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Warm water immersion to reduce hypertension among elderly

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Abstract
Hypertension is a cardiovascular disease characterized by elevated blood pressure. However, studies on the use of water immersion to reduce hypertension are scarce in the literature. Therefore, this study aims to provide an overview of the application of warm water foot soaks with a mixture of salt to reduce blood pressure in elderly individuals with hypertension. The research design for this study utilizes a case study approach with purposive sampling. The author systematically observed hypertension patients and collected factual data. A sample of elderly patients with stage 1 hypertension, aged 56 years, was selected. Data was collected through observation, interviews, and documentation. This study indicates that warm water foot soak therapy with a mixture of salt can reduce both systolic and diastolic blood pressure after 6 sessions, with each session lasting 15–20 minutes. The application of warm water foot soaks with a mixture of salt can lower blood pressure due to the dilation of blood vessels, which reduces muscle tension and increases tissue metabolism. Warm water foot soaks with a mixture of salt appear to be an effective method for reducing blood pressure in elderly patients with hypertension. Further research is recommended to explore this therapy's long-term benefits and potential applications.

Keywords: Health innovation; healthcare professionals; complementary therapy for hypertension; warm water soak; chronic illness.

Introduction

Hypertension, commonly referred to as high blood pressure, is a medical condition characterized by the persistent elevation of the force exerted by circulating blood upon the walls of the arteries (Oparil et al., 2018). This condition is typically defined by a systolic blood pressure reading of 130 mm Hg or higher and/or a diastolic blood pressure reading of 80 mm Hg or higher, as per the guidelines set by the American Heart Association (Gabb, 2020). Hypertension is a significant health concern because it often remains asymptomatic until it progresses to more severe stages, making it known as the "silent killer" (Fatima & Mahmood, 2021). The underlying pathophysiology involves complex interactions between genetic, environmental, and lifestyle factors that contribute to increased vascular resistance and subsequent strain on the cardiovascular system. The basic mechanisms contributing to hypertension include the narrowing and hardening of the arteries, known as atherosclerosis, which increases the resistance against which the heart must pump blood (Nakanishi et al., 2017). This increased workload leads to hypertrophy of the cardiac muscle and eventually compromises the heart's efficiency. Additionally, the kidneys play a crucial role in regulating blood pressure through the renin-angiotensin-aldosterone system (RAAS) (Hsu & Tain, 2021). Dysregulation of this system can result in excessive retention of sodium and water, further elevating blood pressure. Hormonal imbalances, obesity, sedentary lifestyle, high salt intake, and chronic stress are also significant contributors to the development and progression of hypertension (Mills, Stefanescu, & He, 2020). Long-term uncontrolled hypertension has profound implications for overall health, increasing the risk of serious complications such as heart attack, stroke, heart failure, and kidney disease. It can also lead to damage to the blood vessels of the eyes, resulting in vision loss, and contribute to cognitive decline.

Hypertension is a prevalent global health issue, affecting approximately 1.13 billion people worldwide (Pallarés-Carratalá et al., 2023). The World Health Organization (WHO) estimates that nearly 1 in 4 men and 1 in 5 women have hypertension (Mills, Stefanescu, & He, 2020). The prevalence of hypertension varies significantly across different regions due to diverse genetic, environmental, and lifestyle factors. In low- and middle-income

countries, the prevalence is rising rapidly due to urbanization, dietary changes, and increasing obesity rates. In Europe, the prevalence of hypertension is high, affecting about 30-45% of the adult population. Central and Eastern Europe, in particular, have some of the highest rates of hypertension in the world, attributed to factors like high salt intake, obesity, and low levels of physical activity (NCD Risk Factor Collaboration (NCD-RisC), 2021). In the Middle East, the prevalence is also significant, with estimates suggesting that around 25-30% of adults are affected. This is driven by lifestyle changes, urbanization, and a high prevalence of obesity and diabetes (Okati-Aliabad, Ansari-Moghaddam, Kargar, & Mohammadi, 2022). Asia, home to the largest portion of the global population, has a varied prevalence, with countries like China and India experiencing substantial burdens of hypertension, affecting around 27% and 30% of adults respectively (Mohammed Nawi et al., 2021). Rapid economic growth, urbanization, and lifestyle changes, including dietary shifts and reduced physical activity, contribute to the rising hypertension rates in these regions **(Figure 1)**.

