

The Effectiveness of Hot Herbal Compress in Accelerate Uterine Involution and Recovery of Afterpains on the Postpartum Mothers

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Abstract

About 55% of postpartum mothers in Banyumanik and Ungaran districts in October 2019 experienced *uterine subinvolution*, and 75% of them experienced *afterpains*. Hot Herbal Compress could stimulate myometrium contraction required for *uterine involution* and analgesic effect. This study aimed to prove the effectiveness of hot herbal compress in accelerating uterine involution and afterpain recovery on postpartum mothers. This research used a quasi-experimental design—the investigation from 13 December 2019 until 26 January 2020 in Semarang. The authors grouped 42 postpartum mothers equally into experimental and control groups with random cluster sampling. The experimental group received a hot herbal compress for 20 minutes. The control group received uterus massage for 10 minutes and breathing exercises for 15 minutes. Both groups received the therapy 1x/day from the 2nd-10th day of the postpartum period. The observation of uterine fundal height by metlin, lochia volume by gravimetric, and *afterpains* intensity by visual analogue scale before and after the intervention every day. The analysis used *Repeated Measure Anova*. The experimental group's uterine fundal height, lochia volume, and afterpains intensity were consistently lower than the control group. There were significant differences between the experimental and control groups on a uterine fundal height on days 1-5 and 6-8, on lochia volume on days 5-6, and on the intensity of *afterpains* on days 1-4 ($p < 0.05$). The hot herbal compress effectively decreased the uterine fundal height on a uterine fundal size on days 1-5 and 6-8, reduced lochia volume on days 5-6 and effectively decreased *afterpains* intensity on days 1-4 on of postpartum mothers. This study recommends that midwives provide hot herbal compress therapy for the postpartum mother to accelerate *uterine involution* and recovery of *afterpains*.

Keywords: Hot Herbal Compress, Uterine Involution, Afterpains, Postpartum Mother.

A. INTRODUCTION

The postpartum is a period after the delivery of the placenta until six weeks ahead (Hatfield, 2014). Postpartum mothers experience the physical recovery process into a state before they are pregnant, such as *uterine involution* (WHO, 2015). *Uterine involution* is when the uterine returns to its original size and function due to myometrium contraction (Salhan, 2016). A normal *uterine involution* occurs when the uterine fundal decrease ≥ 1 cm per day until it is not palpable on the tenth day and lochia volume ≤ 250 ml. The uterine retardation to follow the normal *involution* is *uterine subinvolution* (Majhi, 2016).

The *uterine subinvolution* cases were still high in some regions of Indonesia, based on the data from 2012 until 2014. The postpartum mothers experience *uterine subinvolution* with a percentage of 43.3%, in Semarang (Mayasari et al., 2015), 30.4% found in northern Lampung (Maksum & Fairus, 2014), 33,8% located in Makassar (Lisnawaty et al., 2015), and 54,1% in Sidoarjo (Puspitaningrum, 2012).

The *uterine subinvolution* causes bleeding (higher than 500 ml in 24 hours). The signs of *uterine subinvolution* are the enlarging uterine from the usual size, malleable consistency of the uterine during the abdominal examination and bimanual, and abnormal lochia production (Majhi, 2016).

The uterine massage is non-pharmacological management to trigger the myometrium contraction. Thus, it can immediately decrease postpartum mothers' uterine fundal height and lochia volume. Postpartum mothers who received uterine massage therapy from the first until the ninth day during the postpartum period (10 minutes per session). They experienced a lot of decreased uterine fundal height than postpartum mothers who did not receive uterine massage therapy it is 10.16 cm than 9.06 cm ($p < 0.05$). However, the uterine fundal size remained palpable until mothers with the uterine massage on the tenth postpartum day. They also experienced a lot of decreased lochia volume than postpartum mothers who did not receive uterine massage therapy; it is 210.27 ml than 248.22 ml ($p < 0.05$). So, they experience *uterine subinvolution* (Restianti et al., 2015). However, uterine massage will stimulate uterine gland cells to produce prostaglandins that activate nociceptors, resulting in afterpains (Leifer, 2012).

Afterpains are lower abdominal pain or cramps felt by postpartum mothers due to contraction and relaxation of the myometrium for the process of *uterine involution* (Leifer, 2012; Majhi, 2016; Whitworth & McMullan, 2017). *Afterpains* can inhibit the mother's activity, cause trauma, and be uncomfortable while breastfeeding. Therefore, it is necessary to give therapy to be comfortable (Hatfield, 2014).

