



**EFFECTS OF FOOT REFLEXOLOGY THERAPY ON BLOOD PRESSURE
AND SLEEP QUALITY IN PATIENTS WITH HYPERTENSION:
A QUASI-EXPERIMENTAL STUDY**

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ABSTRACT

Hypertension still remains a major global burden. Sleep disturbances are associated with elevated blood pressure will affect sleep quality. Foot reflexology improves circulation and may reduce blood pressure; however, evidence on its combined effects on blood pressure and sleep quality remains limited. This study examined the effect of foot reflexology on sleep quality and blood pressure. A quasi-experimental time-series pre-post design with a control group was used. A total of 44 respondents in Central Java, Indonesia, were included. For three times a week, the intervention group gave foot reflexology therapy by applying pressure to the Taichong (LR3), Yongchung, and Taixi (KI3) points for 30 to 45 minutes and the control group received conventional therapy on their individual practices. The Pittsburgh Sleep Quality Index (PSQI) was completed after the intervention to measure the sleep quality. The systolic and Diastolic Blood pressure of all the samples was measured by the researcher. Data Analysis was done using Friedman test. The Friedman test showed significant improvement in sleep quality in the intervention group ($p < 0.001$), with no difference in the control group ($p = 0.55$). The intervention group had lower blood pressure than the control group after the third session ($p < 0.001$). Foot reflexology improved sleep quality and reduced blood pressure in patients with hypertension, supporting its use as a complementary intervention in holistic nursing care.

Keywords: complementary therapy; foot reflexology; hypertension; sleep quality

How to cite (in APA style)

Baidhowy, A. S., Safitri, D. N. R. P., Muhibbi, M., Noysipoom, N., & Haryanti, R. P. (2026). Effects of Foot Reflexology Therapy on Blood Pressure and Sleep Quality in Patients with Hypertension: A Quasi-Experimental Study. *Indonesian Journal of Global Health Research*, 8(4), 983–990. Retrieved from <https://jurnal2.globalhealthsciencegroup.com/index.php/IJGHR/article/view/1975>.

INTRODUCTION

Cardiovascular diseases, particularly hypertension, are among the most prevalent conditions in society, with their incidence rising substantially over the past decade (Bays et al., 2021). Hypertension is one of the most prevalent cardiovascular conditions worldwide and remains a major contributor to morbidity and mortality. Over the past three decades, the global prevalence of hypertension among adults aged 30–75 years has increased from 650 million to 1.28 billion and is projected to continue rising, particularly in low- and middle-income countries (Jabani et al., 2021). In Indonesia, hypertension represents a substantial public health burden due to its high prevalence, long-term complications, and impact on healthcare systems and community productivity (WHO, 2021).

Hypertension is associated with sleep disorders, which can result in physical weakness, mental fatigue, muscular tension, aggression, and difficulty achieving restful sleep. These disturbances not only exacerbate hypertension but also contribute to the progression of other conditions such as diabetes, obesity, and coronary artery disease (Asgari et al., 2020; L. Li et al., 2021). Furthermore, hypertension is linked to heightened anxiety, irritability, an increased heart rate, and elevated myocardial oxygen demand. It also affects the levels of various compounds in the body, including cortisol and glucose, which can further disrupt physiological balance (Bagheri-Nesami et al., 2015; Pulopulos et al., 2020).

Sleep disorders can be managed through pharmacological, non-pharmacological (e.g., herbal remedies and bioenergy), and psychological therapies. While pharmacological treatments offer rapid effects, they are associated with potential side effects and long-term health risks, including memory loss, cognitive impairment, amnesia, dementia, drug resistance, dependence, and addiction (Do & Schnittker, 2020). As an alternative, non-pharmacological therapies, although slower in producing results, provide more lasting benefits without the adverse side effects associated with medication. The use of non-drug sleep aids is considered a safer and more sustainable approach to managing sleep disorders (Bagheri-Nesami et al., 2015).