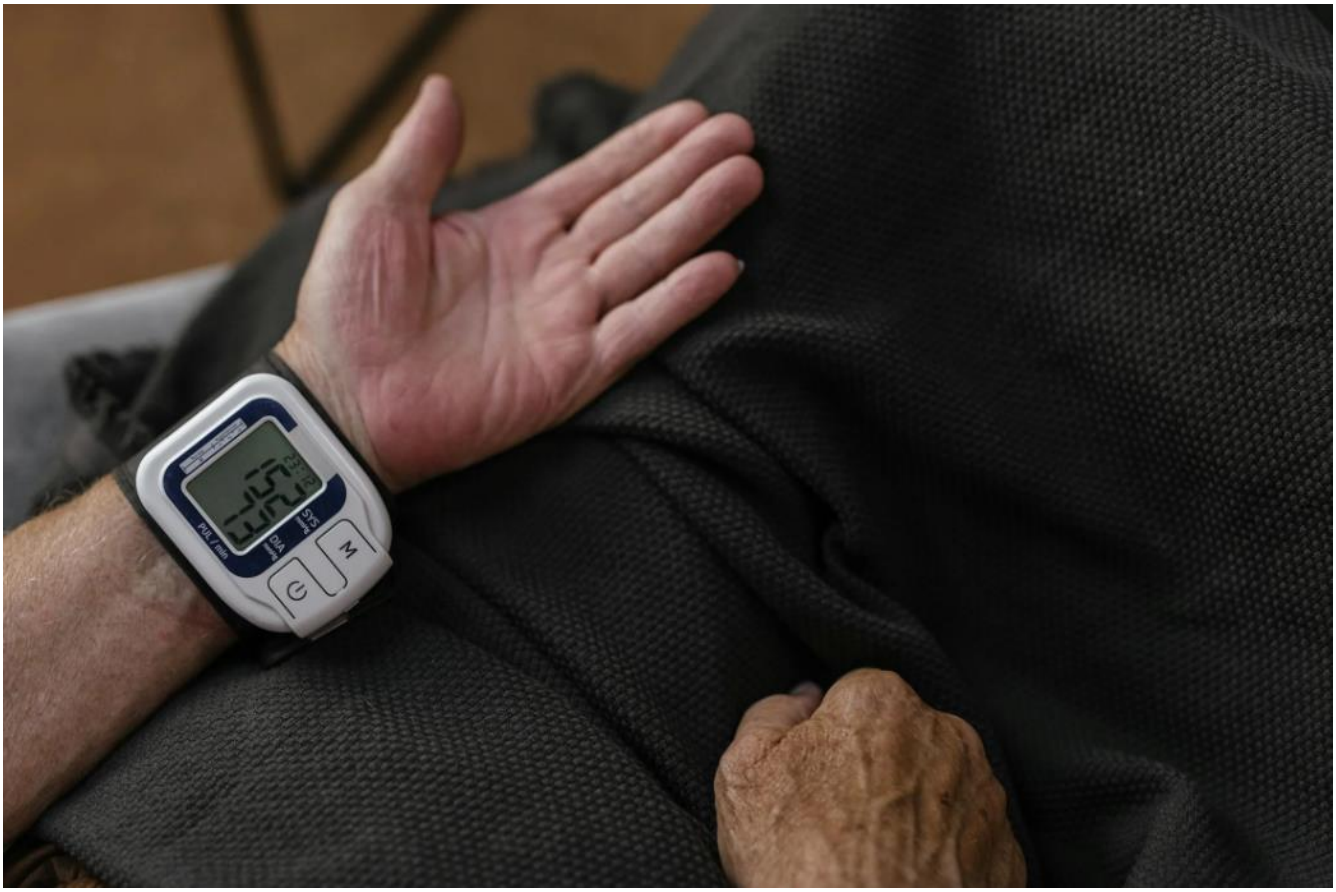

Figure 1. Illustration of hypertension (*Courtesy of pexels.com*).