Research on *afterpains* in Indonesia is also still rarely done. A study on 37 postpartum women in Mojokerto in 2012 showed that 100% of postpartum women experienced *afterpains*, and 10.8% of postpartum women were unable to move due to

uncontrolled pain (Amalia & Mafticha, 2012). The preliminary study in Banyumanik and Ungaran districts in October 2019, on 20 postpartum mothers, showed 55% of mothers experienced *uterine subinvolution*. About 75% of mothers experienced *afterpains*.

Breathing exercise is non-pharmacological management to reduce the intensity of *afterpains*. The study proved that postpartum women who did breathing exercises for 15 minutes experienced a decrease in *afterpains* intensity by 0.85, while postpartum mothers who received standard care experienced an increase in *afterpains* intensity by 0.83 ($p = 0.0001$). However, breathing exercises cannot stimulate myometrial contractions for the process of *uterine involution* (Basyouni & Gohar, 2017).

The hot herbal compress is non-pharmacological management from Thailand that causes warmth and relaxation with the Ayurveda principle. The hot herbal compress contains bangle, turmeric, zedoary, lemongrass, kaffir lime peel, camphor, and salt bound by fabric. All of them are steamed for 15 minutes and wrapped with a dry towel before being used (Ayurved Thamrong School, 2014). Hot herbal compress has been enlisted in the National Essential Medication of Thailand (Jacobsen & Salguero, 2014).

Hot herbal compress can reduce the intensity of *afterpains*. Primigravida, who received hot herbal compress therapy one time per day for three consecutive days (20 minutes per session), experienced a decrease in the average *afterpains* intensity from 2.96 to 1.75 ($p < 0.05$) (Wongwan et al., 2018).

Some of the phytochemicals in hot herbal compresses are *lipopolysaccharide*, *curcumin*, *naringenin*, *apigenin*, *curcumenol*, and steroids. These phytochemicals produce analgesic activity by inhibiting the synthesis of prostaglandins and substances P (Das & Rahman, 2012; Garcia et al., 2015; Koontongkaew et al., 2013; Kumar et al., 2011; Youkwan et al., 2010). Hot herbal compress also contains aromatic essential oil *terpenes-4-ol*, *sesquiphellandrene*, *monoterpenes*, *delta cadinene*, and *elemol*, which stimulate the brain to secrete endorphins. Endorphins block the transmission of pain impulses to the brain (Fritz, 2013).

Some phytochemicals in hot herbal compress are *citrusosides A-D*, *furanocoumarin*, *curcumin*, *naringenin*, *apigenin*, and sodium, which could stimulate myometrium contraction (Youkwan et al., 2010). Hot herbal compress also delivers heat to the skin. It enables the oxytocin hormone secretion that is flown to the uterine. The increased oxytocin hormone in the uterine increases the myometrium contraction amount, duration, and intensity (Kruekaew & Kritcharoen, 2018).

Based on the explanation, this research aims to prove the effectiveness of hot herbal compress in accelerating *uterine involution* and recovery of *afterpains* on postpartum mothers.

B. METHOD

Research Design

This quantitative research used a quasi-experimental design because it manipulated the independent variables. The study examined the influence of the independent variables, administering hot herbal compress for the experimental group, while uterine massage and breathing exercises for the control group, toward the dependent variable, the uterine fundal height, lochia volume, and *afterpains* intensity.

Setting and Samples

This study used the purposive sampling technique. Purposive sampling is a sampling technique that applies inclusion and exclusion criteria based on the research objectives (Swarjana, 2012). The inclusion criteria were postpartum mothers who experience *afterpains* with an intensity scale of 1-7 on five hour-postpartum times, *vaginal* birth history, colostrum production, body mass index $\geq 18,50$ Kg/m², excellent communication, and living in Banyumanik, Tembalang, Gunungpati, East Semarang, and Ungaran districts. The exclusion criteria were unwilling postpartum mothers to be respondents, having an acute or chronic disease, consuming uterotonics, and consuming analgesic.

The sample in this study was grouped equally into experimental and control groups with random cluster sampling. The researchers voted the envelopes containing experimental and control groups labels in the research site. The results were Semarang municipality was the experimental group, while Semarang regency was the control group.

This research used the independent numerical analytic sample formula because the population numbers were unknown. The researchers compared the independent variables with the numerical scale on the unpaired groups. Based on the previous studies about the influence of uterine massage on the decreased uterine fundal height, the authors determined the sample of both groups to be 32 respondents for each group. The standard deviation of the experimental group was 0.568, while the control group was 0.622 (Restianti et al., 2015). Thus, the combined standard deviation was 0.596. Each sample in this research was 21 respondents for each group. Thus, the sample total was 42 respondents.

