

# The effectiveness of reflexology on blood pressure in pregnant women

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## ABSTRACT

High blood pressure during pregnancy, such as gestational hypertension and preeclampsia, is a serious complication that can pose risks to both the mother and fetus. Foot reflexology has emerged as a promising non-pharmacological intervention to help manage blood pressure. This study aimed to systematically review the effectiveness of reflexology therapy in reducing blood pressure among pregnant women. A systematic review was conducted using 18 scientific articles published between 2013 and 2024, retrieved from Google Scholar and PubMed databases. The selected articles included both quantitative and qualitative studies focusing on the use of reflexology as an intervention for managing blood pressure during pregnancy. The data analyzed covered research design, sample size, intervention protocols, and blood pressure outcomes. The findings indicate that foot reflexology consistently reduces both systolic and diastolic blood pressure, especially in pregnant women with gestational hypertension. The mechanism of reflexology involves stimulating specific reflex points related to the cardiovascular and endocrine systems, as well as activating the parasympathetic nervous system to promote relaxation and stress reduction. Reflexology has also been shown to be safe, as it does not induce uterine contractions, and can be effectively combined with other non-pharmacological therapies such as warm foot soaks and aromatherapy for optimal results. Although further research with stronger study designs is needed, current evidence supports the use of reflexology as a complementary therapy in managing blood pressure during pregnancy.

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## INTRODUCTION

Pregnancy is a natural physiological process experienced by women, beginning with fertilization and ending with childbirth. Global and national trends increasingly recognize the importance of non-pharmacologic interventions in managing hypertension during pregnancy, particularly due to growing concerns about the risks of medication use in pregnant women and the need for more

holistic, low-risk care models. Many health systems, especially in low- and middle-income countries, are shifting toward integrative approaches that combine conventional medicine with safe, evidence-based complementary therapies. Reflexology, as a non-invasive and cost-effective method, aligns with this trend by offering a practical alternative for blood pressure management, especially in settings with limited access to specialized care or medications. During pregnancy, the mother's body undergoes significant physiological, metabolic, and anatomical changes (Tan & Tan, 2013). However, these changes can trigger serious complications if not properly managed. Globally, around 80% of maternal deaths are caused by direct factors such as postpartum hemorrhage (25%), infection (15%), hypertension or eclampsia (12%), obstructed labor (8%), and abortion-related complications (13%). The remaining deaths are attributed to indirect causes such as anemia, chronic energy deficiency (CED), malaria, and heart disease ((Elci et al., 2025; Von Dadelszen & Magee, 2017)). According to the latest report from the World Health Organization (WHO, 2023), approximately 287,000 women die each year from complications related to pregnancy and childbirth—equivalent to over 780 maternal deaths per day globally. In Indonesia, the 2023 Indonesia Health Survey (SKI) recorded a maternal mortality ratio (MMR) of 189 per 100,000 live births, showing a decline compared to 305 per 100,000 live births in 2015 (BPS, BKKBN, Ministry of Health, and ICF, 2017). Nevertheless, this number remains far from the 2030 Sustainable Development Goals (SDGs) target of no more than 70 maternal deaths per 100,000 live births (Familia, 2025; Raina et al., 2023). The leading causes of maternal death in Indonesia have remained relatively consistent over the past decade. According to the 2022 Indonesia Health Profile (Ministry of Health, 2023), the primary causes of maternal death are postpartum hemorrhage and hypertensive disorders in pregnancy (HDP). Data from 2022 indicate that HDP accounted for approximately 27% of all maternal deaths, making it a key priority in national efforts to reduce the maternal mortality rate (Ministry of Health RI, 2023). The impact of hypertensive disorders in pregnancy is not only limited to physical health but can also cause psychological distress and anxiety in expectant mothers (Madise et al., 2023). Therefore, the prevention and effective management of blood pressure during pregnancy is a top priority in maternal health services. In Indonesia, hypertensive disorders in pregnancy are a major public health concern. According to national health data sources, including the Ministry of Health and the Indonesia Demographic and Health Survey (IDHS), the prevalence of hypertension during pregnancy is relatively high—reaching approximately 36%. Hypertensive disorders in pregnancy include chronic hypertension, chronic hypertension with superimposed preeclampsia, gestational hypertension, preeclampsia, and eclampsia (Hutcheon et al., 2011; Wilkerson & Ogunbodede, 2019).

