

## THE EFFECTIVENESS OF ACUPRESSURE AT THE LR3, KI3, SP6, ST36, AND SP10 POINT ON ANKLE BRACHIAL INDEX VALUES IN PATIENTS WITH DIABETES MELLITUS

Muhammad Anis Taslim<sup>1</sup>, Dhanang Efendi<sup>2</sup>, Madyo Adrianto<sup>3</sup>

<sup>1,2</sup> Bachelor of Nursing, Universitas Telogorejo Semarang, Indonesia

<sup>3</sup> Bachelor of Pharmacy, Universitas Telogorejo Semarang, Indonesia

Corresponding author: [anistaslim.at@gmail.com](mailto:anistaslim.at@gmail.com)

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### Abstract

**Background:** Type II Diabetes Mellitus (DM) is a chronic metabolic disease that can cause long-term complications, including peripheral artery disease, which can be detected through the Ankle Brachial Index (ABI) examination. Non-pharmacological management, such as acupressure and warm water immersion, serves as a potential complementary therapy to improve ABI scores. **Objective:** This study determined the difference in ABI values after administering acupressure and warm water immersion therapies to type II DM patients. **Method:** The researches used a quasi-experimental design with a pretest-posttest approach and two intervention groups: acupressure and warm water immersion. A total of 76 respondents participated. The researches analyzed the data using the paired t-test and independent samples t-test. **Results:** The paired t-test results showed a significant increase in ABI values after both acupressure ( $p = 0.001$ ) and warm water immersion ( $p = 0.000$ ). The independent samples t-test results indicated no significant difference existed between the two. **Conclusion:** These interventions can serve as alternative non-pharmacological therapies to improve peripheral blood circulation in DM patients.

## BACKGROUND

Diabetes mellitus is a long-term metabolic disorder characterized by high blood sugar levels (hyperglycemia). This condition occurs due to impaired insulin production, a decreased response to insulin, or a combination of both (Taslim et al., 2023). A person can be diagnosed with diabetes if their fasting blood glucose level reaches more than 126 mg/dL or exceeds 200 mg/dL on a random blood glucose test (Sanatang & Syarif, 2022).

Diabetes mellitus is a disease with a steadily increasing incidence year after year and is now a global health issue. Based on data from International Diabetes Federation (IDF), the global number of diabetes cases is predicted to reach 642 million in 2030 and increase to 783 million in 2045 (IDF, 2024). The number of diabetes mellitus (DM) cases in Indonesia in 2023 was recorded at 19.74 million and is expected to increase to 21.3 million in 2030. This data places Indonesia in fifth place in terms of the number of DM cases in 2023 (IDF, 2024). This data aligns with the results of Indonesian Health Survey (SKI) In 2023, the incidence of diabetes mellitus in Indonesia for all ages based on doctor's diagnosis was reported at 877,531 people.

Corresponding Author:

Muhammad Anis Taslim

Email: [anistaslim.at@gmail.com](mailto:anistaslim.at@gmail.com)

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High glucose levels can lead to complications involving both large (macrovascular) and small (microvascular) blood vessels. Macrovascular complications of diabetes mellitus include coronary heart disease and peripheral vascular disease. Microvascular complications include diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy (Irfan & Israfil, 2020). The most common complication of diabetes mellitus is peripheral vascular disease, or Peripheral Arterial Disease (PAD). This condition occurs due to narrowing of the peripheral arteries caused by the accumulation of fatty plaque (atherosclerosis) in the walls of the arteries. This often occurs in the lower extremities, reducing blood flow to the legs and feet (American Heart Association, 2024).

The ABI test is a simple, non-invasive screening method for detecting clinical signs of decreased peripheral perfusion, which may indicate circulatory disorders such as Peripheral Arterial Disease (PAD) in the lower limbs (Susilo et al., 2021). Another non-pharmacological therapy that can be used to manage DM is complementary therapy. Complementary medicine, also known as Complementary and Alternative Medicine (CAM) Various types of CAM are used by people with diabetes mellitus, including acupuncture, massage, herbal medicine, prayer therapy, hydrotherapy, diet-based therapy, relaxation, and manipulation techniques (Susanti & Indriastuti, 2020). Acupressure and warm foot soak therapy are part of the complementary therapy that is effectively used to help improve the value of Ankle Brachial Index (ABI) in patients with diabetes mellitus.