Intervention

The researchers experimented with hot herbal compress therapy and the control group with uterine massage and breathing exercises. The intervention was administered once a day for 20 minutes starting from the second day after the delivery. Then, the researchers continued it every morning until the tenth day.

The composition of hot herbal compress is a dried herb mixture consisting of 50 grams of bangle rhizome, 40 grams of kaffir lime peel, 40 grams of lemongrass, 40 grams of turmeric rhizome, 40 grams of zedoary, 20 grams of salt, and 30 grams of camphor (Karimah et al., 2020). Therapy using a hot herbal compress is done on six abdomen points. Each issue only received ten-second compression. Thus, the reduction lasted for 20 minutes. Every 10 minutes, the bundle of hot herbal compress was replaced. Therefore, each respondent would receive two bundles of hot herbal compress. The hot herbal compress was steamed with an electric steamer for 15 minutes before the administration. Postpartum mothers should postpone their bathing time for 2 hours after the therapy so their skins remain warm and the body can absorb the substances (Haddad, 2013). After the participants finished the treatment, they had to put the bundle in an air-vacuum plastic and store it in the freezer. Thus, they could use it again the next day.

The researchers intervened in the control group with uterine massage for 10 minutes and breathing exercises for 15 minutes once a day for 10 minutes. Uterine massage therapy places one of the palms on the pubic symphysis while the other palm is on the uterine fundal. Gently massage the uterine fundal with a circular motion in a clockwise direction. While doing uterine massage, guide the respondent to do breathing exercises for 15 minutes. The way to do this breathing exercise is to take a long, slow and deep breath through your nose, feel the air flowing into your lungs and let your lungs float, then exhale slowly through your mouth.

Measurement and Data Collection

The instruments of this study were the respondent characteristic questionnaire, the observation sheet of uterine fundus height, lochia volume, and *afterpains* intensity developed by the researchers based on the literature study. Experts validated the instrument contents. They were the obstetricians and gynaecologists, with years of service for more than 25 years, the midwives with master degrees and years of service for more than 25 years, and the midwifery lecturers.

The researchers measured uterine fundal height, lochia volume, and *afterpains* intensity six hours after the delivery process and after the intervention until the tenth day on postpartum mothers—Uterine fundal height measured by metlin. The researchers did it by putting the metlin tip on the symphysis pubis. After the metlin touched the skin along with the uterus, the researchers dragged it until the uterine fundal (Peraturan Menteri Kesehatan Republik Indonesia Nomor 97 Tahun 2014, 2014). Lochia measured according to the gravimetric method, namely weighing the dirty sanitary napkins that have been used by the mother using a manual or digital scale in grams (Hatfield, 2014). Every 1 gram equals 1 ml of blood volume (Leifer, 2012; Whitworth & McMullan, 2017). The lochia expenditure is the difference between dirty and clean sanitary napkins. *Afterpains* is the severity of lower

abdominal pain or cramping felt by postpartum mothers and measured by visual analogue scale (Karsten et al., 2012).

Data collection was done from 13 December 2019-26 January 2020. The research site was in Semarang municipality (Banyumanik, Tembalang, Gunungpati, and East Semarang) and Semarang regency (West and East Ungaran). The researchers involved some health service facility providers because the respondent candidates were from different places during the pretest observation until the posttest observation at the first stage. The healthcare facility providers were Spondol, Ngesrep, Gunungpati, Halmahera, Lerep public health centres, and the Regional Hospital of Ungaran.

Data analysis

The data has been analyzed using SPSS version 25. The analysis consisted of univariate and multivariate analyses. The univariate analysis dealt with the dependent and confounding variables. The dependent variable study consisted of mean, SD, minimal, and maximum calculations. On the other hand, the confounding variable analyzed the amounts and percentages.

The multivariate analysis analyzed the effectiveness of hot herbal compress to decrease the uterine fundal height, lochia volume, and *afterpains* intensity for both groups with *Repeated Measure Anova*. M Box explains that the Anova test is robust, although the data is not average and does not have the same variant between the control and experimental groups (Ghozali, 2018).

Ethical considerations

The ethical clearance has approved this research of the Health Research Ethical Commission of Regional Hospital Dr. Moewardi, Number 1.340/XII/HREC/2019. All respondents in this study were given informed consent before being involved, an observation sheet using the respondent's initial name, and the confidentiality of the research data was guaranteed. The researcher also coordinates with the head of health facility in Semarang municipality and regency.