Effective self-management of hypertension is crucial in maintaining optimal blood pressure levels and reducing the risk of cardiovascular complications (Konlan & Shin, 2023). Central to this approach is the adoption of a heart-healthy lifestyle, which includes a balanced diet rich in fruits, vegetables, whole grains, lean proteins, and low-fat dairy products, while minimizing the intake of sodium, saturated fats, and added sugars (Ahmadi et al., 2019). The Dietary Approaches to Stop Hypertension (DASH) diet is particularly recommended for its proven benefits in lowering blood pressure. Regular physical activity is equally important; engaging in at least 150 minutes of moderate-intensity exercise, such as brisk walking, cycling, or swimming, per week can significantly improve cardiovascular health and aid in weight management. Moreover, maintaining a healthy weight, limiting alcohol consumption, and abstaining from tobacco use are critical components of self-management that contribute to overall cardiovascular wellness (Nicoll & Henein, 2010). Monitoring blood pressure at home is another vital aspect of self-management, enabling individuals to track their progress and detect any significant changes that may require

medical attention. Utilizing home blood pressure monitors provides valuable data that can be shared with healthcare providers, facilitating informed decision-making regarding treatment plans. Stress management techniques, such as mindfulness meditation, deep breathing exercises, and yoga, can also play a significant role in controlling blood pressure by reducing the physiological impact of stress (Spruill, 2010). Also, using complementary therapy such as warm water immersion may help in hypertension care.

Warm water immersion has emerged as a potential method for reducing hypertension, leveraging the therapeutic benefits of water on the cardiovascular system (Kjertakov & Petersen, 2022). Immersing the body in warm water causes vasodilation, where blood vessels widen, which can lead to a temporary reduction in blood pressure. This process helps to alleviate the strain on the heart as it pumps blood through the expanded vessels. Furthermore, the warmth and buoyancy of the water promote relaxation, reducing stress and muscle tension, both of which are contributing factors to high blood pressure. Studies have shown that even short sessions of warm water immersion can result in noticeable decreases in both systolic and diastolic blood pressure, offering a non-pharmacological approach to hypertension management (Shah et al., 2019). In addition to its immediate effects, warm water immersion can improve overall circulation and enhance tissue perfusion, contributing to long-term cardiovascular health (Cider, Sveälv, Täng, Schaufelberger, & Andersson, 2006). Regular sessions can support better management of blood pressure by continually promoting vasodilation and relaxation. However, it is essential to consider the individual's overall health and any existing medical conditions before incorporating warm water immersion into their routine. Patients with severe cardiovascular issues or certain medical conditions should consult with their healthcare provider to ensure the safety and appropriateness of this therapy. While warm water immersion is not a substitute for traditional hypertension treatments, it can serve as a complementary strategy, aiding in the holistic management of blood pressure. Despite the promising findings regarding the use of warm water immersion for reducing hypertension, several gaps exist in the current body of research. Many studies have focused on the immediate effects of warm water immersion, often examining short-term changes in blood pressure during or immediately after the immersion sessions. In addition, there is a lack of a case study that assess the sustained impact of regular warm water immersion on blood pressure and overall cardiovascular health. The duration, frequency, and optimal temperature for these sessions have not been standardized, leaving a significant gap in understanding the best practices for implementing this therapy as part of a long-term hypertension management plan. Moreover, the underlying mechanisms through which warm water immersion influences blood pressure are not fully understood. While vasodilation and relaxation are acknowledged as key factors, more detailed studies are needed to explore the physiological and molecular changes that occur during and after immersion. Addressing these gaps could provide a more comprehensive understanding of the potential benefits and limitations of warm water immersion for hypertension and guide the development of evidence-based guidelines for its use in clinical practice.

