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PREVENTION OF POSTPARTUM URINARY RETENTION WITH PEPPERMINT OIL VAPOR

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ABSTRACT

Urinary retention in the postpartum period (PPUR) is one of the health problems commonly handled using catheterization and antibiotic prophylaxis. This study aimed to look at the influence of peppermint oil on PPUR prevention. This quasi-experimental study with a control group design included 60 postpartum subjects (29 in the control group and 31 in the intervention group) with vaginal delivery (ages 17-50 years). The intervention group obtained treatment by giving 2 mL of peppermint oil, while the controlled group used mineral water in the closet before subjects sat on it for 5-10 minutes and voided. The bladder condition was further checked subjectively and manually by palpation before and after the exposure to peppermint oil (distention or no distention). The relationships between variables were analyzed using the Fisher Exact statistical test, obtaining no significant effect of peppermint oil administration variables on PPUR prevention ($p = 0.495$, CI 95%). PPUR is related to oxidative stress, tissue inflammation, and nerve impulse blocks. Peppermint oil is estimated to be one of the modalities in preventing health problems through antioxidant, anti-inflammatory, and antispasmodic effects. Further research is needed to validate the effect of peppermint oil on PPUR prevention. In addition, support of screening information on the condition of the bladder objectively using a bladder scanner is also needed to measure the post-void residual volume (PVRV). This study showed that peppermint oil on PPUR prevention has no significant effect and may require further investigation.

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1. INTRODUCTION

Urinary retention is one of the postpartum complications. It has been reported by a recent study that the general incidence of PPUR is 12.9%. However, previous studies that have been conducted show different results on the incidence of PPUR (1.7%-17.9%) (Ain, Shetty, & K, 2021; Q. Li, Zhu, & Xiao, 2020). In this case, post-partum urinary retention (PPUR) problems can occur in vaginal births (1.7%-17.9%) (Ain et al., 2021). Previous research conducted at Cipto Mangunkusumo General Hospital Jakarta found that the urinary retention incidence in postpartum mothers reached 14.8% and increased by 38% in postpartum with forceps delivery (Ermiati et al., 2009). Forceps delivery can cause mechanical injury to the perineal and vulvar areas and cause inflammation, leading to edema and constriction of the urethral sphincter. Edema further causes the somatic nerve impulses transmission to be poorly received. These pathophysiological conditions then result in postpartum urinary retention (Q. Li et al., 2020).

One of the impacts of PPUR is postpartum bleeding associated with an increased risk of uterine subinvolution due to mechanical pressure of the bladder on the uterus (Downey, Kruse, & Plonczynski, 2019). In addition, if prolonged PPUR occurs, it can cause bladder dysfunction that is difficult to cure (Mulder et al., 2014; Singh, 2018). In this case, to prevent the complication, frequent medical interventions are needed, such as prophylactic antibiotic treatment and catheterization that can reduce bladder distension (Appleby, 2018). However, the catheterization method can increase the risk of urinary tract infections in the mother, while antibiotic administration can contaminate the mother's milk that will be given to the baby.

To prevent complications, herbal ingredients such as peppermint oil have been used as an alternative measurement to help void difficulty in the mechanical obstruction condition such as PPUR (Anne. Phillips, 1998; Durham & Chapman, 2014). The menthol content in peppermint oil can inhibit inflammation, thereby minimizing oedema (Jeelani et al., 2018). In addition, the antioxidant component in this herbal ingredient can reduce oxidative stress and improve tissue healing (Hoseini et al., 2020; Pavlić et al., 2021). Peppermint oil has antioxidant effects due to its high oxygenated monoterpene content, mainly 1,8-cineole, *rotundifolone*, *menthofuran*, *pulegone*, and menthol (Benabdallah et al., 2018). Many preclinical studies have demonstrated the anti-inflammatory and antioxidant effects of menthol (Dawood et al., 2020; Liu et al., 2015). Peppermint oil also has an antibacterial effect, especially its main components, namely *isomiso menthone*, *menthone*, *pipettinone oxide*, *trans-carveol*, and β -*caryophyllene*. These components inhibit the action of *Escherichia* and *Klebsiella pneumonia* (Gram-negative), and also *Staphylococcus aureus* and *Streptococcus pyogenes* (Gram-positive) (Gholamipourfard et al., 2021). The antibacterial effect of peppermint oil is even induced by some antibiotics, such as penicillin-G and chloramphenicol (Khusro et al., 2020). The use of peppermint oil in the clinical management of PPUR in did not have adequate statistical data. Thus this study aims to add relevant statistical data. This study aimed to see how peppermint oil can prevent the PPUR. One of the