C. RESULTS AND DISCUSSION

The Respondents' Characteristics

The characteristics included age, parity, and body mass index. The data were analyzed using frequency (f), percentage (%), and homogeneity of variance test between the experimental and control group. The respondents' characteristics are shown in Table 1.

Table 1 Respondents' Characteristics of an Experimental and Control Group

Variables	Experimental group		Control group		P value ^a
	f	%	f	%	
Age					0.461
Healthy reproduction	18	85.7	18	85.7	
Risky reproduction	3	14.3	3	14.3	
Parity					0.602
<u>Primipara</u>	5	23.8	8	38.1	
Multipara	16	76.2	13	61.9	
Body mass index					0.572
Normal	15	71.4	12	57.1	
Obesity	6	28.6	9	42.9	

a. Levene's test

Table 1 shows both groups have a homogeneous variant of age ($p = 0.461$). The respondents' ages were grouped into healthy and risky reproductions. Most respondents of both groups were categorized healthy in terms of their reproduction ages, from 18 respondents (85.7%).

Both groups have homogeneous parity variant ($p = 0.602$). The respondents' parities were grouped into primipara and multipara. Most respondents were multipara, 16 respondents (76.2%), found in experimental groups, and 13 respondents (61.9%) in the control group.

The body mass index of the respondents was grouped into normal and obesity. Both groups have homogeneous body mass index variants ($p = 0.572$). Most respondents have an average body mass index, 15 respondents (71.5%), found in the experimental group, and 12 respondents (57.1%) in the control group.

The Average Changes of the Uterine Fundal Height

The average changes occurred in experimental and control groups, as shown in Figure 1.

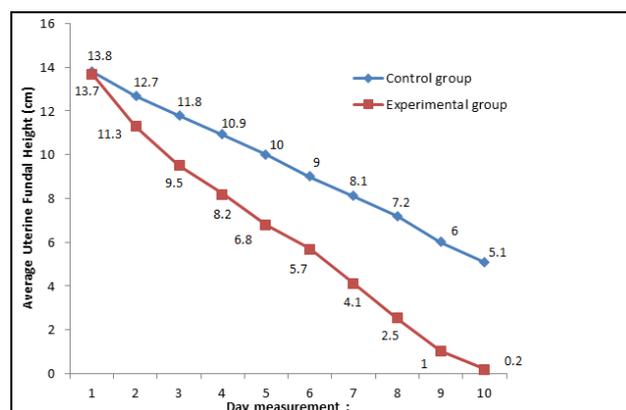


Figure 1 The Average Changes of the Uterine Fundal Height of Experimental and Control Groups

Figure 1 shows the uterine fundal height of the experimental group, with hot herbal compress, lowers quicker than the control group, with the uterine massage. Both

groups' uterine fundal size decreases from the first day until the tenth day. However, the average fundal height of the experimental group was lower than the control group.

The Average Changes of the Lochia Volume

The average changes occurred in experimental and control groups, as shown in Figure 2.

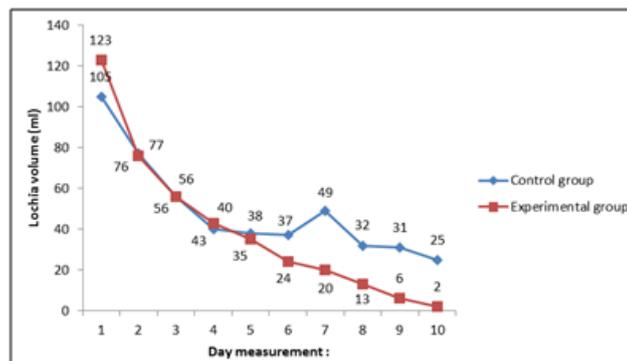


Figure 2 The Average Changes of Lochia Volume of experimental and Control Groups

Figure 2 shows the lochia volume of the experimental group, with hot herbal compress, lowers quicker than the control group, with uterine massage and breathing exercises. The decrease in mean lochia volume on days 1-10 only occurred in the experimental group.