Various non-pharmacological therapeutic approaches have been shown to improve sleep quality, including acupoint massage, progressive muscle relaxation, autogenic relaxation, Benson relaxation, yoga, and foot and back reflexology massage therapy (Cooke et al., 2020; Merdekawati et al., 2021). Additionally, foot reflexology therapy, or acupressure, is an effective non-pharmacological intervention for managing hypertension, as it can help lower blood pressure. This nursing intervention is simple, cost-effective, and free from side effects, making it accessible to individuals, even if the acupoints are not precisely targeted (Chen et al., 2019; Restawan et al., 2023).

Foot reflexology therapy has been shown to alleviate pain by activating the pain gate control mechanism and nerve impulse theory, as well as by increasing the secretion of endorphins and enkephalins, which enhance blood vessel elasticity and improve circulation. Additionally, foot massage can stimulate a reduction in sympathetic nervous system activity, thereby lowering blood pressure (Jing et al., 2022a). Foot reflexology is scientifically defined as the stimulation of specific areas on the hands and feet that correspond to various glands, organs, and body systems. Proper stimulation of these reflex points can have beneficial effects on health and help prevent disease (Lindquist et al., 2018). The mechanism of foot reflexology is believed to promote energy balance in the body through the autonomic nervous system. Furthermore, foot reflexology has been found to alleviate several psychological symptoms, including anxiety and muscle tension, enhance mood, improve sleep quality, and provide a sense of comfort (Nathenson & Nathenson, 2017).

Research on reflexology for lowering blood pressure is essential, as it not only offers therapeutic benefits and enhances comfort for hypertensive patients, but also improves their overall quality of life. Further investigation is needed to understand how foot reflexology therapy can impact blood pressure and sleep quality in relation to the issues mentioned above. The present study explores the effects of foot reflexology therapy on sleep quality and blood pressure, with the hypothesis that foot reflexology therapy improves sleep quality and reduces blood pressure.

METHOD

This study employed a quasi-experimental design with a pretest-posttest approach and a control group, reported in accordance with the TREND guidelines. A quasi-experimental approach was selected due to practical constraints on randomization and to allow repeated measurements for evaluating changes in blood pressure and sleep quality over time. The objective was to assess the effect of foot reflexology on sleep quality and blood pressure. The study was conducted in Central

Java, Indonesia. The study population consisted of individuals with hypertension, with a total of 44 respondents divided into control and intervention groups. The inclusion criteria were individuals aged over 50 years, diagnosed with primary hypertension, and having a systolic blood pressure greater than 140/90 mmHg.

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated instrument with established reliability. The PSQI, originally constructed by Busyee et al., (1989) assesses subjective sleep quality and disturbances experienced in the previous month. The Indonesian version of the PSQI has undergone psychometric testing and demonstrated satisfactory validity and reliability. Previous validation studies (Setyowati A, 2021.) Reported that all PSQI components showed significant item–total correlations ($r = 0.30\text{--}0.70$), indicating good construct validity. Furthermore, the Indonesian PSQI demonstrated good internal consistency reliability, with a Cronbach's alpha coefficient ranging from 0.72 to 0.83, exceeding the acceptable threshold of 0.70. Test–retest reliability was also reported to be adequate ($r = 0.63\text{--}0.79$), indicating stability of the instrument over time. These findings confirm that the Indonesian version of the PSQI is a valid and reliable instrument for assessing sleep quality in this population. The intervention group received foot reflexology therapy, which involved applying pressure to the Taichong (LR3), Yongchong, and Taixi (KI3) points for 30 to 45 minutes, three times for a week. The massage was performed by tensing and stretching the foot using the thumb, moving from one point to another. After the reflexology session, respondents were instructed to relax for a few minutes, after which their hemodynamic parameters were measured. The control group received conventional therapy according to their individual practices. Blood pressure and sleep quality were measured at baseline and after each intervention session. Data collection followed a structured timeline, and quality control was ensured through enumerator training that had been certified and standardized measurement procedures. All data were anonymized and securely stored.

Bivariate analysis was conducted using repeated measures ANOVA, as measurements were taken three times: during intervention 1, intervention 2, and intervention 3, all within a one-week period every 2 days. Normality of the data was assessed using the Shapiro-Wilk test. Since the variables in this study were not normally distributed, repeated measures ANOVA was not applicable, and the Friedman test was used as an alternative. To identify which specific groups exhibited significant differences, Post-Hoc analysis was performed using the Friedman test. Ethical approval was obtained from the Ethics Committee of Universitas Muhammadiyah Semarang (No. 045/KEPK/XII/2022). The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants, and confidentiality was strictly maintained.