The population characteristics of pregnant women in areas with limited medical access are central to positioning reflexology as a socially and economically viable solution. These women often face barriers such as scarce healthcare facilities, limited availability of trained health professionals, and financial constraints that restrict access to conventional medical treatments for hypertension. Reflexology's non-invasive nature, low cost, and ease of administration by community members make it particularly suitable for these settings. Additionally, cultural acceptance of traditional and complementary therapies may increase willingness to adopt reflexology. Therefore, the feasibility of reflexology as an intervention depends significantly on understanding these population-specific factors—such as socioeconomic status, education levels, health beliefs, and access challenges—to ensure it meets the community's needs effectively and sustainably.

One such method is reflexology—a complementary therapy involving the application of pressure to specific points on the feet, hands, or ears that are believed to correspond with various organs and systems in the body. Reflexology is thought to promote relaxation, improve blood circulation, and help restore the body's natural balance, including regulating cardiovascular functions such as blood pressure. Reflexology offers several advantages, especially in settings with limited healthcare infrastructure. It is non-invasive, relatively low-cost, and can be administered by

trained personnel or practiced at the community level with minimal resources. As such, it holds promise as a feasible and accessible intervention for managing hypertension in pregnant women, particularly in regions with limited access to health professionals or medication. Despite its potential benefits, the scientific evidence supporting the effectiveness of reflexology in lowering blood pressure during pregnancy remains limited and requires further empirical investigation. Therefore, this study aims to examine the effectiveness of reflexology in reducing blood pressure among pregnant women with hypertension. The findings are expected to contribute to the development of holistic, affordable, and community-based strategies for improving maternal health and reducing pregnancy-related complications.

## RESEARCH METHOD

This study employed a systematic review design to analyze and describe the effectiveness of reflexology in reducing blood pressure among pregnant women. The inclusion criteria for this review were scientific articles published in either English or Bahasa Indonesia, available in full-text, and focusing on the use of reflexology as an intervention for managing blood pressure during pregnancy. Both quantitative and qualitative studies were considered eligible. A comprehensive literature search was conducted using two electronic databases: Google Scholar and PubMed. The following keywords were used in both English and Indonesian: “reflexology” AND “blood pressure” AND “pregnancy” and “ pijat refleksi” AND “tekanan darah” AND “ibu hamil”. The search was limited to articles published between 2013 and 2024 to ensure relevance and recency of data. All retrieved articles were imported into a reference management tool, and duplicate entries were removed. The remaining articles were screened based on their titles and abstracts to assess relevance. Articles that met the inclusion criteria were then reviewed in full for eligibility. The article selection and screening process was structured following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a transparent, systematic, and replicable approach. Initially, a comprehensive literature search was conducted across multiple databases using predefined keywords related to reflexology and blood pressure management in pregnant women. All retrieved records were imported into reference management software to identify and remove duplicates. Screening was then performed in two stages: first by reviewing titles and abstracts for relevance, and subsequently through full-text assessments to confirm eligibility based on inclusion and exclusion criteria. This rigorous multi-step screening ensured that only studies directly addressing the research question and meeting quality standards were included, thereby enhancing the representativeness and relevance of the results. Data extraction was conducted systematically to capture key study characteristics, intervention details, measurement tools, and outcomes. The descriptive analysis of these data allowed for the synthesis of consistent patterns and meaningful variations, which were then presented narratively to provide a comprehensive evidence-based overview of reflexology’s role in managing blood pressure during

## RESULTS AND DISCUSSIONS

A total of 523 articles were obtained from two databases, EBSCO and Google Scholar. These articles were then screened, and 56 duplicates were removed. Additionally, 357 articles were excluded due to incomplete article details or unclear publication years. Next, eligibility assessment was conducted based on the full text and inclusion criteria. A total of 186 articles did not meet the criteria, leaving 35 articles that were suitable for inclusion. The article selection process and results can be seen in the PRISMA Flow Diagram (Figure 1). From the 18 eligible articles, a synthesis was conducted, and three main themes were identified, as shown in Figure 1. These themes are: the relationship between reflexology and blood pressure reduction during pregnancy, the impact of reflexology on maternal health outcomes, and the potential benefits of reflexology as a non-

pharmacological intervention for managing hypertension in pregnant women. Overall, the findings from these studies suggest that reflexology can be an effective and accessible alternative for controlling blood pressure during pregnancy.