The Average Changes of the Afterpains Intensity

The average changes occurred in experimental and control groups, as shown in Figure 3:

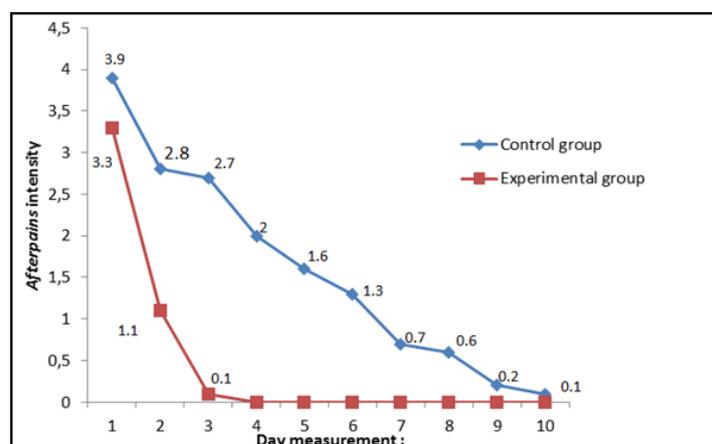


Figure 3 The average changes of afterpains intensity of experimental and control groups

Figure 3 shows that afterpains in the experimental group stopped faster than the control group. The mean intensity of afterpains in the hot herbal compress therapy

group was consistently lower than that given uterine massage therapy and breathing exercises. The experimental group stopped experiencing *afterpains* starting on day 4, while the control group experienced afterpains until day 10.

The Effectiveness of Hot Herbal Compress Therapy

The effectiveness of hot herbal compress therapy is based on decreased uterine fundal height, lochia volume, and *afterpains* intensity.

Table 2 The effectiveness of hot herbal compress therapy toward the decreased uterine fundal height between the experimental and control groups

Uterine Fundal Height	Mean Difference	P Value ^a	The Influence (%) ^b
First day until the second day	1.25	<0.001	39.6
Second day until the third day	0.86	0.001	22.9
Third day until the fourth day	0.49	0.038	10.4
Fourth day until the fifth day	0.51	0.024	12.1
Fifth day until the sixth day	0.16	0.319	2.5
Sixth day until the seventh day	0.62	0.007	16.6
Seventh-day until the eighth day	0.75	0.006	17.3
Eighth day until the ninth day	0.30	0.520	1
The ninth day until the tenth day	-0.13	0.700	0.4

a. *Ranova*

b. *Eta Squared*

Table 2 shows the uterine fundal height from the first day until the fifth day and from the sixth day until the eighth day with $p < 0.05$. Thus, the result accepts H_a and denies H_0 . It means the hot herbal compress therapy effectively decreased the uterine fundal height from the first to second, second to third, third to fourth, fourth to fifth, fifth to seventh, and seventh to eighth days. The effect size of the therapy toward the uterine fundal height is about 0.4% to 39.6%. The highest effect is on the first and second day, 39.6%. The most significant decrease based on the hot herbal compress therapy toward the uterine height occurred every day until the tenth day.

Table 3 The effectiveness of hot herbal compress therapy toward the decreased lochia a volume between the experimental and control groups

Lochia Volume	Mean Difference	P Value ^a	The Influence (%) ^b
First day until the second day	19.76	0.073	7.8
Second day until the third day	-1.00	0.890	0
Third day until the fourth day	-3.62	0.565	0.8
Fourth day until the fifth day	6.43	0.211	3.9
Fifth day until the sixth day	10.09	0.015	13.9
Sixth day until the seventh day	16.33	0.062	8.4

Seventh-day until the eighth day	-10.62	0.223	3.7
Eighth day until the ninth day	5.81	0.310	2.6
The ninth day until the tenth day	-1.95	0.675	0.4

a. *Ranova*

b. *Eta Squared*

Table 3 shows that the lochia volume on days 5 – 6 has $p < 0.05$, then H_a is accepted and H_0 is rejected. This means that hot herbal compress therapy effectively reduces lochia volume on days 5 to 6. The effect size of hot herbal compress therapy on lochia volume ranges from 0% to 13.9%, and the highest occurs on day 5 to 6. day six, which is 13.9%. There is a tendency to decrease the effect of hot herbal compress therapy on lochia volume from day 6 to 10.

Table 4 The effectiveness of hot herbal compress therapy toward the decreased *afterpains* the intensity between the experimental and control groups

<i>Afterpains Intensity</i>	Mean Difference	P Value ^a	The Influence (%) ^b
First day until the second day	1.05	0.033	10.8
Second day until the third day	0.97	0.041	10
Third day until the fourth day	-0.63	0.004	18.7

a. *Ranova*

b. *Eta Squared*

Table 4 shows that *afterpains* intensity on days 1-2, 2-3, and 3-4 has $p < 0.05$, then H_a is accepted and H_0 is rejected. This means that hot herbal compress therapy effectively reduces *afterpains* intensity on days 1 to 2, days 2 to 3 and days 3 to 4. The effect size of hot herbal compress therapy on *afterpains* power ranges from 10% to 18.7 %, and the highest occurred on days 3 to 4, namely 18.7%.

