

Combination of *Foot Massage* and *Compression Stocking (EDEFocs)* for women with Edema in Pregnancy is feasible option

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Abstract. Edema in pregnancy often occurs. Nearly 80% of all pregnancies can occur in leg edema which is a small problem that can provide initial symptoms for various diseases and pathological conditions and can be an indicator of serious chronic disease. Various methods of management to prevent and treat edema in pregnancy are by *compression stocking* and *foot massage*.

The purpose of this study was to analyze the effect of *foot massage* and *compression stocking* on pain intensity and the degree of edema in pregnant women Trimester III. The type of research is *quasi experiment* and using a *pretest-posttest control group design* with 3 treatment groups, namely *foot massage*, *compression stocking* and a combination of *foot massage* and *compression stocking*. The population of this study was all Trimester III pregnant women with edema in Pekanbaru City. The sampling technique used *purposive sampling* with inclusion criteria. This research was conducted on April 9 to September 15, 2018 in Pekanbaru City Health Center namely Rumbai Health Center, Umbansari Health Center and Melur Health Center. Data analysis using Anova Test.

The results showed that in the combination group of foot massage and compression stocking the decrease in the average pain intensity was 1.8 and the decrease in the average degree of edema was 1.6 mm. There is the effect of foot massage, compression stocking and a combination of foot massage and compression stocking on pain intensity and degree of edema (p -value = 0.00). The group that most significantly reduces pain intensity and the degree of edema is a combination of foot massage and compression stocking.

Recommended for health workers in order to use the method of foot massage, compression stocking and a combination of foot massage and compression stocking in preventing and reducing edema in pregnant women.

Keywords: *Foot massage, compression stocking, Pain intensity, Degree of edema and Third trimester of pregnancy.*

1 Introduction

In pregnant women, discomfort because edema is a result of changes in the hormone estrogen which has the effect of increasing fluid retention associated with physical changes, namely the enlargement of the uterus due to increasing gestational age, a study shows that edema has an adverse effect on some pregnant women. the feeling is felt by pregnant women including pain in the area of edema, feeling heavy, night cramps, aches, tingling, dyspnea, skin thickening, pigmentation, and unsightly (Bamigboye, AA & Hofmeyr, GJ, 2006).

In the study of Coban, A. & Sirin, A., (2010), the method that can be used to reduce edema in pregnancy is *foot massage*. *Foot massage* has proven to be a non-pharmacological treatment for reducing edema at the end of pregnancy and is able to stimulate improved circulation. In this study, *foot massage* performed in 10 minutes on each leg every day for 5 consecutive days caused a significant change in ankle circumference and showed the effect of *foot massage* in reducing physiological edema at the end of pregnancy.

Other research according to Wang, EY et. al., (2008) mentions that *foot massage* is one method of reflexology massage that is able to reduce stress, helps facilitate the pregnancy process by facilitating blood flow, spleen, reducing edema, and can reduce joint pain due to additional burden during pregnancy. According to Partsch's research, H, et al (2004) the use of *compression stockings* for 15-20 minutes can reduce and prevent foot edema. Pressing *stockings* can reduce the rate of return of venous blood that leads to the foot. In addition, according to other studies, the use *compartment stockings* of adequate can reduce the diameter of large blood vessels which can increase the speed and volume of blood flow, increase skeletal muscle vascularization, smoothen venous return and improve lymphatic drainage and increase oxygen in limbs. (Lim SC and Davies AH, 2014).

2 Method

Design in this study was quasiexperimental *pre and post- test group control* with three treatment groups, namely foot massage, compression stocking and a combination of foot massage and compression stocking. This study was conducted from April 9 to September 15, 2018, in 3 working areas of Pekanbaru City Health Center namely Melur Health Center, Mumbai Health Center, and Umbansari Health Center. The population in this study were all trimester III pregnant women who experienced edema. The number of samples is determined by an experimental research formula with a total of 15 pregnant women in each intervention group selected by purposive sampling technique with inclusion criteria, namely: 1) Mothers who experience physiological edema in the lower limbs, 2) Primigravida pregnant women in the third trimester (28-40 week), 3) Normal pregnancy, 4) Mothers who have never received a *foot massage* and have not used *compression stocking*. Data were collected in all three groups by conducting *pre-test* and *post-test* to compare pain intensity and degree of edema in third trimester pregnant women at the time before the intervention was given and on day 5 after the the intervention. Pain intensity was measured using the Visual Analogue Scale (VAS) and the degree of edema was measured by pitting edema and depth measurements were made with a millimeter ruler. The provision of foot massage interventions, compression stockings and a combination of foot massage and compression stocking are carried out for 5 consecutive days for 15 minutes at the home of the pregnant woman. Data analysis using ANOVA test. Ethical Clearance was obtained from the Faculty of Medicine, University of Riau Number: 086 / UN.19.5.1.1.8 / UEPKK / 2018 on April 19, 2018.

