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Effect of applying extra virgin olive oil versus obstetric gel on the second stage of labor outcomes among primiparous women

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Abstract :
Background: *Women with a prolonged second stage of labor are liable to develop spontaneous damage during childbirth and therefore they need special attention and care to shorten second stage of labor, protect the perineum and prevent neonatal trauma. Different interventions have been used to facilitate shortening the second stage of labor one of these methods may include the use of obstetric gel or virgin olive oil.*
Objectives: *Identify the effect of using extra virgin olive oil versus obstetric gel during vaginal examination on the second stage of labor outcomes. Design: Experimental study.*
Setting*: Labor and delivery unit of Maternity and Children hospital.*
Participants: *A total sample of 40 primiparous women. The experimental group (20 primiparous) received virgin olive oil and 20 primiparous control group received hospital obstetric gel during vaginal examination.*
Methods: *One tool was developed and used by the researcher for data collection namely: assessment tool which consisted of two parts; first part; socio demographic and obstetric data. The second part included assessment items related to first and second stage of labor outcomes. Results: A significant lower median duration of second stage of labor and crowning was observed for the experimental group compared to control group (30 min, 40min and 50 seconds, 60 seconds, respectively) P= <0.001 and P= 0.01 respectively. Consequently, the median total duration of labor for the experimental group was significantly shorter than the median duration in their counter parts, P=.04. Furthermore, the application of extra virgin olive oil has statistically significant protective effect regarding frequency of pain relief requirement. Conclusion: The application of olive oil had potential benefits of shortening the duration of second stage of labor and it decreases the frequency of requiring pain relief compared to application of routine obstetric gel with no harm done by the practice.*
Keywords: *Virgin olive oil, vaginal examination, second stage of labor*

I. Introduction

The second stage of labor is usually the shortest and considered the most empowering for the laboring woman.[1] However, some women face prolongation of the second stage of labor, which can make them feel frustrated and exasperated [2]. The normal length of the second stage in nulliparous women is 30 min to 3 hours, with a median duration of 50 min [3]. Prolonged duration of the second stage of labor of more than 3 hours is associated with maternal complications, such as an increased risk of perineal trauma, chorioamnionitis, and postpartum hemorrhage [4][5]. These complications often require additional medical interventions. Preventing these complications requires adequate management of the second stage of labor, which can ameliorate the physical, emotional, and financial costs associated with on-going morbidity [6]. Several methods and procedures have been explored in an attempt to shorten the second stage of labor and improve the protection of perineal integrity, including but not limited to perineal massage, lateral positioning, and use of obstetric gels as lubricants; results have been inconsistent. Although the use of lubricants to facilitate vaginal childbirth is not yet a standard procedure in human obstetrics [7], still obstetricians use ultrasound gel during vaginal examination as a lubricant to assess cervical dilatation during the active phase. The food and drug administration (FDA) [8] advice health care providers to stop using products from lot (120111), as FDA testing revealed Pseudomonas aeruginosa and Klebsiella oxytoca bacteria contamination. Not every patient exposed to Pseudomonas aeruginosa and Klebsiella oxytoca bacteria in Other-Sonic Generic Ultrasound Transmission Gel will develop colonization (the presence of bacteria at a site without any signs of infection) or infection, but the risk remains present [9] [8]. As a result of rising awareness about the beneficial effects of olive oil, the worldwide consumption of olives and olive products has increased significantly, particularly in high revenue countries such as the United States, Europe, Canada, Australia, and Japan, which has resulted in the rapid development of olive-based

products [10][11]. The high percentage of monounsaturated oleic acid, which is less susceptible to lipid peroxidation than the poly-unsaturated fatty acids, is one benefit of olive oil; additionally, its high content of alpha-tocopherol may enhance its anti-oxidative effect [12].