Method

In this study, the author employs a descriptive case study method to provide a comprehensive depiction of existing phenomena, such as activities, characteristics, changes, relationships, similarities, and differences among various phenomena (Alsaywid & Abdulhaq, 2019; Sun, 2013). This method allows for an in-depth understanding of the subject matter. Specifically, the researcher focuses on a single respondent diagnosed with Hypertension to illustrate the application of warm foot soaks with a salt mixture aimed at reducing blood pressure in elderly individuals suffering from this condition. The intervention was administered over six visits, with each session lasting between 15-20 minutes. This approach helps to capture detailed observations and outcomes related to the effectiveness of the therapy. The study meticulously outlines various aspects of the case study, including the subject of the case study, the primary focus, the instruments utilized, the location and duration of the research, as well as the methods for data analysis and presentation. To ensure a thorough understanding and reliable results, the researcher established specific criteria for selecting respondents. The criteria included male patients aged 50-60 years, diagnosed with stage 1 hypertension with blood pressure readings exceeding 150 mmHg. Additionally, only patients who were willing and consented to undergo the warm foot soak therapy with a salt mixture, and who had not previously received such therapy, were included in the study.

Data collection was conducted through a combination of interviews and direct observations, allowing for a comprehensive gathering of information. The observations included detailed client data and physical examinations performed directly on the respondents, along with the administration of patient interventions. To ensure a

structured and thorough data collection process, the researcher utilized the NANDA 13-domain assessment format. This instrument facilitated a systematic approach to data collection, enabling the researcher to capture a wide range of relevant information. Through this detailed and methodical approach, the study aimed to provide valuable insights into the potential benefits of warm foot soaks with a salt mixture in managing hypertension among elderly patients **(Figure 2)**.