Research (Harefa & Gulo, 2023) has shown that acupressure, a non-pharmacological method, has been proven effective in slowing the progression and preventing complications associated with type 2 diabetes. This method is considered the most effective alternative therapy for diabetes management compared to other therapies. The results of this study indicate that acupressure has been shown to be effective in lowering blood glucose levels and plays a role in reducing the risk of various complications caused by diabetes mellitus.

Soaking your feet in warm water is one method that can be used to improve blood flow. This therapy works through vasodilation, or vascular widening, which ultimately improves blood circulation and reduces the risk of edema (Maryama et al., 2021). Foot soak therapy involves immersing your feet 10-15 cm above the ankles in water between 30-37°C as a simple intervention to improve blood circulation. For people with diabetes, soaking your feet in warm water aims to strengthen the integrity of peripheral tissues, reduce symptoms of acute and chronic pain, maintain foot hygiene, and identify any abnormalities that can be identified through the feet (Andarni & Nugroho, 2021).

The selection of these two interventions was driven by a desire to find a more effective approach to improving peripheral circulation and quality of life for patients, which are often hampered by vascular complications in diabetes. As nurses, acting as patient advocates, we are responsible for selecting interventions that are not only safe but also provide maximum benefit to the patient. Therefore, in choosing between acupressure and warm water immersion, this study focused on providing a more effective intervention than the existing one to provide safe care, minimize risks, and improve desired outcomes, particularly in terms of ABI values.

## **METHODS**

This research is a quantitative research, the research design uses *quasy experimental*. The form of this research design uses *pre-post test with control group design* where the research was divided into two groups, namely the intervention group and the control group. The population in this study were patients inpatients diagnosed with Diabetic Foot Ulcer. The sampling technique in this study uses *accidental sampling*.

Data analysis using *Paired T Test* To determine the difference in ABI before and after (pre-test and post-test), acupressure and warm foot soaks were administered to each group. Next, a statistical test was conducted. *Unpaired T Test* to determine the difference in ABI before and after acupressure and warm water foot soaks were given to two different groups.

**RESULT AND DISCUSSION**

Data presentation consists of univariate analysis—specifically ABI levels presented in frequency distribution tables—and bivariate analysis, comprising a Paired T-test to assess the effectiveness of acupressure in the intervention group and warm water soaks on ABI in the control group, as well as an Unpaired T-test to determine the difference in effectiveness between the two groups.

**Ankle-Brachial Index (ABI) Values Before and After Acupressure**

Table 4. 1  
Pre- and post-acupressure ABI values in patients with type 2 diabetes mellitus (n=38)

	Mean	Min	Maks	Std Deviasi
Pre Test	1.03	0.71	1.26	0.134
Post Test	1.09	0.80	1.27	0.112

Several studies have shown that the average ABI value before acupressure therapy generally shows a decrease from the normal range, with an average ABI value ranging from 0.84 to 0.85. This value indicates decreased blood flow to the lower extremities due to vascular complications in people with diabetes (Oktasari & Khorini, 2025). A decreased ABI value reflects impaired blood flow in the lower extremities, a condition often found in people with diabetes due to vascular complications such as peripheral artery disease (PAD). Low ABI values are often associated with the appearance of PAD symptoms, such as pain at rest and even gangrene in more severe cases (Sukriyadi et al., 2021). ABI values before acupressure can be influenced by various vascular and metabolic risk factors, including diabetes, high blood pressure, lipid disorders, smoking habits, lack of physical activity, the presence of PAD symptoms, and inflammatory conditions that impede peripheral blood flow. Therefore, acupressure therapy is intended to help improve blood circulation that is impaired due to these factors (Rahayu, 2022).