Virgin olive oil is the natural juice of the olive fruit, which plays a major role in the healthy Mediterranean diet. During labor, olive oil can lubricate the perineum without causing irritation. It can also aid in physical delivery of the infant and can relax and reassure women of their ability to deliver intact or with minimum tearing, which will result in better healing outcomes than episiotomy. Additionally, the laxative effects of pure olive oil can induce labor naturally, as it can increase elasticity of the tissues and prepare the cervix and vagina for childbirth [13] [14]. As such studies are scarce; this study was designed to examine the use of olive oil during vaginal examination. It was hypothesized that olive oil can reduce the friction between the vaginal wall and fetus, thereby minimizing the risk of prolonged second stage of labor and its subsequent complications.

Aim Of The Study

The aim of this study was to identify the effect of using virgin olive oil during vaginal examination versus hospital obstetric gel on the outcomes of second stage of labor.

Hypotheses

Primiparous women who receive virgin olive oil throughout the first and second stages of labor will be more likely to have a shorter duration of the second stage of labor and will exhibit decreased requirements for pain relief and decreased incidence of perineal tears than those who will receive hospital obstetric gel.

Ethical approval

The study was approved by the University of Dammam ethical committee. An official permissions and approvals obtained from hospital administration, chairman of OB/GYN department and chairman of nursing administration. An informed written consent was taken from the women to participate in the study.

II. Subjects And Method

2.1 Research Design

An experimental research design was utilized.

2.2 Setting

The study was performed in the delivery unit at a maternity and children's hospital at Al Hassa, Saudi Arabia

2.3 Participants

The study was comprised of 56 primiparous women who were selected randomly and assigned into experimental and control groups according to random table number. The experimental group included 28 women who received olive oil during a vaginal exam for labor, and the control group included 28 women who received routine hospital obstetric gel during a vaginal examination for labor. Women who fulfilled the following criteria were included in the study.

2.3.1 **Inclusion Criteria**

- **Primiparity**
- Singleton pregnancy with cephalic presentation.
- Anticipated normal birth.
- Estimated birth weight between 2500 g and 3500 g.
- Term pregnancy (37-42 weeks gestation).
- 20 - 35 years old.
- Use of breath-holding pushing technique during labor.

2.3.2 Exclusion Criteria

Women were not being eligible to participate in the study if they met any of the following exclusion criteria:

- Complicated labor.
- Planned cesarean section.
- Intrauterine fetal death.
- Presence of any medical or obstetric risk factors.
- Premature Rupture Of Membranes.

2.4 Data Collection Tools

An assessment sheet was used for data collection and consisted of the following two parts:

Part I: Assessment items related to socio-demographic data and obstetrical history.

These questions collected socio-demographic data, including women's name, age, level of education and occupation, anthropometric data, including BMI, and obstetrical history information, including weeks of gestation, date of last menstrual period (LMP), expected date of delivery (EDD), place and number of antenatal visits, and date of onset of labor.

Part II: Assessment items related to outcomes of the first and second stages of labor.

These questions assessed the duration of the first stage and second stages of labor, duration of crowning, total time of delivery, time of rupture of membranes, frequency of pain relief requirements and evidence of first, second, third and fourth degree perineal tear.

2.5 Methods

An experimental study was conducted between June to September 2012 at Maternity and Children Hospital. The institutional ethics committee approved the study protocol. Informed written consent was obtained from all participants (56 eligible laboring women) following enrollment interviews. The researcher explained the purpose of the study to every woman participating in the study. The data collection tool was developed by the researcher after reviewing the related literature, and the content validity of the tool was tested by five experts in the maternity nursing and medical field. A pilot study was conducted on 10% of the studied women to test feasibility of the tools and the time required to participate. According to the results of the pilot study, necessary modifications were made, and the women participating in the pilot study were excluded from further participation. Following the pilot study, the data collection tool was reconstructed and prepared for use.