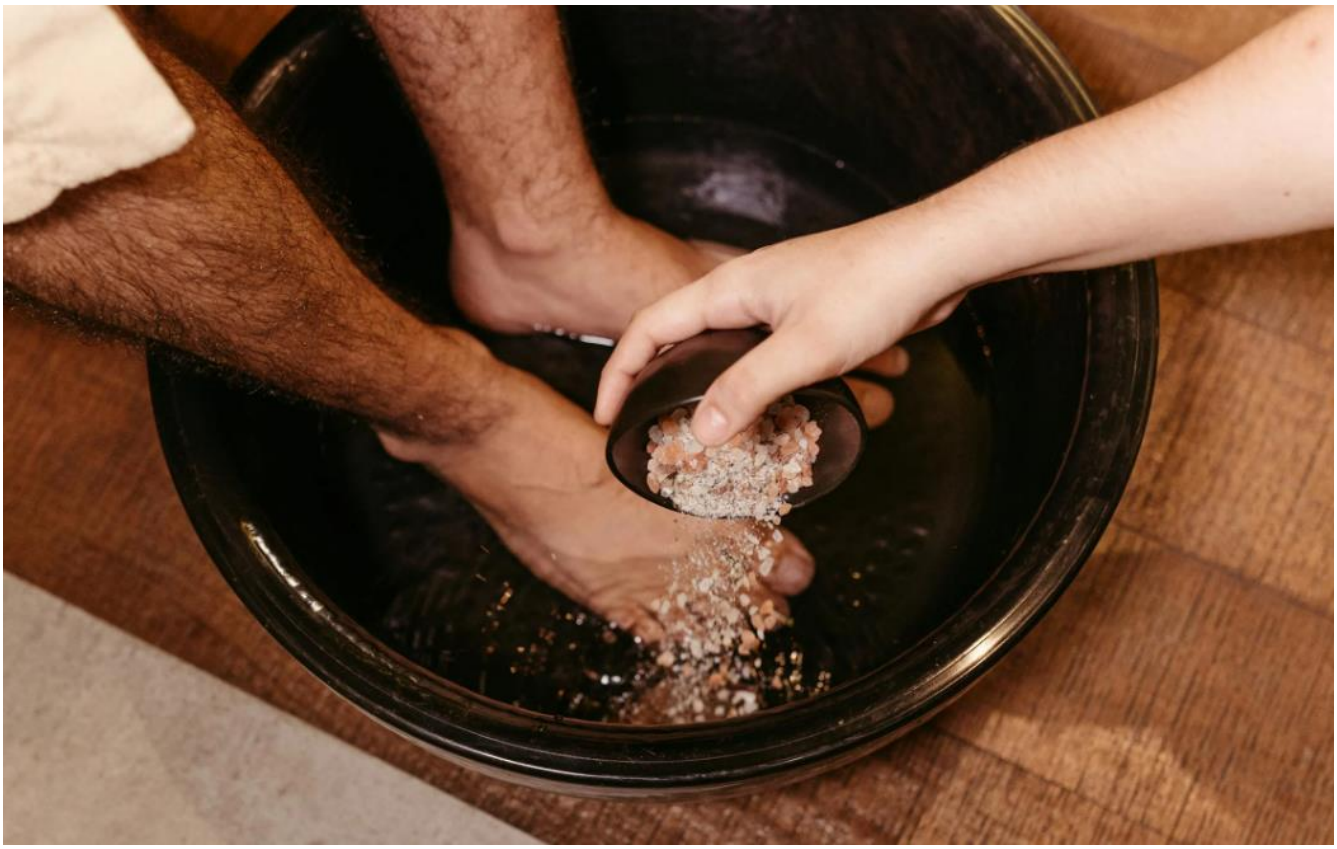

Figure 1. Illustration of warm foot soaks (*Courtesy of pexels.com*).

Results

The implementation process was conducted over six visits within one week. During each visit, the therapy involved soaking the feet in warm water with a salt mixture for approximately 15-20 minutes. The data collected using the NANDA 13 Domain assessment included the following subjective complaints from the client: a heavy feeling in the back, dizziness, occasional difficulty sleeping, and blood pressure readings of 150/90 mmHg and 163/105 mmHg. Additionally, the client's pulse rate was 90 beats per minute, body temperature was 36.6°C, and respiration rate was 22 breaths per minute. The client reported a history of hypertension for the past year, with previous treatments including frequent consumption of cucumbers to lower blood pressure and receiving medical care at a hospital. Upon analyzing the data, the author identified a nursing diagnosis of Risk for Ineffective Peripheral Tissue Perfusion. This condition poses a risk of decreased blood circulation at the capillary level, which can disrupt the body's metabolism. The nursing interventions for addressing the Risk for Ineffective Peripheral Tissue Perfusion were carried out over six visits. After the interventions, the client reported a final blood pressure reading of 133/89 mmHg, feeling relaxed, sleeping soundly, and no longer experiencing a heavy back. Objective data indicated that the client appeared relaxed and cooperative, with an initial blood pressure reading before the warm foot soak therapy with a salt mixture of 136/87 mmHg. The researcher recommended that the client continue the warm foot soak therapy with a salt mixture independently. Additionally, the client was advised to regularly check their blood pressure to monitor their condition. Regular blood pressure monitoring is crucial for individuals with hypertension, as it helps in early detection of any fluctuations or potential spikes that might require immediate attention or adjustment of their

treatment plan. By consistently tracking their blood pressure, the client can better understand how their daily activities, diet, stress levels, and the warm foot soak therapy with salt mixture affect their blood pressure **(Figure 3)**.

