterior	12 (27.9)	6 (14.6)	2 (4.8)	
Cervical consistency	Firm	1 (2.3)	2 (4.9)	6 (14.3)	0.02**
	Medium	13 (30.3)	11 (26.8)	23 (54.7)	
	Soft	29 (67.4)	28 (68.3)	13 (31)	

*: The results of the one-way analysis of variance; **: The results of the Chi-square test

Discussion

This study compared the effects of vaginal and oral EPO on CR and labor progress. Findings revealed that the Bishop score in both intervention groups was significantly greater than the control group, but the difference between the intervention groups was insignificant. Moreover, findings showed that one-week use of vaginal and oral EPO capsules significantly improved cervical consistency and cervical position. In agreement with our findings, some previous studies showed the significant positive effects of vaginal EPO on cervical softening, CR (33), and the Bishop score (34). Gamma-linolenic acid, found in EPO, is a precursor of prostaglandin E2 (24, 27). Prostaglandin E2 improves CR (35) by increasing submucosal fluid, modifying collagen binds and glycosaminoglycans, and increasing myometrium sensitivity to oxytocin (2). Contrary to our findings, some studies reported the insignificant effects of vaginal and oral EPO on CR. Vaginal application of Evening primrose oil capsules in pregnant women from 37 weeks of gestation for one week (31) and its oral use in pregnant women with Bishop Score <4, from 40 weeks of gestation, every 12 hr (36) and for one week, and also for two days in women undergoing hysterosalpingography (32) did not increase Bishop and CR scores. This contradiction is attributable to the differences among the studies in terms of the EPO administration route and CR assessment method.

Our findings also indicated that while there was no significant difference among the groups in terms of the time interval between hospital admission and delivery, the length of the second labor stage in the vaginal and the oral EPO groups was significantly less than in the control group. The greater Bishop Score and shorter labor length in both intervention groups in the present study imply the significant positive effects of EPO on CR. The significant effects of EPO on the length of the second labor stage are probably due to its prostaglandin-like effects, which increase the efficiency of uterine contractions and pelvic blood flow. Contrary to our findings, a study reported that while Single-dose EPO in post-term pregnancy significantly shortened the latent phase of labor, it had no significant effects on the active labor phase and labor progress (24). Another study also showed that daily vaginal EPO from 37 weeks of pregnancy for one week had no significant effects on labor length (31). The contradiction between these studies' findings and the present study's findings may be due to the differences among these studies in the time of intervention and amount of medication.

No adverse effect of using Evening primrose oil was observed in the present study, and also, no significant difference was observed among the three groups in terms of the type of delivery, the need for induction, and 1- and 5-minute Apgar scores. A review study into the effects of vaginal and oral EPO in Iran reported that EPO was well-tolerated by pregnant women and had mild side effects such as headache and gastric discomfort (37). However, a study in the United States found that EPO had no significant positive effects on pregnancy and delivery duration, and on the contrary, prolonged labor phase for three hours compared with a control group and was associated with complications such as premature rupture of membranes and greater need for labor induction and instrumental delivery (Dove). A review study also reported that EPO could cause some side effects (38). The side effects of EPO in these studies might have been due to the use of EPO at high doses and for long periods of time.

The absence of a double-blind study and an accurate time recording in the first step of the delivery process in samples, as they did not refer to the maternity ward since the onset of labor pains, where the limitations of the present study.

Conclusion

Both vaginal and oral EPO significantly increase the Bishop score, while just vaginal EPO significantly shortens the second stage of labor. Therefore, vaginal EPO is recommended as an inexpensive method for CR. Of course, further studies are still needed to determine the most appropriate EPO administration dose, route, and time.

Acknowledgment

This study was part of a thesis supported by the Faculty of Nursing and Midwifery of Tehran University of Medical Sciences, Tehran, Iran. Hereby, we gratefully thank the instructors of this faculty, the Research Administration of this university, the authorities and staff of Valiasr hospital, Bafgh, Iran, and all pregnant women who participated in this study.

Conflict of Interest

The authors declare no conflict of interest.

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