The researcher completed part one of the assessment tool for all participants (56 parturients) to collect socio-demographic characteristics and obstetric history however, 16 women didn't complete the study for failure of progress and emergency CS. Eligible women were randomly assigned to one of the following groups upon confirmation of active first stage of labor (dilatation of the cervix reaching 4 cm); each laboring woman was given a sealed piece of paper detailing her group allocation. The experimental group received extra virgin olive oil during vaginal examination, and the control group received routine hospital obstetric gel during the same period (active first stage of labor to the end of the second stage of labor). The researcher completed part two of the assessment tool for both groups beginning at 4 cm of cervical dilation in the first stage through the second and third stages of labor to assess labor stage duration and timing of rupture of membranes and crowning.

The technique of applying olive oil and routine obstetric gel were as follows:

- Upon confirmation of 4 cm of cervix dilatation, each participant was provided with a dedicated bottle containing extra virgin olive oil bottle for the experimental group or routine obstetric gel for the control group; oil or gel was applied by the examiner during vaginal examination starting at the active phase of the first stage of labor and through the second stage of labor.
- Extra virgin olive oil or obstetric gel was distributed in the birth canal through intermittent vaginal examination according to the hospital policy under strict aseptic technique.
- All women in the experimental and control groups assumed lithotomy position with the head propped up and used only one pushing technique (breath holding techniques) during labor.

Using part II of the assessment tool, the researcher recorded the duration of each stage of labor, requirements for pain relief, occurrence of spontaneous or artificial rupture of membranes, the duration of crowning, the total duration of labor and presence of episiotomy or perineal tear for all participants. Apgar scores and admissions to the NICU were also recorded. The effectiveness on outcomes of the second stage of labor was compared between virgin olive oil and obstetric gel.

1.6 Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS) version (17). Comparisons were made between the experimental and control groups using of chi-square test for categorical variables and the t test for continuous variables; 95% confidence intervals were calculated. A p-value < 0.05 was considered to be statistically significant, and a pvalue < 0.01 was considered to be highly significant. The quantitative significance signifies an abnormal distribution. Accordingly, the quantitative variables are presented as median (measure of central tendency) and interquartile range (measure of dispersion). The nonparametric test Mann Whitney test was used to compare the medians between the groups.

III. Results

A total of 56 women were recruited for the study. Sixteen women were excluded after recruitment; eight were in the experimental group, and eight were in the control group. The reasons for exclusion were delivery by cesarean section following either failure to progress or fetal distress. Data from 40 participants were available for analysis; women were split evenly between the experimental and control groups. Socio-demographic data are presented in Table 1, and both groups were comparable with respect to age, level of education, place of residency, occupation and BMI (P = .2, P = .2, FETP = .5, P = .6 & P = .4, respectively). Regarding antenatal characters, all study subjects in both groups (experimental and control) had an adequate number of antenatal visits starting in the first trimester of pregnancy (≥ 4 antenatal visits), and there was no significant difference in the median weeks of gestational age (FET= .8). As shown in Table 2, the total median duration of the first stage of labor was shorter in the experimental group (562.5 min) than in the control group (630 min), though the difference was not statistically significant. However, the median durations of the active and transition phases of the first stage of labor were significantly shorter in the experimental group (P = .007 and P = .004, respectively). Furthermore, the median duration of the second stage of labor and the median duration of crowning were significantly short in the experimental group compared to the control group (30 min vs. 40 min, P < .001 and 50 seconds vs. 60 seconds, P = .01, respectively). The median duration of the third stage of labor did not differ significantly between the groups (experimental and control). However, the median total duration of labor was significantly shorter in the experimental group (598 min vs. 672.5 min, respectively); the median duration was within normal limits in both groups.

The duration of the second stage of labor was normal in both groups. Table 3 shows that significantly more women in the experimental group had short durations of second stage of labor than in the control group (25% vs. 0%, FETP= .047); olive oil contributed to one quarter (25%) of women with short duration of second stage of labor (ARR=25%). Approximately four women needed to be treated with extra virgin olive oil to shorten the duration of second stage of labor in one patient (NNT≈ 4). Table 4 shows that the use of extra virgin olive oil was associated with significant reductions in the need for pain relief (RR = .47, p = 0.003). Approximately twice as many women in the control group (85%) used pain relief compared with the experimental group (40%); extra virgin olive oil reduced the need for pain relief by 45% (ARR=45%). Two women needed to be treated with extra virgin olive oil to avoid the need for pain relief agents in one woman (NNT≈ 2).