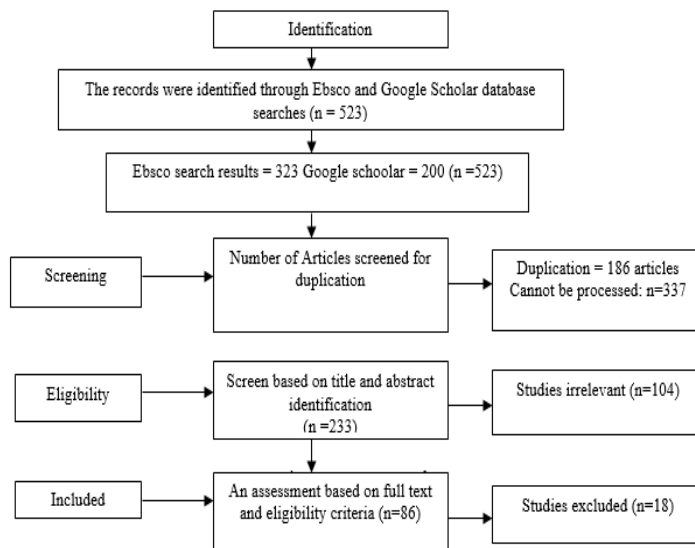


Figure 1. Prism digraph

An increase in blood pressure during pregnancy, particularly in the form of gestational hypertension and preeclampsia, is one of the main causes of obstetric complications that can endanger both the mother and the fetus. In an effort to find a safe and effective non-pharmacological approach, foot reflexology has been extensively studied as a complementary therapy. Based on an analysis of 18 selected articles, the majority indicate that reflexology plays a significant role in reducing both systolic and diastolic blood pressure, as well as improving the emotional well-being of pregnant women

Table 1. Selected articles related to the effectiveness of reflexology on blood pressure in pregnant

No	Authors (Year)	Article Title	Methodology	Findings
1	(Kaki et al., 2019)	The Effect of Foot Massage on Blood Pressure Reduction in Pregnant Women	Quantitative study with pre-post test design; pregnant women received foot massage intervention over several sessions.	Significant reductions in systolic and diastolic blood pressure post-intervention; improved blood circulation.
2	(Yang et al., 2024a)	Effects of Foot Reflexology Massage on Pregnant Women: A Meta-Analysis	Meta-analysis of randomized controlled trials on foot reflexology during pregnancy.	Reflexology reduced anxiety and pain but had no significant impact on blood pressure.
3	(Warisantika, Kusmiyati, & Guna Bangsa Yogyakarta, 2024)	Effectiveness of Warm Foot Soak and Massage on Blood Pressure in Preeclampsic Pregnant Women	Experimental study with two groups: one receiving a combination of foot soak and massage, one control.	The combined therapy significantly reduced blood pressure in preeclampsic pregnant women.
4	(Liang et al., 2023a)	The Effects of Reflexology on Symptoms in Pregnancy	Systematic review of studies evaluating reflexology during pregnancy.	Reflexology was effective in relieving labor pain and anxiety, but evidence for blood pressure reduction was inconclusive.
5	(Abeer AA Mansour et al., 2023)	Effect of Foot Reflexology on Preeclampsia	Experimental study on women with mild preeclampsia.	Reflexology significantly reduced mean arterial pressure (MAP), serum

