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Foot Massage Modification to Reduce Blood Pressure in Pregnant Woman with Preeclampsia

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Abstract

The Maternal Mortality Ratio (MMR) in Indonesia remains high, including in West Java province. One of the MMR causes is preeclampsia (24%). Currently, the management of preeclampsia is focused on pharmacological therapy. Preeclampsia is characterized by high blood pressure. Some studies revealed that non-pharmacological therapy was effective in dealing high blood pressure including foot massage. Foot message has benefits both physiologically and psychologically. However limited study applied this massage among pregnant women with preeclamsia. The aim of this study was to determine the effectiveness of as a complementary therapy: foot massage to reduce of blood pressure among pregnant women with preeclampsia. The study applied quasi experimental design with time series approach. The samples were chosen using consecutive sampling technique. This study involved 30 pregnant women with preeclampsia. There were two steps of data collection. First, respondents' blood pressure was measured by researchers without any interventions for 6 days. Second, the 7th -12th respondents had 20 minutes message, and observed blood pressure at the first minute before massage (pr-etest), and the 30th minutes after massage (post-test). Data were analyzed using Friedman Test. The result showed that there were no significant differences of mean systolic and diastolic blood pressure between pre-test and post-test ($p > 0.05$) in control period. Whereas, in the treatment period showed that there were a significant differences of mean systolic blood pressure between pre-test and post-test on the seventh day until twelfth day ($p < 0.05$). While, the significantly differences in mean of diastolic blood pressure between pre-test and post-test were present during the eighth until twelfth in treatment period ($p < 0.05$). This study revealed that there were significant differences in decreasing of blood pressure among pregnant women with preeclampsia after treatment by foot massage. The foot massage techniques can be used as one of the interventions to lower blood pressure in pregnant women with preeclampsia, however further research is needed to support the evidence based for nursing intervention especially in complementary therapies.

Keywords: Blood pressure, foot massage, preeclampsia, pregnant women.

Introduction

The world development framework has shifted from Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs) (World Health Organization, 2016). One of the SDGs goals is a good health, including reducing maternal mortality rate (MMR). MMR is the number of maternal deaths during pregnancy, childbirth, and childbirth caused by pregnancy, childbirth, after childbirth but not for other causes such as accidents, falls, etc. in every 100,000 live births (Ministry of Health of the Republic of Indonesia, 2011).

The SDGs' targeted that the MMR is below 70 per 100,000 live births by 2030. While, the Indonesian Population Demographic Survey (2014) reported that MMR in Indonesia was 228 per 100,000 live births (West Java Provincial Health Office, 2015). In addition, the Routine Report of Maternal Health Program (LRPKI) reported that West Java was the highest rank in the number of MMR, 765 cases of 5.019 cases of maternal deaths occurred in West Java in 2013. It is known that 24% cause of maternal death in Indonesia is cased by preeclampsia (Suryanti, 2015).

Preeclampsia is a specific multisystemic disorder in pregnancy characterized by hypertension and proteinuria after 20 weeks gestation (Rahmadhayanti, Hayati, & Saleh, 2014). Preeclampsia is needed to be treated appropriately because it would cause serious complications to mother and fetus including maternal complications and life-threatening fetal complications (Heazell, 2010). This would also impact mothers' and fetus quality of life.

Nowadays the therapy of preeclampsia focuses on conventional medical therapy and pharmacology. Those therapies are only affecting through physiological mechanisms. According to Nightingale's theory, human needs is holistic including physiological, psychological, social, and spiritual needs of both healthy and unhealthy. This holistic approach is illustrated by applying complementary therapies combined with the conventional medical therapy. One type of complementary therapies that have proven by literatures in reducing blood pressure through physiological, psychological, social, and spiritual mechanisms is foot massage (Setyoadi & Kushariyadi, 2011).

The foot massage is a soft-tissue manipulation of the feet without any specific point that associated with other parts of the body (Coban & Sirin, 2010). Several studies have proven the benefits of foot massage physiologically and psychologically (Puthusseril, 2006; Kozier, Erb, Berman, & Snyder, 2010)

One physiological effect of foot massage is to reduce the blood pressure. Hayes and Cox's study showed that foot massage have reduced blood pressure, heart rates, and respiratory rates (Smith, Yamashita, Bryant, Hemphill, & Kutner, 2009). In addition, foot massage also decreased Mean Arterial Pressure (MAP), heart rates, and respiratory rates and increased oxygen saturation (Kaur, Kaur, & Bhardwaj, 2012; Setyawati et al., 2016). Another study found that the effect of foot massage was reducing pain, anxiety, depression, and other negative psychological perceptions that one of sign was low the blood pressure (Chacko, 2007; Halm, 2008).