Table 1: Distribution of the experimental and control groups according to their general characteristics

General characteristics	Experimental (n = 20)	Control (n = 20)	Test of significance
Socio-demographic characteristic Age (years) Median (IQR)	24 (7.3)	21.5 (7)	Z = 1.508 P = .2
Level of education Literate Intermediate Secondary University and more	0 (0.0) 0 (0.0) 9 (45.0) 11 (55)	1 (5.0) 2 (10.0) 11 (55.0) 6 (30.0)	P = .2
Place of residency Rural Urban	6 (30.0) 14 (70.0)	3 (15.0) 17 (85.0)	FETP = .5
Occupation Housewife Working	18 (90.0) 2 (10.0)	19 (95.0) 1 (5.0)	P = .6
Anthropometric character Body mass index (BMI): Range Median (IQR)	21-53.8 31 (9.6)	17-40 27.9 (5.7)	Z = .798 P = .425
Current antenatal characters Place of antenatal centers Governmental hospitals MCH PHC Private	0 (0.0) 18 (90.0) 2 (10.0)	7 (35.0) 11 (55.0) 2 (10.0)	P = .013
Antenatal care Regular	19 (95) 1 (5)	19 (95) 1 (5)	FET = .8

Irregular			
Gestational age/wks. Range Median (IQR)	 37-39 39 (0)	 37-40 39 (1)	 Z = .58 P = .55

Note. Qualitative variables are expressed as median (IQR); (IQR) = (interquartile range), N (%); * Significant (S) ($P \leq .05$), X^2 = Chi square, FET (Fisher's exact test) MCH = Maternity and Children Hospital, PHC = Primary Healthcare Center, Z= Mann Whitney Test, FET = Fisher's exact test.

Table 2: Distribution of experimental and control groups according to duration of first, second, and third stages of labor and the total duration of labor

Group	Latent phase in min.	Active phase in min.	Transition phase in min.	Total duration of first stage in (min.)	Second stage		Duration of 3rd stage in min.	Total Duration of labor (min.)
					Total duration of second stage in min.	Duration of crowning in seconds		
Experimental								
Rang	180-950	70-300	30-150	370-1080	11-60	35-60	10-15	410-1125
Median (IQR)	300(120)	160(60)	65(48.8)	562.5 (160)	30 (2.5)	50 (15)	10 (0)	598 (158.5)
Control								
Range	150-860	60-540	17-320	390-1100	33-65	45-75	10-15	460-1140
Median (IQR)	240(103.8)	240(125)	125(91.25)	630 (214)	40 (25)	60 (4)	10 (4)	672.5
Z	1.758	2.685*	2.894*	1.813	2.562*	3.503*	1.233	2.015*
P	.08	.007	.004	.07	<.001	.01	.2	.04

*Significant

Table 3: Short duration of second stage of labor among both experimental and control groups

Group	Second stage		Test
	Short	Normal	
Experimental	5 (25.0)	15 (75.0)	FET P= 0.047 ARR= 25.0% NNT= 4%
Control	0 (0.0)	20 (100.0)	

Note. RR = relative risk; ARR = attributable risk reduction; NNT = number needed to treat.