RESULT

Tabel 1.
Characteristic of respondents based on Gender, education, and history disease

Characteristics	Group	f	%
Gender	Male	17	38,6
	Female	27	61,4
Education level	Elementary school	25	57,1
	Junior high school	1	2,4
	Senior high school	9	21,4
	No Education	8	19,0
Comorbidity	Diabetes	18	40.9
	Hypertension	20	45.5
	None	6	13.6

Table 1 shows that most respondents were female (61.4%), had elementary education (57.1%), and a history of hypertension (45.5%). The intervention and control groups were homogeneous regarding age, sleep quality, systolic, and diastolic blood pressure, with $p\text{-values} > 0.05$ (Table 2).

Table 2.
Homogeneity of the intervention group and control group

Variables	Group	n	Mean	SD	Median	P-value
Age (y/o)	Intervention	22	67	5.0	56	0.16
	Control	22	65	3.6	56	
Sleep Quality	Intervention	22	4.1	1.4		0.26
	Control	22	3.6	1.4		
Systolic (mmHg)	Intervention	22	165	8.2		0.50
	Control	22	166	8.9		
Diastolic (mmHg)	Intervention	22	91	3.5		0.34
	Control	22	92	3.4		

Intervention measurements showed significant improvements in sleep quality ($p = 0.01$) and reductions in systolic and diastolic blood pressure ($p = 0.01$) in the intervention group, with no significant changes observed in the control group ($p = 0.55$ and $p = 0.48$, respectively). A comparison of these changes between the two groups is presented in Table 3.

Table 3.
Differences in sleep quality, systolic and diastolic blood pressure after foot reflexology in the intervention group and control group were analyzed using ANOVA

Variable	Intervention		p	Control		P
	SD (min-Max)	Mean		SD (min-Max)	Mean	
Sleep quality						
1 st Intervention	1.4(2-8)	4.1	0.01	1.4(2-7)	3.6	0.55
2 nd Intervention	1.2(2-7)	3.7		0.9(3-6)	3.7	
3 rd Intervention	1.0(2.6)	3.2		1.2(2-7)	3.9	
Systolic						
1 st Intervention	8.2 (150-180)	165	0.01	8.9(150-180)	166	0.48
2 nd Intervention	8.7(145-175)	160		9.6 (145-180)	165	
3 rd Intervention	6.7(145-170)	154		9.5(140-175)	165	
Diastolic						
1 st Intervention	3.5(87-89)	91	0.04	3.4 (88-98)	92	0.35
2 nd Intervention	5.9(80-100)	85		4.2(80-97)	92	
3 rd Intervention	7.0 (80-100)	87		5.4(80-97)	91	

DISCUSSION

Hypertension is a prevalent condition among the elderly population. In this study, the average age of respondents was 66 years, with a minimum age of 60 years and a maximum age of 79 years. Several respondents reported experiencing common symptoms of hypertension, such as fatigue, difficulty sleeping, dizziness, anxiety, and chest pain. Preventive measures to reduce or stabilize blood pressure include following a low-salt diet, consuming fruits and vegetables, maintaining physical activity, avoiding smoking, limiting alcohol consumption, and reducing the intake of fast food and fatty foods (Ojangba et al., 2023). However, many respondents had not implemented these measures. Additionally, most respondents had not taken steps to stabilize their blood pressure, and none were aware of the potential benefits of foot reflexology in helping to reduce and stabilize blood pressure.

Foot reflexology therapy has been shown to significantly enhance sleep quality, as well as reduce systolic and diastolic blood pressure (Bagheri-Nesami et al., 2015). Its impact is particularly pronounced in improving sleep quality, with key factors influencing these outcomes including the targeted acupressure points, the intensity of application, and the duration of the intervention. Patients frequently report a sense of relaxation following foot reflexology therapy.