ABI values in diabetes mellitus patients after acupressure therapy increased significantly compared to pre-intervention values. In several studies, the average ABI value of DM patients, which was previously in the range of 0.84-0.87, increased to around 0.90-0.98 after several sessions of acupressure therapy (Deby & Windiarti, 2025). This increase indicates improvements in peripheral blood circulation, particularly in the lower extremities, as a result of stimulation of acupressure points that stimulate blood flow and autonomic nervous system function (Sujati et al., 2024).

**Ankle-Brachial Index (ABI) Values Before and After Warm Water Soaking**

Table 4. 2  
Pre- and post-warm water immersion ABI values in type 2 diabetes patients (n=38)

	Mean	Min	Maks	Std Deviasi
Pre Test	0.992	0.58	1.22	0.157
Post Test	1.137	0.96	1.13	0.102

According to several studies on the use of physical therapy in diabetes patients, the average ABI value before intervention, including warm water immersion as a form of physical therapy aimed at improving blood circulation, was around 0.808. This figure indicates a fairly serious impairment of blood perfusion to the lower extremities, as it was below the normal threshold (Awalin et al., 2020). Physiologically, diabetes mellitus patients before undergoing warm water immersion therapy generally experience stiffness and narrowing of blood vessels due to atherosclerosis, accompanied by impaired tissue metabolism. This condition impacts poor blood circulation in the peripheral area, which often causes complaints of pain and discomfort in the feet (Deski & Yendrial, 2024).

After being immersed in warm water, ABI values increased. Warm water helps improve blood flow. Furthermore, the pressure in the water also plays a role in strengthening muscles and ligaments that affect joints. Soaking a body part in warm water can help improve blood flow, reduce swelling, and relax muscles.

This is because the heat stimulates vasodilation, which contributes to improved blood circulation (Maryama et al., 2021).

### The Effect of Acupressure Therapy on ABI Values in Type 2 Diabetes Mellitus Patients

Table 4. 3  
Data analysis of the effect of acupressure therapy on ABI values in Type 2 diabetes mellitus patients (n=76)

Variabel	N	Mean	Std Deviation	P value
Pre-Acupressure	38	1.030	0.13412	0.001
Post-Acupressure	38	1.097	0.11257	

This finding is in line with a study conducted by Olivia et al., (2020) on 34 respondents, where the results showed that providing acupressure interventions could increase ABI values in type 2 DM patients with values  $P=0.000$ . Similar results are also supported by research by Saputra et al., (2023), which found that acupressure can lower blood pressure with the aim of providing a relaxing effect on the body. Acupressure stimulation can trigger mast cell activity, which then releases histamine as a mediator in the blood vessel process (vasodilation), resulting in increased blood flow and a feeling of greater comfort.

Acupressure therapy helps improve ABI values in diabetes patients by improving blood flow to the feet. Key acupuncture points, such as LR3, KI3, SP6, ST36, and SP10, are located on the legs and feet and are known to be part of the meridian pathway rich in nerve endings and blood vessels. When pressure is applied to these points, the autonomic nervous system and sensory receptors are stimulated, which then triggers the release of vasoactive substances such as *Calcitonin Gene-Related Peptide* (CGRP) and Substance P. The release of these substances helps increase blood vessel dilation and improve circulation to the lower extremities (Tessa et al., 2020).

### The effect of warm water immersion therapy on ABI values in Type 2 diabetes mellitus patients

Table 4.4  
Data analysis of the effect of warm water immersion therapy on ABI values in Type 2 diabetes mellitus patients (n=76)

Variabel	N	Mean	Std Deviation	P value
Pre-Warm water	38	0.9921	0.15715	0.000
Post-Warm water	38	1.1379	0.10223	

This finding is in line with the research results of Maryama et al., (2021), which also showed a significant effect of warm water immersion therapy on ABI values with values  $p$  value of 0.001. Furthermore, these results are supported by a case study by Astutik & Mariyam (2021), who found a decrease in blood pressure after three days of warm water immersion therapy, namely a decrease in systolic blood pressure of 7.21 mmHg and diastolic blood pressure of 1.1 mmHg.