Table 4: Pain relief requirements during the second stage of labor among both groups

Group	Pain relief		Test
	Yes	No	
Experimental	8 (40.0)	12 (60.0)	X^2 = 8.642 P = 0.003* RR= 0.47 ARR= 45.0% NNT= 2.22 % ≈ 2%
Control	17(85.0)	3 (15.0)	

IV. Discussion

Long labor duration increases maternal morbidity, vaginal operative deliveries (VOD), C-sections and lacerations of the birth canal [15]. Special attention and care to shorten the second stage of labor, protect the perineum and prevent neonatal trauma are the core objectives of labor management. In contrast to the previous investigations using ''classical perineal massage'' with a lubricant in the late second stage of labor or using specially developed obstetric gel to optimize the lubrication effect for vaginal delivery, the present study is the first randomized controlled trial aimed to identify the effect of using extra virgin olive oil during vaginal examination versus hospital obstetric gel on outcomes of the second stage of labor. The median durations of the second stage of labor and crowning were significantly shorter in the experimental group compared to control group (30 min vs. 40 min, P < .001 and 50 seconds vs. 60 seconds, P = .01, respectively. Consequently, the median total duration of labor for the experimental group was significantly shorter than the median total duration in the control group (598 min vs. 672.5 min, respectively; P = .04), which emphasizes other benefits of extra virgin olive oil, including shortening the duration of the second stage of labor and the total duration of labor (Table 2). A randomized controlled prospective trial performed by **Kühnert et al** [16] in a Scientific Expert Report investigated the application of a specially designed obstetric gel in the first and second stage of labor and found a reduction in total labor duration among women used Dianatal Obstetric Gel without epidural anesthesia. Furthermore, Andreas et al, who used the obstetric gel to shorten the duration of second stage of labor and prevent perineal trauma in nulliparous women, found that obstetric gel shortens the second stage by 30% (26 min), which was both statistically and clinically significant [17]. This study revealed that the application of extra virgin olive oil shortened the duration of the second stage of labor among the experimental group (90%) compared to the control group (65%), who received routine obstetric gel. Therefore, the application of extra virgin olive oil shortened the duration of the second stage by approximately one and half times that of the control group (as RR = 1.4). One quarter (25%) of women with shorter second stage could attribute their shorter second stage to the use of olive oil (ARR=25%). Approximately four women needed to be treated with extra virgin olive oil to shorten the duration of the second stage of labor in one woman (NNT≈ 4) (Table 3). Most women believe that pain will be a major part of childbirth. However, the need for pain relief is highly variable between individuals and should be assessed individually. Women are encouraged to use a collection of simple, non-pharmacological pain relief methods that have no potential harm to the mother or infant [18]. Kuo et al [19] studied factors influencing prolonged second stage and its effects on perinatal and maternal outcomes and found that the application of oil during the second stage of labor can lubricate the perineum without causing irritation. It can also help in physical delivery of the infant and may relax the woman. Similarly, the current study revealed that the application of extra virgin olive oil was associated with a statistically significant reduced need for pain in the experimental group (40%) compared with the control group (85%) (p = .003). Pain relief requirements among women who received extra virgin olive oil was reduced to 45% (ARR=45%). Approximately two women needed to be treated with extra virgin olive oil to decrease the requirements for pain relief in one woman (NNT≈ 2) **(Table 4)**. However, the present study conflicts with that by Smith et al [20], who studied 513 women randomized to receive aromatherapy (Roman chamomile, clary sage, frankincense, lavender, or mandarin essentials oils) or standard care. They found no differences between the groups in level of pain.

Limitations Of The Study

The present study has several limitations, including the lack of references and evidence based studies on this topic. All primiparous women undergo episiotomy per hospital policy, so there was no opportunity to examine the effect of extra virgin olive oil during labor on perineal integrity. Limitations of time for submitting the project in its due date did not allow investigators to recruit a large sample of women.

V. Conclusions

Based on the findings of the present study, it can be concluded that the application of extra virgin olive oil has the potential benefit of shortening the duration of the second stage of labor as well as decreasing the duration of crowning. It also decreased the need for pain relief, and there was no harm detected with this practice.

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Running title: Effect of olive oil versus obstetric gel on labor outcomes.

Contribution:
Aisha: Protocol/project development, Data collection or management, Data analysis Manuscript writing/editing
Eman: Protocol/project development, Data analysis, Manuscript writing/editing (Corresponding author)
Nourah: Protocol/project development, Data analysis, Manuscript writing/editing and final draft.

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