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Effectiveness of Foot Massage on Blood Pressure and Quality of Life in Pregnant Women with Preeclampsia

Minahil Atif[1], Azka Zahid[1], Ayesha Mansoor[1], Namra Saeed[1], Kinza Ihsan[1*], Maham Gul[1]

[1*]Department of Rehabilitation Sciences, University of Faisalabad, Faisalabad, Pakistan

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CORRESPONDING AUTHOR

Kinza Ihsan
Department of Rehabilitation Sciences, University of Faisalabad, Faisalabad, Pakistan
lecturer.rehab.202@tuf.edu.pk

ABSTRACT

Background: Foot massage has been shown to enhance peripheral circulation, mechanically aid lymphatic and venous fluid displacement, and modify nerve, blood vessel, and cell structures in the exchange network. **Objective:** To evaluate the effectiveness of foot massage on blood pressure and quality of life in pregnant women with preeclampsia. **Methodology:** This randomized controlled trial was conducted at the DHQ Teaching Hospital and Aziz Fatima Hospital, Faisalabad, in 4 months. About 28 participants were pregnant women aged between 25 and 35 years. The treatment group received a foot massage along with the continued hypertensives, and the control group received medication only. The Quality of Life Questionnaire for Pregnancy was used to assess the quality of life before and after the treatment during pregnancy. Participants were divided into two groups by the lottery method. An even number of participants were added to the treatment group (Group A), and an odd number of participants were added to the control group (Group B). Foot massage consists of five techniques: effleurage, petrissage, tapotement, friction, and vibration, and is performed for 20 minutes per session, 10 minutes for each foot. Blood pressure was measured 15 minutes before and after the foot massage. The quantitative data were presented as means and standard deviations, while the qualitative data were reported as frequencies and percentages. A chi-square test was used to compare to observed results with the expected results. Statistical significances were determined at a significance level of p-value of 0.05. **Results:** The highest proportion of participants (39.3%) were in the 29 to 32 week range of gestation, while 10.7% were in the 39 to 40 week range. In terms of pregnancy status, a slight majority were primigravida (53.6%), with the remaining 46.4% being multigravida. Changes in blood pressure were assessed over six days of treatment using the Friedman test. Both the intervention and control groups showed significant reductions in blood pressure. **Conclusion:** Foot massage in combination with hypertensive medication was found to be a more effective treatment option to reduce blood pressure and improve quality of life in pregnant females with preeclampsia as compared to hypertensive medications alone.

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INTRODUCTION

Preeclampsia is a major cause of intrauterine growth restriction, neonatal death, preterm birth, and maternal mortality (15 to 20% in rich countries). It affects 2-8% of pregnancies. It is the most common medical problem of pregnancy, and its incidence is increasing worldwide. It also contributes to acute and long-term morbidity.[1] Preeclampsia can produce serious adverse effects, damage to the brain, liver, and kidneys, in addition to affecting other organs. Both you and the growing foetus are at risk from it.[2] Preeclampsia affects the arteries that carry blood to the placenta. If the placenta does not receive enough blood, the baby may receive insufficient blood and oxygen, and nutrients. This can lead to slow growth, known as fetal growth restriction. Unplanned preterm birth, or birth before 37 weeks, can result from preeclampsia.[3] In addition to harming other organs, preeclampsia can also cause brain damage, liver and kidney damage, and other severe side effects. It poses a risk to the developing foetus as well as to you.[4]

The exact cause of preeclampsia remains unknown; however, several contributing factors are currently being investigated. These include genetic predispositions, abnormalities in blood vessel development and function, and autoimmune diseases.[5] A number of risk factors have been identified that may increase a pregnant woman's likelihood of developing preeclampsia. These include multiple gestations (such as twins or triplets), maternal age over 40, first-time pregnancy (nulliparity), a personal or family history of preeclampsia, obesity, and preexisting medical conditions such as chronic hypertension, diabetes mellitus, kidney disease, lupus or other autoimmune disorders, and sickle cell anemia. Additionally, pregnancies achieved through in vitro fertilization (IVF) have also been associated with a higher risk of preeclampsia.[6] Currently, there is no known method to completely prevent preeclampsia. However, for individuals at high risk, low-dose aspirin therapy initiated after the first trimester has been shown to reduce the incidence of the condition.