No	Authors (Year)	Article Title	Methodology	Findings
6	(Warisantika, Kusmiyati, & Sunartono, 2024)	Effectiveness of Warm Water Foot Soak and Massage in Reducing Blood Pressure in Hypertensive Pregnant Women	Quasi-experimental with pre-post blood pressure measurement.	cortisol, and proteinuria. The combined intervention significantly reduced both systolic and diastolic blood pressure.
7	(Saber et al., 2024a)	Foot Reflexology vs. Warm Foot Soak on Blood Pressure in Preeclamptic Pregnant Women	Experimental study comparing two groups (reflexology vs. warm foot soak).	Both were effective, with reflexology showing slightly greater blood pressure reduction.
8	(A et al., 2023)	Effectiveness of Foot Massage with Lemongrass Oil on Blood Pressure in Hypertensive Pregnant Women	Experimental pre-post design using foot massage with lemongrass oil.	Significant reduction in blood pressure, with lemongrass oil aiding relaxation.
9	(Ermiati et al., 2018)	Modified Foot Massage to Reduce Blood Pressure in Pregnant Women with Preeclampsia	Intervention study using a modified foot reflexology technique.	Effectively lowered blood pressure and improved wellbeing among preeclamptic women.
10	(Siti et al., 2024)	Effectiveness of Foot Reflexology in Reducing Blood Pressure in Hypertensive Pregnant Women	Quasi-experimental study with 3 weekly sessions of reflexology.	Significant decrease in blood pressure, attributed to energy channel stimulation.
11	(Venugopal et al., 2023)	Foot Reflexology for Blood Pressure Reduction in Hypertensive Patients	Systematic review on hypertensive patients (not pregnancy-specific).	Inconclusive findings; no significant blood pressure reduction observed.
12	(Zulhijjah & Ibrahim, 2024)	Effect of Acupressure on Blood Pressure Changes in Pregnant Women	Controlled experimental study.	Acupressure significantly reduced blood pressure and can be used as complementary therapy.
13	(Liang et al., 2023b)	Reflexology for Pregnancy Symptoms	Systematic review of global literature.	Reflexology helped reduce anxiety and pain; insufficient evidence on blood pressure effects.
14	(Yang et al., 2024b)	Foot Reflexology in Pregnant Women with Hypertension	Quasi-experimental (not yet published online).	Reflexology reduced stress, improved circulation, and gradually lowered blood pressure.
15	(Saber et al., 2024b)	Effect of Foot Reflexology versus Warm Water Foot Soak with Body Relaxation Techniques on Symptoms and Quality of Life of Preeclampsia	Comparative quasi-experimental study involving 90 pregnant women with mild preeclampsia, divided into two groups: foot reflexology and warm water foot soak with body relaxation techniques.	Both interventions improved symptoms and quality of life, with foot reflexology showing a more significant reduction in blood pressure.
16	(El-Fekey et al., 2018)	Effect of Foot Reflexology on Stress and Anxiety during Pregnancy	Experimental study with 50 pregnant women in their third trimester experiencing anxiety; foot reflexology sessions were administered.	Foot reflexology significantly reduced stress and anxiety levels, which are associated with elevated blood pressure during pregnancy.
17	(wati & Azlina, 2025)	The Implementation of Foot Soak Using Warm Water with Lemongrass on Blood Pressure Reduction in Mrs. W with Preeclampsia	Case study of a pregnant woman with preeclampsia undergoing foot soak therapy with warm water and lemongrass.	The intervention led to a notable decrease in blood pressure, suggesting its potential as a complementary therapy for managing preeclampsia.
18	(Kadek et al.,	The Effect of Feet	Quasi-experimental study	Significant reduction in

No	Authors (Year)	Article Title	Methodology	Findings
	2023)	Reflection Massage on Blood Pressure in Hypertension Patients at Community Health Centers II Petang	with 36 hypertensive patients receiving foot reflexology three times a week for 20 minutes.	both systolic and diastolic blood pressure, indicating the effectiveness of foot reflexology in managing hypertension.

Hypertension during pregnancy, including preeclampsia, is one of the leading causes of maternal and fetal morbidity and mortality worldwide. Non-pharmacological approaches, such as foot reflexology, are increasingly being used as complementary therapies to help manage blood pressure safely and without the adverse effects of medication. Based on a review of 18 scientific articles, it can be concluded that foot reflexology has potential as a supportive therapy for reducing blood pressure in pregnant women. The following discussion categorizes the findings according to their effectiveness, additional benefits, combination approaches, and study limitations.