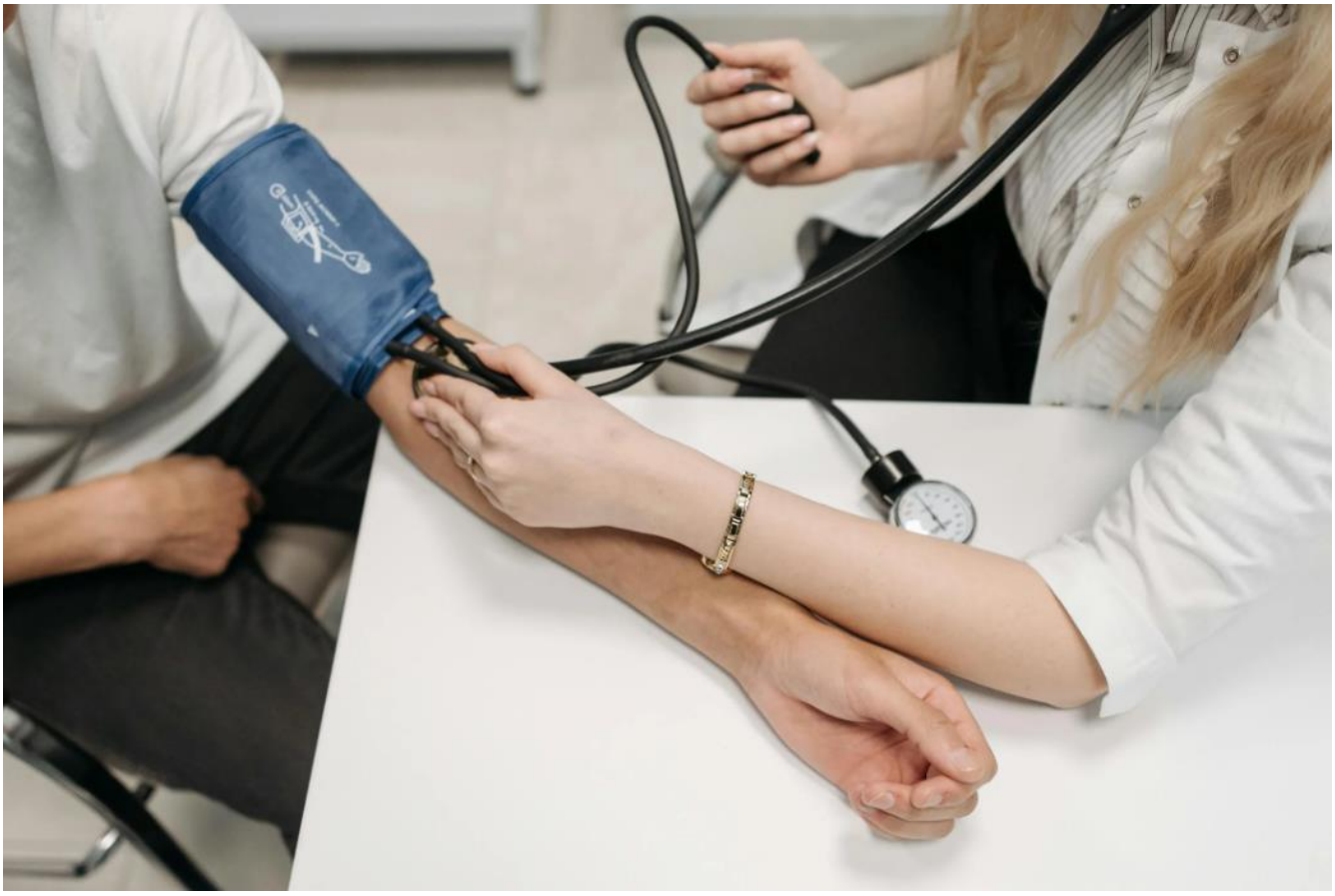

Figure 3. Illustration of hypertension monitoring (*Courtesy of pexels.com*).

Furthermore, regular monitoring empowers the client to take a proactive role in managing their health, providing valuable data that can be shared with healthcare professionals during follow-up visits. This continuous self-monitoring ensures that any adverse changes are promptly reported, allowing for timely interventions that could prevent complications. The healthcare team can then make more informed decisions regarding the client's treatment regimen, whether that involves adjusting medications, recommending lifestyle modifications, or suggesting additional therapies. In addition to self-monitoring, the client was encouraged to maintain a detailed log of their blood pressure readings. This log serves as an important tool for both the client and their healthcare providers, offering a comprehensive overview of the client's blood pressure trends over time. Such a record not only aids in identifying patterns and triggers that may influence blood pressure but also provides concrete evidence of the effectiveness of the warm foot soak therapy, reinforcing the importance of this complementary treatment in their overall hypertension management plan.