3. Results

A total of 45 subjects in the third trimester of pregnancy were divided into 3 intervention groups namely the foot massage intervention group only, compression group stocking only and a combination of foot massage and compression stocking, with each group numbering 15 research subjects / pregnant women. Most of the age of pregnant women in the group *foot massage* include the age category with a low risk of 20-35 years which is 11 people (73.3%), parity with the majority of pregnancies of the first child (parity 0) which is 5 people (33.3 %), the history of hypertension is mostly 13 people (86.7%).

Pregnant women in the group *compression stocking* included the age category with a low risk of 20-35 years, namely 10 people (66.7%), parity with most of the second and third child pregnancies as many as 5 people (33.3%), hypertension history most of them are not as many as 13 people (86.7%). Whereas in the combination group of *foot massage* and *compression stocking*, most of the age of pregnant women included the age category with low risk, namely 20-35 years, that is as many as 8 people (53.3%), parity with most

pregnancies for the first child (parity 0) that is 5 people (33.3%), the history of hypertension was mostly not as many as 13 people (86.7%).

The average decrease in pain intensity in the foot massage group is 1.5 and the average decrease in the degree of edema is 0.9 mm, in the compression stocking group the average decrease in pain intensity is 1.5 and the average decrease in the degree of edema is 1.1 mm, while in the combination group of foot massage and compression stocking the decrease in the average pain intensity was 1.8 and the decrease in the average degree of edema was 1.6 mm.

Table 1. Effects of *foot massage* and *compression stocking* with pain intensity edema in pregnant women

Intervention	Mean + SD	Minimum-maximum	P value
Foot massage	4.5 ± 1,076	2.5-6	0,000
Compression stockings	4.2 ± 1,147	2-6,5	
Foot massage and compression stockings	2,1 ± 0.743	1 to 3.5	

Based on table 1 it can be seen that from a statistical test edema pain intensity using ANOVA shows that the average pain intensity of edema ingroup *foot massage* was 4.5 with a standard deviation of 1.076. The group *compression stocking* is 4.2 with a standard deviation of 1.147. In the group *foot massage* and *compression stocking*., the pain intensity is 2.1 with a standard deviation of 0.743. The results of the statistical test showed that the value of $p = 0,000$ and it can be concluded that there were differences in pain intensity among the three groups that were intervened. Further analysis proves that significantly different groups are groups with a combination of *foot massage* and *compression stocking*.

Table 2. Effects of *foot massage* and *compression stocking* with degrees of edema in pregnant women

Intervention	Mean + SD	Minimum-maximum	P value
Foot massage	3.8± 0.614	2.8-5	0.00
Compression stocking	4.3 ± 0.518	3.6-5.1	
Foot massage and compression stocking	2.8 ± 0.183	2.6-3.2	

Based on table 2 it can be seen that from the statistical test of the degree of edema using ANOVA shows that the average degree of edema in the group with *foot*

massage is 3.8 with a standard deviation of 0.614. In the group *compression stocking* is 4.3 with a standard deviation of 0.518. In the group *foot massage* and *compression stocking*, the pain intensity is 2.8 with a standard deviation of 0.183. The results of statistical tests showed the results of $p = 0,000$ and it can be concluded that there are differences in the degree of edema among the three groups that were intervened. Further analysis proves that significantly different groups are groups with a combination of *foot massage* and *compression stocking*.

4. Discussion

Based on the results of statistical tests it appears that there is a very significant influence on the group combination of *foot massage* and *compression stocking* on the intensity of edema pain. Edema in pregnancy is excessive fluid accumulation in body tissues. Generally, edema occurs in the extracellular fluid compartment which can involve intracellular fluid. Edema can occur in a normal pregnancy. The most obvious reaction among many mothers' reactions to excessive pregnancy hormones is an increase in the size of various organs of pregnancy. Sometimes it causes edema, zits, , and acromengaly images. (James & David, 2006).

In this study, the provision of *foot massage* can reduce the intensity of leg pain that has edema. According to Budiarti (2011) mentions by stimulating certain points along the spinal meridian, which are transmitted through large nerve fibers to the reticular formation, thalamus and limbic system the body releases endorphins. Inhibition of sympathetic pathways through massage at the height of the second lumbar vertebra is the main nerve block used to relieve pain. The benefits of massage are controlling persistent or persistent pain, controlling frustration and stress, regulating production during pregnancy and childbirth. Massage techniques can be used to reduce discomfort during the process of pregnancy and childbirth and improve relaxation by triggering a feeling of comfort through the surface of the skin.