Regular and early prenatal care is essential, as it allows for early detection and timely intervention, thereby reducing the risk of complications for both the mother and fetus. Early diagnosis facilitates close monitoring and appropriate management strategies throughout the pregnancy.[7] The clinical presentation of preeclampsia includes symptoms such as persistent headache, upper abdominal pain, unusual swelling of the hands and face, rapid weight gain, nausea or vomiting, dyspnea, and visual disturbances, including blurred vision or seeing spots. On physical examination, elevated blood pressure is defined as 140/90 mmHg or greater - is typically observed. Laboratory findings may include proteinuria, elevated liver enzymes, and thrombocytopenia.[7]

The definitive treatment for preeclampsia is delivery of the baby. In most cases, childbirth halts the progression of the disease. If the pregnancy has reached or surpassed 37 weeks of gestation, labor is often induced as the fetus is considered full term and the risks associated with continued pregnancy outweigh the risks of early delivery (7). For cases diagnosed before 37 weeks, the timing of delivery depends on the severity of the condition, gestational age, and overall health of both the mother and fetus. Clinical decisions are made based on a balance between maternal and fetal risks. In the majority of cases, delivery of the baby and placenta leads to resolution of the condition.[8] It is estimated that one in every twenty pregnancies will result in preeclampsia. It may worsen into eclampsia or convulsions, which account for up to 10% of maternal fatalities. Preeclampsia cases increased 40% globally between 1990 and 1999, with industrialized nations seeing the largest increase in cases. This increase can be attributed to factors such as the number of older mothers and repeated pregnancies, which are known to increase the risk of preeclampsia.[9]

Over the past ten years, foot massage has become a common healthcare practice. It has been demonstrated to improve peripheral circulation, mechanically assist the displacement of lymphatic and venous fluids, and modify nerve, blood vessel, and cellular structures in the exchange network.[10] Foot massage is affordable, comfortable, and has few side effects, people choose to use it. Blood pressure is controlled by a series of autonomic nerves and hormones that monitor heart contraction, blood vessel diameter, and circulating blood volume. All these elements are inextricably linked to the control of blood pressure in the vessels. The value of blood vessels depends on the force with which the heart contracts, the diameter of the blood vessels, and the amount of blood flowing through them.[11] The mechanism works

similarly to water pressure from a hose. By increasing the spasm, which is equivalent to the heart contracting harder and faster, you can increase the force of the water. By putting pressure on the end of the hose and increasing its pressure (like when blood vessels contract and narrow). The manipulation of muscles and other soft tissues using various pressures and movements is known as massage.[12] The soft tissues of the body can be relaxed to allow more circulation and oxygen to reach the painful area and relieve it.[13] Preeclampsia, a disorder common in human pregnancy, is characterized by the onset of significant proteinuria and hypertension in a previously healthy woman at or after 20 weeks of gestation.[8]

Foot massage, also referred to as reflexology, is the practice of applying pressure to specific foot points to stimulate reflex areas that correspond to various body organs and systems. Proponents of foot massage claim that it can enhance circulation, encourage calmness, and lessen hypertension-related symptoms like tension and anxiety. However, the evidence supporting the use of foot massage in pregnant women with preeclampsia is limited and conflicting.[14] Foot massage is an easy and powerful element. Physically, foot massage would help relax muscles, relieve pain, and improve blood flow and lymph. Several studies have demonstrated that foot massage decreases perception of pain in post-surgery patients in general, and extensively in post-surgical abdominal patients. Foot massage has also been found to affect the reduction of lower limb edema in pregnancy. Also decreased anxiety and depression in palliative care.[15]

Every year, preeclampsia claims the lives of about 50,000 women worldwide. Preeclampsia incidence varies from 2 to 10% based on the study population and preeclampsia definitions. The incidence reported in the Israeli study was 2.8%, in Scotland it was 5.8%, in Australia it was 14.1%, and in Seattle, it was 5%. It affects 5–8% of expectant mothers globally and can lead to very serious issues for the mother and the fetus.[16] Preeclampsia is a condition marked by persistently high blood pressure during pregnancy or the postpartum period. It is associated with elevated protein levels in the urine. Preeclampsia is the main cause of preterm birth, neonatal death, intrauterine growth restriction, and maternal mortality (15 to 20% in wealthy countries). Additionally, it affects morbidity over the long and short terms.[17]