Discussion

The respondents between experimental and control groups had homogeneous age variants. Most respondents were aged from 20 until 35 years old. From this data, the cause of the *uterine involution* and *afterpains intensity* difference was not the respondent age of both groups. Maksum & Fairus (2014) proved no correlation between age and *uterine involution* ($p = 0.222$) (Maksum & Fairus, 2014). Individuals aged from 20 to 35 years usually have healthy reproduction organs because the uterine muscles are normal. Thus, the contraction and relaxation of the myometrium are adequate. It leads to *uterine involution*, and *afterpains* run normally. However, the uterine muscle tone is not mature for women younger than 20. On the other hand, uterine muscular tones decrease in women older than 35. It causes the contraction and relaxation of the myometrium to be exaggerated so that the decreasing process of the *uterine involution* runs slowly and *afterpains* intensity excessive (Mayasari et al., 2015).

The parity of the respondents, in this research, had homogeneous variants. Therefore, the equality did not cause both groups to decrease uterine involution and afterpains intensity. Paliulyte et al. (2017) Also proved no correlation between the parity and the *uterine involution* ($p = 0.284$) (Paliulyte et al., 2017). Liliana (2019) also found no correlation among the equality with *uterine involution* (0.289) (Liliana, 2019).

The respondents of both groups had a homogeneous body mass index. Most respondents had an average body mass index. Therefore, body mass index did not cause *uterine involution* and *afterpains* intensity of both groups. This is supported by Mayasari et al. (2015) that found no correlation between the nutritional status and the *uterine involution* ($p = 0.666$). As much as 61% of mothers with normal dietary levels had normal uterine involution, 57% of mothers with lower nutritional status had non-normal *uterine involution* (Mayasari et al., 2015). The body mass index is the simple method to monitor individuals' nutritional status, aged older than 18 years old. Nutritions have essential roles in the physical recovery process of postpartum mothers, especially for the *uterine involution* process. Postpartum mothers require higher energy, 500 calories per day, to recover their health and breastfeed. Postpartum mothers with body mass index higher and equal to 18.5 kg/m^2 have adequate myometrium contraction. Therefore, the process of *uterine involution* could normally run (Leifer, 2012).

This research aims to prove the effectiveness of hot herbal compress in accelerating *uterine involution* and recovery of *afterpains* on the postpartum. A normal *uterine involution* occurs when the uterine fundal decrease ≥ 1 cm per day until it is not palpable on the tenth day and lochia volume ≤ 250 ml. This study showed that the experimental group's uterine fundal height, lochia volume, and afterpains intensity decreased faster than the control group.

The hot herbal compress therapy administration effectively decreased the uterine fundal height from the first day until the fifth day and the sixth day until the eighth day. Studies about the decrease of fundus height for ten days during the postpartum period are seldom to carry out. Besides that, studies about hot herbal compress are also seldom to carry in Indonesia. This research result is the first evidence of hot herbal compress potential with the administration of once per day for 20 minutes, lasting in 9 days. It was practical to decrease the uterine fundal height of postpartum mothers.

Some previous studies also supported this finding. Calim & Kavlak (2014) proved that uterine massage was not adequate to decrease the uterine fundal height of postpartum mothers ($p = 0.116$). The highest average of uterine fundal size, after 24 hours of the postpartum period with uterine massage was 1.76 cm below the umbilicus, higher than postpartum mothers without the uterine massage, 1.23 cm below the umbilicus (Calim & Kavlak, 2014). Resianti et al. (2015) also found the

average uterine fundal height on the ninth day on postpartum mothers with and without the uterine massage relatively had the same size, 8.25 cm and 9.50 cm ($p < 001$) (Restianti et al., 2015).

This study also showed a tendency to decrease the effect size of hot herbal compress therapy on uterine fundal height. The highest magnitude of influence occurs on days 1-2. The cause of the significant decrease in effect is the decrease in the quality of hot herbal compresses that have been used repeatedly. The first hot herbal compress for therapy could maximally trigger the myometrium contraction to decrease the uterine fundal height. The cause of this matter was the phytochemicals in a hot herbal compress that was easily dissolved during the steaming process. Thus, skins absorbed it well. The composition of the herbal ingredients could also transfer the heat into the skin maximally during the first-new hot herbal compress administration.