#### **Effectiveness of Foot Reflexology on Blood Pressure**

Based on findings from various analyzed studies, the majority indicate that foot reflexology is effective in reducing both systolic and diastolic blood pressure in pregnant women. Studies by Kaki et al. (2019) and Siti et al. (2024), which employed a pre-test and post-test design on pregnant women with elevated blood pressure, reported significant reductions in blood pressure following several sessions of foot reflexology. These findings are consistent with those of Warisantika et al. (2024), who demonstrated that the combination of warm foot soaking and foot massage enhances peripheral vascular relaxation, thereby improving blood flow and lowering blood pressure. Foot reflexology is believed to work through stimulation of specific nerve points on the feet that correspond to various body organs, including the heart and kidneys. This stimulation is thought to balance the autonomic nervous system and trigger the release of endorphins, which contributes to hypotensive effects and improved peripheral circulation.

#### **Foot Reflexology as a Relaxation Therapy: Reducing Anxiety and Stress**

While the primary aim of foot reflexology in the context of maternal care is often to manage physiological parameters such as blood pressure, its psychological benefits should not be underestimated. A number of studies, including those by El-Fekey et al. (2018) and Liang et al. (2023a), emphasize that although not all clinical trials report statistically significant reductions in blood pressure, foot reflexology consistently demonstrates a therapeutic effect on reducing anxiety and stress levels among pregnant women. This is particularly relevant, as chronic psychosomatic stress—common during pregnancy—can activate the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system, leading to elevated blood pressure and exacerbation of hypertensive disorders. From a physiological standpoint, foot reflexology is believed to stimulate the parasympathetic nervous system, which counters the effects of stress by promoting a state of rest and relaxation. Parasympathetic activation slows the heart rate, dilates blood vessels, and enhances gastrointestinal function, all of which contribute to a general state of calm and cardiovascular stability. These effects are especially critical during pregnancy, when emotional fluctuations and hormonal changes can significantly influence cardiovascular dynamics. Moreover, by targeting specific reflex points believed to correspond with the adrenal glands, heart, and kidneys, foot reflexology may help regulate hormonal output and autonomic responses. The intervention often involves a quiet, supportive environment and tactile stimulation that further enhances its psychosocial impact, making it not only a physical but also a mind-body therapy. Thus, while foot reflexology may not serve as a replacement for pharmacological treatment in severe cases of hypertension, it offers valuable adjunctive benefits in a holistic care model, particularly for managing maternal anxiety, stress-induced hypertension, and emotional well-being during pregnancy. Reflexology is believed to help regulate blood pressure by activating the parasympathetic nervous system and reducing levels of stress hormones such as cortisol.

Stimulation of specific reflex points on the feet or hands can trigger a relaxation response, slow the heart rate, dilate blood vessels, and reduce vascular resistance. Additionally, by lowering elevated cortisol levels caused by chronic stress—which can lead to vasoconstriction and increased blood pressure—reflexology contributes to maintaining blood pressure stability through natural, neuroendocrine pathways.

### **Combined Therapies and Comparative Approaches**

Recent literature also supports the notion that integrating foot reflexology with other complementary therapies can amplify its therapeutic effects. For example, studies conducted by Warisantika et al. (2024) and A et al. (2023) explored the synergistic outcomes of combining foot reflexology with warm water foot soaking and the application of lemongrass aromatherapy oil. These integrative approaches yielded greater reductions in both systolic and diastolic blood pressure than standalone interventions, suggesting a cumulative or potentiating effect when multiple relaxation modalities are used in tandem.

The benefits of these combinations may stem from the simultaneous activation of various sensory and neural pathways. Warm water immersion enhances peripheral circulation and induces muscle relaxation, while essential oils like lemongrass may influence mood through olfactory stimulation and their mild hypotensive properties. Reflexology, in this context, acts as a catalyst for systemic relaxation, and when administered alongside other calming therapies, creates a multisensory environment that fosters deeper physiological and psychological tranquility. Furthermore, Saber et al. (2024a & 2024b) conducted comparative studies examining the effectiveness of foot reflexology versus warm water foot soaking combined with full-body relaxation techniques. While both approaches resulted in improved maternal outcomes, reflexology was more effective in lowering blood pressure and enhancing the quality of life in pregnant women with mild preeclampsia. These findings underscore the need for a patient-centered approach in therapeutic decision-making—taking into account individual preferences, accessibility of services, cultural acceptability, and the skill level of available healthcare providers.