Foot massage manipulation consists of 5 basic techniques: effleurage, petrissage, tapotement, friction, and vibration (Haakana, 2008). The foot massage was performed on the soles and back of the feet for 10 minutes (Wang, Tsai, Lee, Chang, & Yang, 2008). Other studies foot massage performed on the soles and back of feets and legs for 20 minutes (Halm 2008; Kaur et al. 2012; Setyawati et al., 2016).

Many researchs has proven the effect of foot massage physiological and psychological, even though it applied in different points of feets and times. Study literatures showed that foot massage in different points of massage and and times effected different blood pressure in the treatment group (Falkensteiner, Mantovan, Müller, & Them, 2011). However, there is no a study that assess the effectiveness of foot massage in pregnant women with preeclampsia. This study is aimed to determine the effectiveness

of a complementary therapy: foot massage to reduce of blood pressure among pregnant women with preeclampsia.

Method

The research design was the quasi experimental with time series design. The population in this study were all pregnant women in the work area of Jatinangor Community Health Center (CHC=Puskesmas). The samples in this study were 30 pregnant women with preeclampsia in the PHC of Jatinangor. The samples were chosen using the consecutive sampling technique. The inclusion criteria were respondents who were diagnosed with preeclampsia, systolic blood pressure> 120 mmHg, diastolic blood pressure> 80 mmHg. The exclusion criteria were respondents with fractures, trauma, or leg injuries, and had venous thrombosis manifestations. The instrument of this study was an observation sheet including respondent's demographic data, clinical data, and blood pressure data of respondent: pretest and posttest. Researchers also provided the foot massage intervention protocol for respondents. Data were gathered using time series design, respondents had two roles as control and interventions group. First, as the control group, researchers observed respondents' blood pressure for 1–6 days, in the first minute (pretest) and 30th minutes (posttest). Second, the same respondent obtained foot massage for 20 minutes from day 7 to day 12, along with the blood pressure was observed in the first minutes (pretest) and the thirtieth minutes (posttest). The data were analysed using Friedman Test. Based on the normality test, it was found that blood pressure data in this study was not normally distributed.

Result

The univariate analysis applied to analyze the characteristics of respondents including

Table 1 Characteristic of respondents (n=30)

Characteristic of Respondents		f	%
Age	No risk	20	66.7
	Have a risk	10	33.3
Work Status	Housewife	24	80
	Private employee	6	20
Education	College	1	3.3
	High school	16	53.3
	Junior school	12	40
	Elementary	1	3.3
Pregnancy Age	Trimester 2	16	53.3
	Trimester 3	14	46.7
Pregnancy Status	Primipara	6	20
	Multipara	24	80
Grand Multigravida	Yes	2	6.67
	No	28	93.3

Table 2 The mean distribution of respondents' blood pressure between Pre-Posttest on the control and intervention group

TD[8]	Observation	Control						Treatment					
		1	2	3	4	5	6	1	2	3	4	5	6
TDS	Pretest (average ±SD)	127,23 ±9,504	126,40 ±8,585	122,90 ±8,980	121,60 ±8,669	124,53 ±8,549	126,27 ±12,114	125,30 ±9,685	125,37 ±8,282	123,67 ±9,672	125,87 ±11,203	124,83 ±9,079	121,10 ±10,186
	Posttest (average ±SD)	124,37 ±10,287	124,60 ±7,863	122,93 ±9,606	123,57 ±9,054	122,27 ±9,784	124,07 ±7,939	119,40 ±9,561	118,53 ±8,764	116,57 ±9,623	119,57 ±9,533	116,93 ±7,723	113,83 ±10,613
	Z	-2,593	-1,419	-0,141	-2,150	-2,831	-1,223	-3,395	-4,649	-4,297	-4,610	-4,610	-4,459
	p	0,010	0,156	0,888	0,032	0,005	0,221	0,001	0,000	0,000	0,000	0,000	0,000
TDD	Pretest (average ±SD)	81,17 ±8,107	79,80 ±8,880	79,60 ±8,720	79,30 ±8,035	80,53 ±9,442	79,50 ±8,291	78,37 ±10,473	80,20 ±7,814	79,10 ±8,515	79,93 ±9,552	79,70 ±9,086	78,47 ±8,565
	Posttest (average ±SD)	80,50 ±8,341	80,53 ±7,838	80,07 ±7,714	79,33 ±8,001	79,83 ±8,502	80,80 ±5,857	77,63 ±8,455	75,80 ±8,973	76,43 ±8,561	76,50 ±8,496	75,97 ±7,449	75,33 ±8,568
	Z	-1,160	-0,069	-0,433	-0,096	-1,088	-0,523	-0,743	-3,817	-3,117	-3,825	-3,773	-2,980
	p	0,246	0,945	0,665	0,923	0,277	0,601	0,458	0,000	0,002	0,000	0,000	0,003