While changes in sleep patterns are a common occurrence in older adults, prolonged disruptions can escalate into sleep disorders. Foot reflexology has been found to stimulate and enhance blood circulation in the feet and throughout the body, alleviate muscle tension, improve both blood and lymphatic circulation, reduce blood pressure, and increase overall body flexibility. These physiological effects collectively facilitate relaxation, contributing to improved sleep quality (Kang et al., 2022). The observed improvements in circulation are primarily attributed to the release of histamine, which induces vasodilation, thereby enhancing oxygen delivery to cells throughout the body. This enhanced circulation exerts a calming, relaxing, and rejuvenating effect on the body, effectively reducing anxiety (Nina et al., 2022).

Foot reflexology is a non-pharmacological intervention involving the application of manual pressure to specific areas of the feet that are hypothesized to correspond with internal organs and physiological systems. Unlike acupuncture, reflexology does not involve needle insertion but relies on tactile stimulation, which may activate peripheral nerve endings and influence central autonomic regulation. Contemporary evidence suggests that its effects are mediated through modulation of the autonomic nervous system, particularly by reducing sympathetic activity and enhancing parasympathetic responses, thereby promoting relaxation and improving hemodynamic parameters. A recent meta-analysis of randomized controlled trials reported that foot reflexology was associated with modest but statistically significant reductions in systolic and diastolic blood pressure, as well as heart rate, indicating its potential role as an adjunctive therapy in cardiovascular management (Jing et al., 2022).

Foot reflexology therapy stimulates the release of neurological mediators and nerve hormones, leading to an increase in endorphins in the brain. This promotes muscle relaxation, reduces pain, and enhances comfort, thereby improving sleep quality ((Reza et al., 2019). Significant changes were also observed in the systolic and diastolic blood pressure of the intervention group. However, while these changes were notable, the reduction in blood pressure was modest, which may be attributed to insufficient precision in targeting the reflexology points (W. H. C. Li et al., 2016). The reflexology points emphasized during the intervention were Taichong (LR3), Yongchung, and Taixi (KI3) (Chen et al., 2019; Kotruchin et al., 2021; Restawan et al., 2023).

Foot reflexology able influencing hemodynamics. It can produce relaxation which causes the emergence of a complex neuro humoral response in The Hypothalamic-Pituitary Axis (HPA) to the circuit through neural pathways. HPA will secrete cortisol and endorphin hormones which can reduce the activity of the sympathetic nervous system causing vasodilation of blood vessels so that blood pressure can decrease until it stabilizes (Karimah et al., 2024)(Can Çiçek et al., 2022). In addition, more precise application of foot reflexology can improve quality of life by reducing fatigue and pain (Lindquist et al., 2018).

The findings of this study indicated that the experimental group experienced a significant improvement in overall sleep quality, whereas no similar improvement was observed in the control group. These results are consistent with those of (Chen et al., 2019), who found that foot reflexology can positively impact sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbances. Foot reflexology may promote the release of dopamine and serotonin, elevate GABA neurotransmitter activity, and reduce insomnia. Additionally, the neurotransmitter melatonin plays a critical role in regulating sleep quality. By enhancing blood oxygenation and maintaining homeostasis, foot reflexology contributes to improved sleep quality (Aygin & Şen, 2019; Faradhila et al., 2022; Waits et al., 2018; Zhou et al., 2012).

CONCLUSION

The findings support the use of foot reflexology as a complementary intervention for patients with hypertension, particularly those with a lack of sleep quality. Nurses may integrate this therapy into

routine supportive care to promote relaxation, improve sleep, and assist blood pressure management alongside standard treatment. Given its low cost and feasibility, foot reflexology can be applied in community and primary care settings, with institutional support through basic training and inclusion in holistic nursing care protocols.

Foot reflexology therapy was associated with improved sleep quality and modest reductions in blood pressure among patients with hypertension, supporting its potential role as a complementary nursing intervention. Although the decrease in blood pressure was limited, the findings indicate that foot reflexology may enhance relaxation and autonomic regulation when applied as an adjunct to standard care. This study contributes incremental evidence for the integration of low-cost, non-pharmacological foot reflexology into holistic nursing practice, particularly in resource-limited settings.

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