Foot massage is one of the interventions to reduce physiological edema in pregnancy that works by giving pressure to areas that experience edema. By providing *foot massage* to the lower extremities of pregnant women, it is expected that fluid movement in the area experiencing edema is expected. *Foot massage* can improve blood work in the process of transporting nutrients and oxygen throughout the body, so it can reduce edema and smooth circulation of fluid in the body (Adiguna, 2016). *Foot massage* is one of the non-pharmacological interventions to reduce extremity edema by removing extravascular fluid without interfering with intravascular fluid (Bamigboye, AA & Hofmeyr, GJ, 2006).

In the study also showed that the provision of *compression stocking* can reduce the intensity of pain edema felt by pregnant women. The benefit of *compression stocking* is to move blood and fluid upward from the ankle and back to the heart by fighting the gravitational force towards the foot. In the event of pregnancy edema, especially in the lower limbs, there is excessive fluid accumulation between body cells or in various body cavities, this is due to an imbalance of factors that control the transfer of body fluids, including a capillary hemodynamic system

causing retention sodium and water, kidney disease and the transfer of water from intravascular to interstitium. (Guyton & Hall, 2006).

The volume of interstitial fluid is maintained by Starling law. According to the laws of Starling, the speed, direction of movement of water, and solutes including proteins between capillaries and tissues are strongly influenced by differences in the hydrostatic and osmotic pressure of each compartment. Osmotic pressure is the pressure produced by plasma proteins that are not permeable through capillary membranes. This transfer process is through the process of diffusion, ultrafiltration, and reabsorption. The factor involved is the difference in intravascular and extravascular hydrostatic pressure. In this study, the use of *compression stocking* uses the principle of intravascular hydrostatic pressure transfer with extravascular. (Guyton & Hall, 2006).

Edema that occurs is caused also by a decrease in the exchange of materials between blood and cells, along with the accumulation of interstitial fluid, the distance between cells and blood that must be taken by nutrient O₂, and substances widening, so that the speed of diffusion decreases. Thus, the cells in the edematous tissue may get a blood supply so that if it is not treated, tissue damage can cause pain and can lead to death. (Sherwood, 1996).

The pressure given by *compression stocking* can have a beneficial effect in reducing edema for pain, both sitting and standing when using it. Pain is caused by the widening of the veins due to the accumulation of fluid that occurs. This vein has a valve that directs blood flow from the superficial vein to the deep vein. If this valve does not function (failure), the blood flow will be reversed so that superficial venous pressure gets higher and varicose veins will easily form. This relationship usually occurs above and below the *medial malleolus*, in the *gaiter area*, in the mid-calf region, below the knee, and a long connection to the lower thigh. The valves in the perforator point inward so that blood flows from the superficial system to the deep system from where the blood is pumped up, aided by contraction of the calf muscles. So with this pathophysiology, the use of compression stockings is installed until the calves are covered by stockings. (Kuncoro A, 2016).

Based on the results of this study it can be seen that the intervention of the foot massage and compression stocking each has an effect that can reduce the pain intensity of edema in the foot with each pathophysiology. Based on statistical tests, the combination group of foot massage and compression stocking was the most meaningful intervention group in reducing pain intensity in leg edema.

In addition, according to Ariyani & Hendro (2015) that the Endorphin Pommeranz theory states that the body will react by removing endorphins due to massage. Endorphin is a substance that is produced naturally by the body, works, and has effects such as morphine. Endorphin is soothing, has a comfortable effect, and plays a role in regenerating cells to repair parts of the body that are not functioning properly. The relaxed feeling felt by pregnant women during massage is due to the pressure given during massage in the edema area and supported by comfortable environmental conditions.

If the provision of foot massage triggers the hormone endorphin so that the mother feels comfortable and the pain is reduced, with the use of a compression stocking, the pain caused by widening the vein can be held by the stocking. Stocking will maintain a vein that has a valve to keep directing the flow of blood from the superficial vein to the deep vein, thereby reducing the pressure on the legs that can cause pain. Certain conditions such as standing too long and the burden of pregnancy will trigger an increase in hydrostatic pressure in the vein, this will cause chronic venous distension and inoculation of secondary venous valves in the superficial venous system. If the deep vein connecting valve with the superficial vein in the proximal part becomes incompetent, there will be a high-pressure transfer in the deep vein to the superficial venous system and this condition progressively becomes irreversible in a short time and causes pain in the lower leg / pregnant woman's leg. With the use of compression stocking, this distention will be prevented.