*mmHg

of age, occupation, education, gestational age, and pregnancy status (primipara or multipara). Frequency distribution of respondents' characteristics present in table 1.

Table 1 revealed that the majority of respondents' age were not at a risk for pregnancy (66,7%), they were a housewife (80%), attended high school (53,3%), trimester two (53.3%), multiparas (80%), and only two of them were grand multigravida.

Table 2 presented that the mean difference of systolic blood pressure between pretest and posttest were significant. The first treatment period (p = 0.001), second day (p = 0.000), third day (p = 0.000), fourth day (p = 0.000), fifth day (p = 0.000), and the sixth day (p = 0.000). The same trend also found in the diastolic blood pressure. The mean differences between pretest and posttest were the second day of treatment (p = 0.000), third day (p = 0.002), fourth day (p = 0.000), fifth day (p = 0.000), and day sixth (p = 0.003). Table 2. The mean distribution of respondents' blood pressure between Pre-Posttest on the control and intervention group

Discussion

The characteristics of pregnant women in this study were multiparous, aged 20 to 35 years, and only two women were grand multigravida. Respondents in this study have no risk factors of preeclampsia. Preeclampsia is a specific condition of pregnancy characterized by hypertension after the 20th week of pregnancy, and women had history of normal blood pressure (Bobak et al., 2004; Lewis, 2015).

Signs and symptoms of preeclampsia arised during pregnancy and disappeared after giving birth. No particular criteria for whom would suffer from preeclampsia. There were risk factors associated with preeclampsia including primiparas, grandmultigravids, large fetuses, multiple pregnancies, obesity, and maternal age less than 20 years or more than 35 years (at risk). Respondents in this study excluded those risks, in fact they suffered of preeclampsia. Health workers should detect preeclampsia immediately whether pregnant women in risk or no risk conditions.

The effect of foot massage to the blood pressure of pregnant women with preeclampsia

The results of this study indicated that during the control period (no foot massage), respondents blood pressure did not decrease significantly. After foot massage the mean of systole and diastole of pregnant women's blood pressure decreased significantly both pretest and posttest. Physiologically, foot massage is part of cutaneous stimulation that would help the body to achieve homeostasis through arrangement of the extrinsic and intrinsic of peripheral blood flow. In extrinsic setting, smooth and rhythmic vibrations of muscles because of foot massage manipulation impacted vasomotor activities in the medulla (Guyton & Hall, 2007; Marley, 2005; Price & Wilson, 2005). Vasomotor activities mean releasing acetylcholine and histamine that impact relaxation of muscles and vasodilatation of arterioles (Marley, 2005). As a result, decreasing peripheral resistance, increasing the blood flow through the microvascular circulation section, and decreasing in the blood pressure.

The intrinsic processes, when blood flow have increased via microvascular circulation, it would stimulate secondary mechanisms that impacted arteries dilatation (Guyton & Hall, 2007). Endothelial cells lining arterioles and small arteries synthesize would affect the level of contraction of artery walls. These ingredients are vasodilator substances called endellomial relaxation factors, which essentially consist of nitric oxide that a half-life in the blood for only 6 seconds. Healthy blood flow via arteries would cause "shear-stress" in endothelial cells due to the viscous pull of blood to the vascular walls. This stress would change the shape of endothelial cells and increase the release of nitric oxide. The nitric oxide would be impacted relaxation and dilatation arterial walls. This is a beneficial mechanism because the dimensions of large blood vessels increased secondary, when the microvascular flow is increased.