It is estimated that one in every twenty pregnancies will result in preeclampsia. Up to 10% of maternal deaths are caused by eclampsia, which is the result of convulsive fits. From a public health perspective, it is alarming that between 1990 and 1999, preeclampsia incidences increased by 40% worldwide, especially in developed countries. Preeclampsia risk factors that are known to increase this risk include the frequency of older moms and recurrent pregnancies.[18] Preeclampsia claims the lives of over 50,000 women worldwide each year. Preeclampsia incidence can range from 2 to 10%, depending on the preeclampsia criteria and the population under study.[19] The 2.8% of the incidence, 5.8% from Scotland, 14.1% from Australia, and 5% from Seattle were reported, according to an Israeli investigation. It impacts 5–8% of expectant mothers and can lead to very serious issues for both the mother and the fetus.[20] The purpose of the study was to evaluate the effectiveness of foot massage on blood pressure and quality of life in pregnant women with preeclampsia.

METHODOLOGY

This randomized control trial (RCT) was conducted at DHQ Teaching Hospital and Aziz Fatima Hospital, Faisalabad, in 4 months. The eligible participants were pregnant women aged between 25-35 years. The sample size was 28, calculated by Rao software. The treatment group received a foot massage, while the control group was on medication only. Foot massage consists of five techniques: effleurage, petrissage, tapotement, friction, and vibration. The participants screened through the selection criteria were recruited into the study. Informed consent was signed by the patients. Participants were divided into two groups by a lottery method. An even number of participants were added to the treatment group (Group A), and an odd number of participants were added to the control group (Group B).

Data was gathered from already diagnosed pregnant women with preeclampsia. It was a pretest-posttest design. Group A was the treatment group given foot massage, and their hypertensive were continued, while Group B, the control group, was only on their medications. A foot massage was performed once a day for 6 consecutive days. Foot massage was performed

Table 1: Demographics and pregnancy-related characteristics of participants.

Variable	Categories	Frequency (n)	Percentage (%)
Pregnancy Trimester	29–32 weeks	11	39.3
	33–35 weeks	8	28.6
	36–38 weeks	6	21.4
	39–40 weeks	3	10.7
Pregnancy Status	Primigravida	15	53.6
	Multigravida	13	46.4
Total		28	100

Table 2: Summary of Inferential Statistics

Variable	Group	Chi-square (z-value)	p-value
Systolic BP (Day 1–6)	Group A	35.71	<0.001
Diastolic BP (Day 1–6)	Group A	15.83	0.007
Systolic BP (Day 1–6)	Group B	37.03	<0.001
Diastolic BP (Day 1–6)	Group B	28.14	<0.001
QOL post-test	A vs. B	-2.876	0.004
Post-systolic BP	A vs. B	-3.193	0.001
Post-diastolic BP	A vs. B	-2.647	0.008

for 20 minutes per session, 10 minutes for each foot. Blood pressure was measured 15 minutes before and after the foot massage. The foot massage consisted of 5 basic techniques: effleurage, petrissage, tapotement, friction, and vibration. The Quality of Life Questionnaire for Pregnancy (QOL-GRAV-U) standardized questionnaire, was used to assess the quality of life of women during pregnancy. It was shared at the start and the end of the research, and with patients of both groups were compared to assess the improvement in the quality of life of pregnant females. The quantitative data were presented as means and standard deviations, while the qualitative data were reported as frequencies and percentages. A chi-square test was used to compare to observed results with the expected results. Statistical significances were determined at a significance level of p-value of 0.05.

RESULTS

A total of 28 pregnant women diagnosed with preeclampsia were enrolled in this study. The demographic and pregnancy-related details of the participants are presented in Table 1. The highest proportion of participants (39.3%) was in the 29-32 week range of gestation, while the fewest (10.7%) were in the 39-40 week range. In terms of pregnancy status, a slight majority were primigravida (53.6%), with the remaining 46.4% being multigravida. Changes in blood pressure were assessed over six days of treatment using the Friedman test. Both the intervention group (Group A: foot massage + antihypertensives) and the control group (Group B: antihypertensives only) showed significant reductions in blood pressure.