### **Effectiveness in Preeclampsia and Gestational Hypertension**

Preeclampsia remains a major concern in maternal health due to its potential for rapid progression and complications such as eclampsia, organ dysfunction, and fetal compromise. It is a multifactorial condition marked by sustained hypertension, proteinuria, endothelial damage, and inflammatory responses. Traditional pharmacological treatments are essential but often limited by concerns regarding fetal safety and maternal tolerance. Studies by Abeer AA Mansour et al. (2023) and Wati & Azlina (2025) offer compelling evidence that foot reflexology can serve as a safe and effective complementary therapy for women with preeclampsia. Their findings not only reported significant reductions in blood pressure, but also lowered serum cortisol and urinary protein levels—both of which are important markers of stress and renal function. The reduction in cortisol is particularly noteworthy, as elevated cortisol levels have been linked to adverse pregnancy outcomes, including preterm birth and low birth weight. Importantly, these studies confirmed that foot reflexology did not induce uterine contractions or compromise fetal well-being, alleviating concerns often associated with manual therapies during pregnancy. The sessions were also associated with improved maternal psychological state, suggesting that the therapy addresses both the somatic and emotional dimensions of preeclampsia. This dual effect makes reflexology a holistically appropriate intervention for primary care settings and maternity clinics, particularly in low-resource environments where access to advanced medical therapies may be limited.

## **CONCLUSION**

The review of 18 scientific studies provides strong evidence supporting the role of foot reflexology as an effective complementary therapy for managing blood pressure during pregnancy. Most notably, foot reflexology has shown a consistent capacity to reduce both systolic and diastolic

blood pressure, particularly in pregnant women diagnosed with gestational hypertension or preeclampsia. Its underlying mechanism appears to involve the stimulation of specific reflex points associated with cardiovascular and endocrine regulation, leading to enhanced autonomic balance and peripheral circulation. In addition to its physiological effects, foot reflexology plays a significant role in reducing psychological stress and anxiety, conditions that are both prevalent during pregnancy and known contributors to elevated blood pressure. Through its activation of the parasympathetic nervous system, reflexology promotes deep relaxation, emotional regulation, and stress hormone modulation. This reinforces its value not only as a circulatory aid but also as a mind-body therapy, contributing to overall maternal well-being. The benefits of foot reflexology are further magnified when combined with other non-pharmacological interventions, such as warm foot soaks and aromatherapy. These combinations have demonstrated synergistic effects that lead to more substantial reductions in blood pressure and improvements in maternal comfort. Comparative studies have shown that reflexology may outperform other relaxation therapies in enhancing quality of life and stabilizing physiological markers in women with mild preeclampsia. Moreover, in high-risk populations such as those with preeclampsia, foot reflexology has been shown to safely lower blood pressure, cortisol levels, and proteinuria without triggering uterine contractions or fetal distress. These findings are especially critical in settings where access to pharmacologic interventions is limited, or when minimizing medication exposure is a priority. Despite a few studies with inconclusive results, the overall evidence base affirms the therapeutic potential of foot reflexology as an adjunct to conventional care in managing hypertensive disorders of pregnancy. Nevertheless, further research with standardized protocols, larger sample sizes, and long-term follow-up is essential to strengthen clinical guidelines and expand its integration into mainstream antenatal care. Integrating reflexology into the training curriculum of midwives and primary health care workers can significantly enhance their capacity to deliver non-pharmacological interventions for managing hypertension during pregnancy, especially in resource-limited settings. By equipping frontline providers with skills in reflexology, health systems can offer safe, low-cost, and accessible alternatives or complements to conventional treatments. This is particularly important for high-risk groups, such as women with preeclampsia, where reflexology has shown potential in reducing blood pressure and stress-related biomarkers without adverse effects on maternal or fetal outcomes. Standardizing this training would promote consistent practice, support holistic maternal care, and reduce reliance on medication, while also empowering communities with self-care strategies.

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