The foot massage stimulates parasympathetic nerve fibers (Eimani & Eshq, 2004). One of the function of these parasympathetic fibers is innervating sinoatrial and arterioventricular nodes (Hudak & Gallo, 2010). Parasympathetic stimulation releases acetylcholine near nodal cells and decreases depolarization frequency, as a result decreasing heart frequency and rates. Decreasing heart rate impacted ventricular filling times are longer than usual, resulting in larger stroke volume and lead to the increase of cardiac output (Marley, 2005). A good cardiac output would improve blood circulation throughout the body including to the uteroplacental-fetal system. The extrinsic and intrinsic processes of peripheral blood flow, the foot massage would reduce the blood pressure of pregnant women with preeclampsia.

Several studies have proven the effect of foot massage on blood pressure of cancer patients and postoperative patients. Quattrin et al.'s (2006) study showed a significant decrease in systolic blood pressure ($p < 0.001$) and a significant decrease in diastolic blood pressure ($p < 0.05$) in cancer patients with chemotherapy after foot massage. In addition, Chacko's (2007) also found a significant reduction in blood pressure in post-surgical abdominal patients after foot massage ($p < 0.05$).

Foot massage is a systematic and rhythmic touch using manipulation of whole areas of soft tissues in the feets. Foot massage has been done for thousands years with various techniques worldwide, including Egypt, India, and China. This massage has also become popular in some developed countries such as USA, UK, and Japan (Fan, 2006). According to the Oxford Concise Medical Dictionary, the basic this complementary therapy is that the feet have points that are related to other parts of the body. So if there is manipulation of soft tissue, for example the soft tissue of the foot, it would be affected in health improvement.

Foot massage is an easy and powerful element (Puthusseril, 2006). Physically, foot massage would be impacted relaxing muscles, relieving pain and congestion by releasing lactic acid, improving blood flow and lymph, and stretching joints. Foot massage is also considered to release the body's toxins and

stimulate the immune system. In the mental-emotional area, foot massage would relieve anxiety and provide a sense of relaxed well-being.

Several studies have demonstrated foot massage to decreased perception of pain in post-surgery patients in general, extensively (Wang & Keck, 2004), in post-surgical abdominal patients (Chacko, 2007), and in post-cesarean section patients (Degirmen, Ozerdogan, Sayiner, Kosgeroglu, & Ayranci, 2010). Foot massage has also been found to have an effect on the reduction of lower limb edema in pregnancy (Coban & Sirin, 2010), decreased anxiety and depression in palliative care (Puthusseril, 2006), decreased agitation in dementia patients (Moyle, Johnston, & O'Dwyer, 2011), as well as decreased pain, depression, anxiety, stress, and weakness in cancer patients (Cassileth & Vickers, 2004; Quattrin et al., 2006; Falkensteiner et al., 2011; Kim & Oh, 2011). This study finding in line with Hayes and Cox'x's study found that a significant reduction of Mean Arterial Pressure (MAP) of 25 patients at Intensive Care Unit (ICU) after foot massage (Smith et al., 2009). In addition, Eimani and Eshq's (2004) also found a a significant decrease of MAP ($p < 0.001$) after foot massage of 46 stroke patients who hospitalised in ICU. Futhermore, Shaban, Amiry, Mehran, and Kahrary's (2004) study showed a significant decrease of MAP after foot massage in 50 patients at the General Intensive Care Unit (GICU).

Conclusion

There was no difference in the mean of systolic and diastolic blood pressure both pretest and posttest ($p > 0.05$) in the control period from day 1 to day 6. It was different with the intervention period, there was a significant difference in the mean of systolic blood pressure between pretest and posttest on day 7 to day 12 ($p < 0.05$). In addition, the mean of diastolic blood pressure was significantly difference at the 8th day of treatment until the 12th day ($p < 0.05$) for pre and post test. This study has proven there is a significant difference in decreasing blood pressure in pregnant women with preeclampsia after foot massage.

This study has proven there is a significant difference in decreasing blood pressure of pregnant women with pre-eclampsia after foot massage. Foot massage techniques can be used as one of the interventions to reduce blood pressure in pregnant women with pre eclampsia. However, there is a need of further development of this intervention, so that it can be a useful nurses' intervention and evidence as a companion intervention for pharmacology therapy.

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