Warm water immersion therapy aims to improve blood circulation to the lower extremities through vasodilation, the widening of blood vessels caused by exposure to warm temperatures. Vasodilation helps improve peripheral blood flow impaired by vascular complications such as atherosclerosis, which is common in diabetes. Furthermore, the warmth of this therapy can relax tense muscles, thereby reducing pain and discomfort in the legs. Several studies have also reported that warm water immersion can have systemic effects, such as improving blood pressure and blood glucose levels, which contribute to the stability of the patient's metabolic condition. Therefore, warm water immersion therapy has the potential to

be an effective physical modality in helping to address impaired peripheral perfusion in patients with type 2 diabetes (Nur et al., 2022).

**Differences in ABI values following the administration of acupressure and warm water soaks in Type 2 diabetes patients.**

Table 4. 5  
*Analysis of Differences in ABI Values Following Acupressure and Warm Water Soaking in Type 2 Diabetes Mellitus Patients (n=76)*

Variabel	N	Nilai ABI		P Value
		Mean	Standar Deviasi	
Acupressure	38	1.097	0.11257	0.259
Warm water immersion	38	1.137	0.10223	

The absence of significant differences between the acupressure and warm water immersion groups can be explained by the physiological mechanisms of action of both interventions, which essentially have similar therapeutic effects: increasing peripheral blood flow. Acupressure therapy is performed by applying pressure to specific points associated with the autonomic nervous system and increasing the release of neurotransmitters and endocrine hormones that support smooth muscle relaxation and blood vessel dilation, thereby improving tissue perfusion (Restawan, 2023). One important factor in implementing acupressure therapy is the strength of the applied pressure. Differences in pressure intensity can affect the physiological effectiveness of therapy on the vascular system, including improving the Ankle Brachial Index (ABI) in patients with type 2 diabetes (Komariah et al., 2021). Too light pressure may not sufficiently stimulate the acupressure points, thus decreasing the effectiveness of the therapy. Conversely, too strong pressure can cause discomfort and potential tissue injury, which can compromise the therapeutic outcome (Nurahmasari & Septiany, 2024).

Meanwhile, warm water immersion works through a thermal effect that increases peripheral tissue temperature. This increase in temperature stimulates vasodilation of blood vessels, reduces blood viscosity, and increases blood flow to the lower extremities. Increased blood supply leads to increased tissue perfusion, which can indirectly increase ABI values (Nurpratiwi & Novari, 2021). However, it's important to note that several confounding factors can influence these results. One possible factor is temperature and immersion duration. Water temperatures that are too hot or too warm can cause varying degrees of vasodilation. Meanwhile, inconsistent immersion durations can potentially lead to inconsistent hemodynamic effects among respondents (Ugwu & Anyanwu, 2021).

Body position during ABI measurement also affects the obtained value. Ideally, ABI measurements are taken in a supine position, but sitting or standing can alter peripheral blood pressure and affect the value (Danieluk & Chlabicz, 2021). In DM patients, various long-term complications can impact the effectiveness of complementary therapies such as acupressure and warm water immersion. One cause is chronic complications, particularly blood vessel disorders (macrovascular) and peripheral nerve damage (neuropathy). According to research by Rifat et al., (2023), the most common complications experienced by DM patients are cardiovascular system disorders. This can certainly impact ABI values in respondents receiving treatment.

**CONCLUSIONS AND RECOMMENDATION**

**Conclusion**

Based on a comparative analysis of acupressure therapy and warm water soaks regarding ABI values in type 2 diabetes patients at Plombokan Village, a p-value of 0.259 (>0.05) was obtained. This indicates no significant difference between the two therapies in improving ABI values. Thus, both acupressure and warm water soaks offer comparable potential benefits in helping to improve blood circulation in patients with type 2 diabetes.

## Recommendation

Future researchers are advised to use a larger sample size to optimize statistical power in detecting potential differences; additionally, the findings of this study can serve as a reference regarding acupressure and warm water soak nursing interventions, providing a basis for future research into the most effective frequency and duration for improving ABI values in patients with type 2 diabetes mellitus.

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