largest components in peppermint oil is monoterpene menthol. In this case, the antispasmodic mechanism involves the effect of menthol as a calcium canal antagonist on smooth muscles and induction against prostaglandins and nitric oxide (Oz et al., 2017). Another literature further explains that menthol also has analgesic and antioxidant/anti-inflammatory properties (lowering interleukin expression 6 and reducing the number of free radical cations) (Singh et al., 2015). In this case, the menthol contained in peppermint oil can be used as an external urethral sphincter relaxant agent that undergoes constriction due to inflammation of the vulva and birth canal as an impact of vaginal delivery. In the future, this intervention will become one of the non-pharmacological modalities in addition to previous routine interventions, such as listening to the sound of running water, washing using warm water, and warm compresses in the suprapubic area.

2. METHOD

Research Design

This research is a quasi-experimental study with a control group design at Dr. Soekardjo Hospital from September to November 2021.

Population and Sample

This study was conducted involving 60 respondents on the 2nd floor of the Melati puerperal room at Dr. Soekardjo Hospital Tasikmalaya for three months. The sample size was selected using a proportional formula with a consecutive sampling technique. Furthermore, the inclusion criteria used to choose the respondents are those giving birth through vaginal delivery at the age of 17-50 years old and have a postpartum status of a maximum of 6 hours (screened by using the respondent's checklist form). Meanwhile, postpartum caesarian section, severe comorbid diseases (heart, kidney, and nerve disease), attached indwelling catheters, and a history of allergies to peppermint oil (menthol) were excluded from the respondent's criteria. The respondents were further selected based on these predetermined inclusion and exclusion criteria using the purposive sampling technique and were divided into two groups. In this case, the two groups are the intervention group (respondents who were given exposure to peppermint oil vapour in the perineal area with a distance of about 15-20 cm) as many as 31 people; and the control group (respondents who were not given peppermint oil, but were exposed to mineral water) as many as 29 people.

Instrument

Peppermint oil was given through a procedure listed in the checklist format of the intervention stages: 1) informed consent; 2) interviews and examinations before intervention; 3) the provision of voiding interventions by indirect administration of peppermint oil; and 4) examination after the intervention.

PPUR prevention was obtained through bladder emptying information after the intervention (complete/incomplete) resulting from palpation examination after intervention recorded in the electronic observation checklist format. To ensure the validity of the examination, researchers have

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carried out the Kappa test on enumerators to equalize perceptions of bladder emptying information (Cohen's kappa = 0.62). Complete bladder emptying was assessed by the absence of distention in the suprapubic area, while incomplete bladder emptying was assessed if there is still resistance or distension in the suprapubic area.

Research Procedure

Before the two groups of respondents was treated, the research team collected the characteristic data of respondents. These data include age, gravida states, weight before and after the delivery, height, length of phase I (early labour) and phase II (active labour), baby birth weight, type of delivery (spontaneous/forceps/vacuum), regional anesthesia usage, history of severe illness, history of episiotomy, and external tears.