Discussion

Foot water immersion is one of the alternative therapies that can help improve cardiovascular health. This therapy involves soaking the feet in warm water for a certain period of time (Tsoutsoubi et al., 2022). This process can trigger some physiological changes that are beneficial for the cardiovascular system. First, soaking the feet in warm water can cause vasodilation, or the widening of blood vessels. This can lower blood pressure and help increase blood flow throughout the body (Sugawara & Tomoto, 2021). In addition, this process can also stimulate the release of chemicals that help dilate blood vessels, such as nitric oxide. This condition can help reduce the workload on the heart and improve endothelial function of the blood vessels. Second, foot water immersion can increase blood

circulation. When the feet are immersed, there is an increase in blood flow to that area. This can improve overall blood circulation and help increase the supply of oxygen and nutrients to body tissues (Drummond & Chung, 2012). This condition can help prevent cardiovascular problems such as hypertension and coronary heart disease. Foot water immersion can also help reduce stress and improve relaxation. This process can trigger the release of endorphin hormones that can help lower blood pressure and improve heart function. In addition, the relaxation resulting from this therapy can also help reduce the risk of cardiovascular diseases associated with stress **(Figure 4)**.

Figure 4. Illustration of stress (*Courtesy of pexels.com*).

Studies suggest that daily or near-daily foot water immersion sessions, performed 5-7 days per week, can provide the most consistent and significant cardiovascular benefits. Each session should last around 20-30 minutes, with the water temperature in the range of 40-42°C (104-108°F), as this temperature range has been found to be optimal for inducing vasodilation and improving blood flow (Daanen, Koedam, & Cheung, 2012). To maintain the positive effects, it's important to practice foot water immersion consistently over the long term, rather than sporadically, by incorporating it into a daily or weekly routine. However, individual responses may vary, and some people may need to adjust the frequency, duration, or water temperature based on their personal preferences and tolerance. Consulting with a healthcare professional can also provide personalized guidance on the optimal foot water immersion regimen for cardiovascular health. This temperature range has been found to be the most effective in triggering the physiological changes that lead to improved cardiovascular function (Esperland, de Weerd, & Mercer, 2022). Specifically, warm water in this temperature range can induce vasodilation, or the widening of blood vessels, which helps lower blood pressure and improve overall blood flow throughout the body. The warm temperature also stimulates the release of nitric oxide, a chemical that further helps dilate blood vessels and improve endothelial function. Soaking the feet in water at this temperature can increase blood circulation to the

lower extremities, which in turn enhances circulation and oxygen/nutrient delivery to the rest of the body. The warmth and relaxation associated with the foot water immersion can also help reduce stress and lower the risk of cardiovascular diseases linked to stress.

There are some precautions and potential contraindications to consider when using foot water immersion for cardiovascular health. Precautions such as skin sensitivity since some individuals may have sensitive skin and may experience irritation or discomfort from prolonged exposure to warm water (Takahashi, Okura, Kaga, & Yoshioka, 2022). It's important to start with shorter durations and monitor for any adverse reactions. People with poor circulation, such as those with peripheral artery disease or Raynaud's phenomenon, may not tolerate the foot water immersion as well and should consult a healthcare provider first. Proper hygiene and sanitization of the foot soak area is important to prevent the risk of infection, especially for those with diabetes or other conditions that impair wound healing . In contrast, the contraindications such as individuals with uncontrolled high blood pressure, recent heart attack or stroke, or other acute cardiovascular events should avoid foot water immersion until their condition is stabilized. People with significant nerve damage in the feet, such as diabetic neuropathy, may not be able to feel the temperature of the water properly and are at higher risk of burns (Engelland et al., 2020). Foot water immersion should be avoided if there are any open wounds, ulcers, or active infections on the feet to prevent further irritation or spread of infection. Pregnant women should consult their healthcare provider before using foot water immersion, as the effects on the developing fetus are not well-studied. It's important for anyone considering foot water immersion, especially those with pre-existing medical conditions, to first discuss it with their healthcare provider to determine if it is a safe and appropriate therapy for their individual needs.