The decreased quality of hot herbal compression was due to the repeated steaming processes. It caused many contents of phytochemicals to dissolve during the repeated steaming process. Thus, only a few phytochemicals were absorbed by the skins. Besides that, the herbal ingredient composition capability to transfer the heat decreased. Therefore, after being used for some administrations, the hot herbal compress had a lower influence to lower the uterine fundal height for ≥ 1 cm per day than the first and the new ones.

This study indicates that the lochia volume in the hot herbal compress therapy group decreased faster than the group given uterine massage therapy and breathing exercises. Providing hot herbal compress therapy effectively reduced lochia volume from day 5 to day 6.

Research on lochia volume expenditure for ten days of the puerperium is rarely done. There has been no research on the potential of giving hot herbal compress therapy to lochia volume in postpartum women. The results of this study are the first to prove the potential for providing hot herbal compresses one time per day with a duration of 20 minutes for nine days to be effective on lochia volume in postpartum women.

The uterine massage is a careful massage on the uterine fundal. This therapy stimulates the uterine gland cell to produce prostaglandins. Prostaglandins can stimulate the myometrium contraction, so it causes the uterine to experience atrophy, indicated by the decrease of uterine fundal height. Myometrial contractions are helpful to encourage the release of blood clots so that the lochia can come out smoothly (Restianti et al., 2015). However, this study proves that uterine massage is ineffective in decreasing uterine fundal height and lochia volume in postpartum women.

Previous studies support the results of this study that uterine massage therapy is not effective in reducing lochia volume in postpartum women. Chen et al. (2013) proved that uterine massage was ineffective in lowering lochia volume during 2 hours postpartum ($p = 0.23$). The mean lochia volume in the group of postpartum women who received uterine massage therapy (266 ml) was more than the group of postpartum women who did not receive uterine massage therapy (259 ml) (Chen et al., 2013).

This study also showed a significant decrease in the effect size of hot herbal compress therapy on lochia volume since the sixth day. This means that the composition of the herbal ingredients in the hot herbal compress has decreased the ability to conduct heat since day 6. The decrease in the ability to work heat causes a decrease in its effect on myometrial contractions, which reduces lochia volume. Therefore, it is recommended that the hot herbal compress be used repeatedly only until the fifth day and use a new hot herbal compress on the sixth day. However, there was a significant decrease in the effect of hot herbal compress therapy on lochia volume starting on the 6th day. However, lochia volume in the group given hot herbal compress therapy was better than that given uterine massage and breathing exercises.

Phytochemicals of hot herbal compress cause myometrium contraction. The steamed hot herbal compress causes the hot steam. The hot moisture and salts can open the skin pores (Haddad, 2013). Then, the absorption process of some phytochemicals, such as *citrusosides A-D* and *furanocoumarin*, could bind the *acetylcholinesterase* enzyme, so the *acetylcholine* concentration increased. *Acetylcholine* can stimulate the smooth muscle, including the myometrium (Youkwon et al., 2010). *Curcumin*, *naringenin*, and *apigenin* decrease the *metalloproteinase-9* matrix that causes the myometrium contraction (Lim et al., 2013). The sodium has the active potential in cells during the myometrium contraction (Lim et al., 2013).

The steamed hot herbal compress for compressing the six points on postpartum mothers' abdomen could transfer the heat into the skins. This transfer stimulates the oxytocin secretion that triggers the myometrium contraction. The heat stimulation due to a hot herbal compress could trigger the myometrium contraction. The contraction causes the uterine muscular cells to undergo atrophy, making the sizes smaller than the original size. The sign is the decreased uterine fundal height and encourages the release of blood clots. Then lochia can come out smoothly (Kruekaew & Kritcharoen, 2018). The heat transfer generated by the hot herbal compress can also prevent the formation and dissolution of blood clots in the uterus that occur in the first postpartum week. Lochia can come out smoothly (Dhippayom et al., 2015).

The previous studies proved that hot herbal compress could stimulate oxytocin secretion. It stimulates the myometrium contraction to decrease the uterine fundal height and enables the myoepithelium contraction on breasts. This contraction is

helpful for the colostrum secretion process. Pakdeechot et al. (2010) found hot herbal compress was effective to shorten the duration needed for the first colostrum secretion ($p < 0.05$). The average period of the first colostrum secretion of mothers with hot herbal compress (21 hours, 49 minutes) shorter than mothers without the compression, 2-3 hours (30 hours, 37 minutes) (Pakdeechot et al., 2010).