Furthermore, both of the respondents' groups were checked for bladder condition subjectively through palpation techniques to determine the presence of tension on the suprapubic surface as an indicator the presence of urine in the bladder. After obtaining the basic data, both groups of respondents were asked to urinate for the first time after entering the postpartum unit. Respondents urinated on the sitting toilet (commode) with maintained privacy for 5-10 minutes. Before urinating, the toilet used for urinating was given peppermint oil as much as 10-15 drops (2mL). Meanwhile, the group of respondents who were not exposed to peppermint oil, the peppermint oil droplets were replaced with mineral water. During the urination, respondents were asked to report any discomfort. After urinating, the bladder was rechecked to find out the qualitative changes in urine volume in the bladder after voiding (distention or no distention). After the urination process, respondents were asked about their ability to urinate subjectively (complete or incomplete). In addition, all respondents were asked about general satisfaction with the intervention of the urination process.

Data Analysis

The data were analyzed with univariate using percentages (qualitative data) and averages (quantitative data). The bladder condition (distention/no distention) was processed to measure the effect of peppermint oil in preventing PPUR. Furthermore, bivariate analysis was also conducted using the Fisher exact test (CI 90%) to obtain the effect of intervention peppermint oil administration on the ability to urinate in postpartum mothers (as an effort to prevent PPUR).

Ethical Clearance

This research has obtained ethical approval from the ethics committee of Poltekkes Kemenkes Tasikmalaya with the number No. 2021/KEPK/PE/ VI/00103.

3. RESULTS

Based on the data collection, the characteristics of the two groups are described as presented in table 1.

Table 1. Respondent's Characteristics

Respondent's characteristics	Intervention Group	Control Group
	n = 31	n = 29
Age (years)	29±6.38	29±6.07
Weight before delivery (Kg)	63±10.58	65±7.89
Weight after delivery (Kg)	59±113	62±8.12
Height (cm)	154±6.79	153±6.06
Duration of phase I (minutes)	355±344.37	525±580.64
Duration of phase II (minutes)	8±2.9	12±18.26
Baby's birth weight (grams)	2754±772.73	2939±332.68
Severe disease history	0 (0%)	1 (3.45%)
Primiparous	12 (38.71%)	9 (31.03%)
Spontaneous birth	31 (100%)	29 (100%)
Regional anaesthesia	0 (0%)	0 (0%)
Current episiotomy	14 (45.16%)	14 (48.28%)
External tears	0 (0%)	0 (0%)
Bladder has distention before intervention	31 (100%)	29 (100%)
Bladder has no distention after intervention	31 (100%)	29 (100%)
Duration of intervention (minutes)	6±1.72	6±1.96
Satisfied after intervention	31 (100%)	29 (100%)

Description: Data is presented as an average ± standard deviation or number (%)

Table 2. Fisher Exact Test on the Effect of Peppermint Oil Administration on Voiding Ability

Groups	Voiding Ability (Bladder Condition)								p
	Preintervention				Postintervention				
	Distention		No Distention		Distention		No Distention		
	n	%	n	%	n	%	n	%	
control group	29	100	0	0	0	0	29	100	0.495
intervention group	31	100	0	0	2	6	29	94	

Furthermore, each characteristic of respondents in the intervention and control group was tested for its homogeneity using the Lavene Test. As a result, each characteristic of the respondent in both groups showed homogeneous results ($p > 0.05$). The determination of the influence intervention of peppermint oil administration and the ability to urinate (as an indicator of PPUR prevention) is indicated by the results of the Fisher Exact bivariate test listed in table 2 with the results of no significant effect of the administration of peppermint oil and the voiding ability in the prevention of PPUR ($p = 0.495$, CI 95%).

The results of this study substantially showed that the giving of peppermint oil vapor to the vulvar and perineal area did not have a significant effect on the prevention of PPUR.