The role of a healthcare provider is crucial when it comes to the use of foot water immersion for cardiovascular health. First and foremost, a healthcare provider can help determine the suitability of the complementary therapy for an individual's specific health condition (Liu, Tang, Baxter, Yin, & Tumilty, 2021). They can assess the person's medical history, current cardiovascular status, and any underlying health issues that may affect their response to this therapy. For example, individuals with certain cardiovascular conditions, such as uncontrolled hypertension or recent heart events, may require special consideration or may need to avoid this therapy altogether. The healthcare provider can provide guidance on the appropriate precautions and contraindications to ensure the safe and effective use of foot water immersion (Ernst, 2000). Secondly, the healthcare provider can help establish the optimal parameters for the foot water immersion therapy. This includes determining the appropriate water temperature, duration of each session, and frequency of practice. They can also provide recommendations on the proper foot positioning and water depth to maximize the cardiovascular benefits. Additionally, the healthcare provider can monitor the individual's response to the therapy, such as changes in blood pressure, heart rate, and overall well-being, and make adjustments to the protocol as needed (Aveni et al., 2017). The healthcare provider can play a crucial role in educating and supporting the individual throughout the foot water immersion therapy. They can provide guidance on proper foot hygiene, hydration, and any other lifestyle modifications that may enhance the cardiovascular benefits. Furthermore, the healthcare provider can help the individual track their progress, identify any potential issues, and make informed decisions about continuing or modifying the therapy based on their individual needs and responses (Aizuddin et al., 2022). This comprehensive approach ensures that the foot water immersion therapy is tailored to the individual's specific health requirements and is implemented in a safe and effective manner.

Healthcare providers may order several additional diagnostic tests to further evaluate a patient's suitability for foot water immersion therapy. These tests can include vascular studies, such as an Ankle-Brachial Index (ABI) test and Doppler ultrasound, to assess the patient's peripheral circulation and identify any issues like peripheral artery disease (Bailey, Griffin, & Scott, 2014). Cardiovascular imaging, such as an echocardiogram and stress echocardiogram, can provide insights into the structure and function of the heart, while cardiac function tests, like an electrocardiogram (ECG) and Holter monitor, can help detect any abnormalities in heart rhythm or function (Shah, 2020). Additionally, nerve conduction studies may be used to evaluate the patient's nerve function, particularly in the feet and lower extremities, to identify any neuropathy or nerve damage that could be affected by the foot water immersion. Finally, the provider may closely examine the skin and any existing wounds on the feet to ensure there are no conditions that could be exacerbated by the therapy. By ordering these comprehensive diagnostic tests, the healthcare provider can gain a more thorough understanding of the patient's overall cardiovascular, vascular, and neurological health, as well as the condition of their feet, to make an informed decision on the suitability and safety of foot water immersion therapy for the individual patient.

Conclusion

Immersing feet in water is an alternative therapy that can contribute to better cardiovascular health. The warm water helps to relax the muscles, reduce stress, and improve blood circulation. Enhanced circulation can be particularly beneficial for cardiovascular health as it helps to lower blood pressure and improve overall heart function. Additionally, foot soaks can aid in reducing inflammation, alleviating pain, and promoting a sense of well-being. This simple yet effective therapy can be easily incorporated into regular health routines, offering a natural way to support cardiovascular and overall health. However, there is a need for larger, more diverse studies that include participants of different ages, ethnic backgrounds, and health statuses to better understand how warm water immersion affects various demographic groups.

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Author's perspective

Key points

- Immersing feet in water is an alternative therapy that can contribute to better cardiovascular health
- Healthcare providers may order several additional diagnostic tests to further evaluate a patient's suitability for foot water immersion therapy
- It's important for anyone considering foot water immersion, especially those with pre-existing medical conditions

Potential areas of interest

- What is the role of healthcare providers in providing complementary therapy?
- How do family nurses manage complications related to hypertension at home?
- When should patients be involved in therapy collaboration?

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