This study indicates that the group given hot herbal compress therapy stopped experiencing *afterpains* since day 4, while the group given uterine massage therapy and breathing exercises still experienced *afterpains* until day 10. Hot herbal compress therapy effectively reduces the intensity of *afterpains* in postpartum women from the 1st day to the 4th day.

The phytochemicals in the hot herbal compress provide an analgesic effect. Hot herbal compresses that have been steamed will generate hot steam. When used to compress the stomach, the hot steam and salt will open the skin pores (Haddad, 2013). Then the absorption of several phytochemicals, namely lipopolysaccharide, compound D (E)-4-(3',4'-dimethoxyphenyl) but-3-en-2-ol), curcumin, naringenin, apigenin, curcumenol, and steroids can inhibit enzyme activity. COX-2 and substance P. If the action of the COX-2 enzyme is inhibited, the synthesis of prostaglandins is also inhibited. Impaired synthesis of substance P and prostaglandins will block the transmission of pain to the brain (Das & Rahman, 2012; Jogdand & Bhattacharjee, 2017; Koontongkaew et al., 2013; Kumar et al., 2011; Lim et al., 2013). Luteolin activates opioid receptors, thereby inhibiting pain transmission at the spinal cord level (Garcia et al., 2015). Eugenol can start the Transient Receptor Potential Vanilloid 1 (TRPV 1). TRPV 1 functions as an antinociceptive by blocking pain transmission to C fibers (Malanga et al., 2015).

Hot herbal compresses also contain some essential oils that have analgesic effects. The essential oils in the hot herbal compress are terpinene-4-ol, sesquiphellandrene, terpinene-4-ol, monoterpenes, delta cadinene, and elemol (Chotikamas et al., 2018). The aroma of essential oils inhaled through the nose causes volatile molecules to enter the nose. Then the impulse is caught by the cilia and transmitted to the olfactory nerve. The olfactory nerves transmit impulses to the brain, especially the limbic system to secrete endorphins. Endorphin hormones will cause a feeling of comfort and inhibit the release of substance P (the main protein in pain transmission) (Fritz, 2013).

The results of this study also showed a tendency to increase the effect size of hot herbal compress therapy on the intensity of *afterpains* on day 2 to day 4. The effect is 10% on day 2 to day 3, then increases to 18.7% on day 3 to day 4. The cause of this is that the intensity of *afterpains* decreases typically every day, so the effectiveness of hot herbal compress therapy is increasing every day.

The implications of the results of this study are as advocacy to midwife organizations regarding standard operating procedures for giving hot herbal

compresses to postpartum mothers and provide innovation for midwives in providing midwifery services using hot herbal compress for postpartum mothers.

This research has some limitations so that it needs further improvements. For example, the observation time from the six hours of the postpartum period until the second day among the respondents ranged from 11 until 24 hours due to different delivery times. The researchers also could not control factors that might influence the fundus height decrease, such as breastfeeding frequency, daily activity, and uterine condition, such as overdistention uterus due to macrosomia *polyhydramnios*, *uterine fibroids*, and *lochiometra*. The results recommend the researchers adjust the limitations by promoting minimum observation time between six hours until the second day of the postpartum period. The time range of this research did not influence the uterine fundal height, lochia volume, and *afterpains* intensity. It was 11 until 24 hours. Besides that, the hot herbal compress should be replaced with the new one on the sixth day. The results showed the hot herbal compress capability to transfer the heat decreased on the sixth day.

D. CONCLUSION

The hot herbal compress therapy once per day for 20 minutes, lasted for nine days was effective to decrease the uterine fundal height on a uterine fundal size on days 1-5 and 6-8, effectively decreased on lochia volume on days 5-6 and effectively decreased on *afterpains* intensity on days 1-4 on of postpartum mothers. The researchers suggest that health workers, especially midwives, provide hot herbal compress therapy for 20 minutes, once a day, lasting in 9 days from the second day until the tenth day of the postpartum period to accelerate *uterine involution* and recovery of *afterpains*.

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AUTHORS CONTRIBUTIONS

NK is the first author of this research. The first author was involved in all research aspects, starting from determining the research topic, designing the research, analyzing the data, and creating the article draft. S and SM were involved in this research by specifying the research design, interpreting the data, and reviewing the final article. SS was involved in analyzing and interpreting the data.

DECLARATION OF CONFLICT OF INTEREST

The authors declare there is no conflict of interest in this study.

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