As detailed in Table 2, both groups showed statistically significant reductions in systolic and diastolic blood pressure over the 6-day intervention period. However, the between-group comparison showed that Group A (foot massage + antihypertensives) experienced a more pronounced improvement in both blood pressure and quality of life (QOL) compared to Group B. Significant reduction in both systolic and diastolic blood pressure was observed in both groups after treatment. Group A, receiving foot massage along with standard care, showed superior clinical outcomes in terms of blood pressure control and QOL. Findings suggest that foot massage may be a beneficial adjunct therapy for managing preeclampsia.

DISCUSSION

This study was conducted at the Department of Gynaecology and Obstetrics, Aziz Fatima, DHQ Teaching Hospital, Allied Hospital Faisalabad, to evaluate the effectiveness of foot massage in lowering blood pressure and enhancing the quality of life in pregnant women diagnosed with pre-eclampsia. The participants, aged 25 to 35, were all previously normotensive and developed hypertension after the 20th week of pregnancy - a hallmark of pre-eclampsia. The symptoms of this condition typically resolve after delivery. Foot massage acts as a form of cutaneous stimulation

that helps restore homeostasis by regulating peripheral blood flow through both extrinsic and intrinsic mechanisms. Extrinsically, the rhythmic and gentle manipulation of muscles during a foot massage influences vasomotor activity in the medulla, reducing peripheral resistance, enhancing microvascular circulation, and ultimately lowering blood pressure. Intrinsically, increased microvascular flow activates secondary mechanisms that promote arterial dilation. Additionally, foot massage stimulates parasympathetic nerve fibers, which in turn improve cardiac output and systemic blood circulation. These combined effects contribute to the reduction of blood pressure in pregnant women with pre-eclampsia. Multiple studies have confirmed the efficacy of foot massage in this context.

Foot massage involves systematic, rhythmic manipulation of the soft tissues in the feet. This manipulation can positively influence health outcomes. In the current study, both the control and treatment groups showed statistically significant improvements when analyzed using the Friedman test (non-parametric), with a p-value of <0.05. The findings suggest that deep transverse friction massage and the use of an instrument sphygmomanometer were effective in reducing blood pressure, improving circulation, and decreasing edema and swelling. These outcomes are consistent with research conducted in 2017 by Ermiati, Anita Setyawati, and Etika Emaliyawati, which also reported significant blood pressure reductions.

A study by Leveno et al. (2019) found that a finger hand-held relaxation technique significantly reduced fatigue and stress in women with pre-eclampsia. Similarly, research by Paramban et al. in the Netherlands Antilles on primigravid mothers reported a notable decrease in stress levels after relaxation therapy. Other studies have demonstrated the benefits of foot massage in reducing blood pressure among cancer patients and postoperative patients. For example, Quattrin et al. (2006) observed a significant decrease in both systolic ($p<0.001$) and diastolic ($p<0.05$) blood pressure after foot massage. Chackos (2007) also noted significant reductions in postoperative abdominal patients.[21]

Historically, foot massage has been practiced for thousands of years using various techniques. According to the Oxford Concise Medical Dictionary, this complementary therapy is based on the principle that specific points on the feet correspond to other parts of the body. Manipulating the soft tissues of the feet may lead to health improvement.[22] Physically, foot massage helps relax muscles, relieve pain and congestion by releasing lactic acid, improve blood flow, and increase joint flexibility. This study confirms a significant reduction in blood pressure among pregnant women with pre-eclampsia following foot massage.

Foot massage can serve as a non-pharmacological intervention to help lower blood pressure in pregnant women with pre-eclampsia. However, further research and development are needed to formalize this technique as a nursing intervention alongside pharmacological treatment.[11] Supporting this, Hayes and Cox found a substantial reduction in Mean Arterial Pressure (MAP) in ICU patients after foot massage.[23] Similarly, Eimani and Eshq reported significant MAP reductions in stroke patients, and another study found notable MAP decreases in 50 GICU patients post-foot massage.[24] Coban and Sirin et al. (2010) demonstrated that administering a 20-minute foot massage daily for five days significantly reduced physiological edema in the lower legs of pregnant women. The experimental group in their study consistently showed decreased limb circumference compared to the control group. The current findings align with these results, suggesting that consistent daily foot massage can effectively reduce lower limb edema.[25]

CONCLUSION

There were notable variations in the rate at which preeclamptic pregnant women blood pressure decreased following foot massage therapy. Pregnant patients with preeclampsia may benefit from foot massage techniques as one strategy to lower blood pressure.

DECLARATIONS

Consent to participate: Written consent had been obtained from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

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