Based on the results of statistical tests, it was found that there was a significant influence between the mean or mean degree of edema before and after the provision of *foot massage*, *compression stocking* and a *combination of foot massage and compression stocking*. In this study, the average or mean degree of edema of *foot massage* was 3.8, *compression stocking* 4.3 and a *combination of foot massage and compression stocking* 2.8. Based on the results of statistical tests, it can be seen that there is a very significant influence on the combination group of *foot massage and compression stocking* on the degree of edema.

In this study, for 5 days giving *the foot massage* to 15 respondents had different degrees of edema decline. Decreasing the degree of edema ranges from 1 to 3 mm. This is due to the influence of differences in maternal activities on a daily basis. High maternal mobilization will be different from low maternal mobilization. High maternal mobilization is aimed at pregnant women who have activities and movements on a daily basis, such as walking, gymnastics, washing and doing other household chores. Decreasing the degree of edema will be different from pregnant women who only do little activity and physical movement on a daily basis. This difference in activity can trigger muscle tension and joint pain so that it will affect the decrease in the degree of edema.

Physical activity carried out will have an impact on the occurrence of fluid and electrolyte imbalances as a result of immobility will result in decreased protein supply and reduced serum protein concentration, which can interfere with body fluid requirements. In addition, a reduced fluid transfer from intravascular to the interstitial can cause edema resulting in fluid and electrolyte imbalances.

During pregnancy, edema will cause muscle tension and swelling. The enlarged uterus presses against the large veins that drain blood to the lower extremities when they enter the abdominal cavity. Damage to blood in the veins causes an increase in blood pressure in the leg and leg capillaries which encourages regional edema in the lower extremities. Everyone, especially pregnant women, is prone to leg vein edema and varicose veins, this is due to the periodic distention of the walls and venous valves due to the effect of an increase in hormone progesterone. Pregnancy increases the risk of suffering from edema and varicose veins due to the influence of hormonal

factors in the circulation associated with pregnancy. This hormone will increase the ability of vein wall distension and soften venous valve leaves that affect venous blood feedback. (Fahad, 2017)

Giving foot massage therapy will reduce muscle tension and smooth circulation of blood vessels, especially veins so that there is shrinkage of the swelling of the edema that occurs. Foot massage can also increase blood flow back to the heart to prevent the accumulation of fluid in the lower part of the body due to standing for a long time and because of the burden of pregnancy. (Coban, 2010)

Foot massage can improve blood work in the process of transporting nutrients and oxygen throughout the body, so it can reduce edema and smooth circulation of fluid in the body (Adiguna, 2016). *Foot massage* is one of the non-pharmacological interventions to reduce extremity edema by removing extravascular fluid without interfering with intravascular fluid (Bamigboye, AA & Hofmeyr, GJ, 2006).

The results of this study are similar to previous studies that have been carried out, namely Coban, A. & Sirin, A., (2010) study which states that there is a significant decrease in the circumference of the legs of pregnant women after *foot massage* 20 minutes every day for 5 consecutive days take part Other research states that *foot massage* is a type of reflexology massage that can reduce various disorders during pregnancy, one of which is to reduce edema and facilitate blood flow (Wang, EY et. Al., 2008).

During a normal pregnancy, the body experiences an addition of 6-8 liters of water, 4-6 liters of which is extracellular, and about 2-3 liters is interstitial. This occurs from the movement of sodium and water which is available for use during pregnancy. hormonal changes such as progesterone, estrogen, and prolactin will cause changes in the permeability of blood vessels, which can lead to edema (Fahad, 2017).

In research also shows that the provision of *compression stocking* can reduce the degree of edema experienced by pregnant women. Based on the results of this study in the intervention group *compression stocking* alone there was a decrease in the degree of edema of the pre post average of 3.2 to 2.1 mm after compression was conducted. This means that the degree of edema decreases by an average of 1.1 mm. Given the intervention, compression stocking can reduce the size of the femoral vein even though the pressure is very low in the mid-thigh, which is about 6 mmHg. The use of compression stockings with a pressure of <20 mmHg can prevent and reduce edema in the foot either in a sitting or long-standing condition. Compression in the superficial and deep vein area will greatly depend on the body position when using stockings. (Hugo, 2012).

In the foot massage and compression stocking combination intervention group it can be seen that the degree of edema before the intervention was an average of 3.6 mm to an average of 2.0 mm. This means a decrease of around 1.6 mm. When compared with a group that is only intervened in compression stocking alone the decrease in the average degree of edema in the combination group of foot massage and compression stocking occurs greater. The biggest compression from the use of *compression stockings* is the ankle. The level of compression gradually decreases from the ankle up just below the knee. Another benefit of *compression stocking* is to

move blood and fluid up from the ankle and back to the heart by fighting the gravitational force towards the foot. (Hugo, 2012)

5. Conclusions

Combination of foot massage and compression stocking is the best choice to prevent and reduce edema in pregnancy.

6. References

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