5. DISCUSSION

The insignificant effect of peppermint oil vapor in the prevention of PPUR is associated with the pathophysiology factors of PPUR, which include neurological, physiological, and mechanical (Perú Biurrun, Gonzalez-Díaz, Fernández Fernández, & Fernández Corona, 2020). The

combination of these factors determines the trigger of a postpartum mother experiencing PPUR. Age changes affect the condition of nerve axons and the deposition of smooth muscle collagen detrusor in the bladder so that it can decrease its contractility. Furthermore, regional anesthesia, neuropathy in the perineum due to stretching of the pudendal nerve, and spasm of the urethral muscle due to pain in the perineum are neurological factors that may occur. The length of time duration of phases I and II during the inpartu period can also cause disturbances in the innervation of the pudendal and autonomic nerves that affect the spontaneous voiding process (Mevorach Zussman et al., 2020).

Physiologically, respondents were in the immediate postpartum period which allows high levels of progesterone during pregnancy that further lead to a decrease in bladder detrusor muscle tone. As a result, it causes less contraction of bladder muscles in the voiding process (Tiberon et al., 2018). In addition, mechanically, the process of vaginal delivery can cause injury to the birth canal, especially the perineal and vulva area (Ain et al., 2021). The duration of phase II of labor also causes inflammation in the vulva and urethra area (Q. Li et al., 2020). Another study explained that factors influencing the incidence of PPUR covert are primigravidae, perineal tears, instrumental using delivery, the prolonged second phase of delivery, birth baby weight of 3.5 kg, and previous cesarean delivery (Ain et al., 2021; Perú Biurrun et al., 2020). In this case, primigravida is considered a risk factor for PPUR because the birth process is prolonged and allows high pressure on tissues in the vulva and perineal area. This pressure results in inflammation and oedema as well as trauma to the pudendal nerve in the perineum, as well as an episiotomy or perineal tear. Birth using a device (especially forceps) can cause stretching of the nerve endings and tissues in the birth canal area (including the urethra). In such situation, inflammation and contradiction may occur. The use of epidural anesthesia and morphine after delivery can block afferent nerve impulses in the bladder area which can cause bladder overdistention. History of caesarean delivery is also one of the factors supporting the occurrence of PPUR because of the possibility of inadequate uterine muscle contractions causing a longer second phase of labor (> 1 hour).

An intervention that is often used to treat PPUR routinely is indwelling or intermittent catheter insertion protocols (Downey et al., 2019). A recent study demonstrated the results of randomized case-controlled acupuncture and electropuncture interventions to treat PPUR. Electropuncture is an intervention developed in China by utilizing PPUR-related neuroanatomy (HE et al., 2021; Lauterbach et al., 2018). The focus of this study is the use of peppermint oil vapour in preventing PPUR. As previously stated, peppermint oil has an abundant and volatile menthol component. The menthol component has antispasmodic (calcium channel inhibitors in muscles), anti-inflammatory, and antioxidant effects. This effect is considered to reduce inflammation and edema in the perineal area and induce relaxation of the urethra. Peppermint oil is also one of the economical herbal ingredients that humans have commonly used in the food, drug, and cosmetic industries. In addition, applying peppermint oil vapor to the perineal and vulvar areas is a non-invasive and easy intervention (Gholamipourfard et al., 2021; Pavlić et al., 2021).

However, the results of this study have limitations, including that respondents are not fully controlled based on the pathophysiology of PPUR risk. It will affect the mechanism of action of giving peppermint oil. Peppermint oil has a channel calcium inhibitor effect (antispasmodic) (Maghami, Afazel, Azizi-Fini, & Maghami, 2020) and a local anti-inflammatory effect (Y. X. Li et al., 2017). In addition, this study has not been able to show the impact or effect of peppermint oil on PPUR prevention because it does not cause any significant difference in voiding ability between the two groups. To validate objectively about the effect of peppermint oil on the management of PPUR, further study is needed by paying attention to the feasibility of objective tools in measuring PVRV (bladder scanner) and sample grouping.

6. CONCLUSION

This study has not shown any significant effect of peppermint oil on the prevention of the occurrence of PPUR. Therefore, this research requires further study with respondent control, adequate time, and an objective bladder scanner so that the evidence-based practice of giving peppermint oil has adequate evidence-based support.

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