**INTERNASIONAL CONFERENCE ON**
**MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE**
VOLUME 3, No 1. Tahun 2025 , ISSN 3032-4408
(Online)
*https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs*

# Traditional Medicinal Plants for Hypertension Control in Sigi District, Central Sulawesi

Helmi Rumbo[1*], Moh. Ryan YL. Saad[2], Irzan[3], Bulan Raodatul Jannah[4], Nensi Novita[5]
[1,2,3,4,5]STIK Indonesia Jaya Palu

**Article history**
Posted : 2025-08-31
Reviewed : 2025-11-10
Received : 2025-12-13

**Abstract**
Hypertension is a growing public health concern in Indonesia, particularly in rural areas like Sigi District, Central Sulawesi, where access to conventional medical care is limited and traditional remedies remain widely practiced. Among the local population, medicinal plants such as moringa leaves (Moringa oleifera), bay leaves (Syzygium polyanthum), and avocado leaves (Persea americana) are commonly used to manage high blood pressure. This study aimed to evaluate and compare the effectiveness of these three herbal interventions in reducing systolic and diastolic blood pressure among hypertensive individuals. A quasi-experimental design was employed, involving 78 participants divided equally into three intervention groups, each receiving a standardized dose of one type of leaf extract daily. Blood pressure measurements were taken before and after the intervention period. Statistical analysis using the Kruskal-Wallis Test indicated significant differences between groups ($p < .001$). Post hoc Mann-Whitney U Tests confirmed that bay leaves were the most effective in lowering both systolic and diastolic pressure, followed by avocado leaves for systolic and moringa leaves for diastolic. These findings suggest that bay leaves may offer the most potent antihypertensive effect, possibly due to their high content of bioactive compounds such as flavonoids and tannins. The results support the integration of traditional knowledge into community-based health strategies and highlight the potential of locally available medicinal plants as complementary therapies for hypertension control in resource-limited settings like Sigi District.
**Keywords:** hypertension, herbs, bay, avocado, moringa, leaves

Corresponding author: helmi.rumbo@gmail.com

## INTRODUCTION

The global fight against non-communicable diseases (NCDs) remains a critical public health challenge, with hypertension (HTN) standing out as the leading modifiable risk factor for global mortality and morbidity (WHO, 2023). Current estimates indicate that HTN affects over a billion adults worldwide, serving as the primary antecedent for major cardiovascular events, including stroke, myocardial infarction, and chronic kidney disease (Abbafati et al., 2020; Pokharel et al., 2022). The sustained management and control of blood pressure are therefore paramount, yet effective control rates remain significantly low, particularly in low- and middle-income countries where diagnostic and therapeutic resources are scarce (Park et al., 2023; Rikmasari et al., 2025). The necessity for accessible, affordable, and culturally acceptable therapeutic options is becoming increasingly urgent as demographic shifts project a continued rise in the hypertensive population over the next decade (Aloufi et al., 2022; Azizah et al., 2021; Dian Kurniati et al., 2025).

Within Southeast Asia, the epidemiological transition has amplified the burden of NCDs, with Indonesia facing a particularly rapid acceleration of hypertension prevalence across its archipelago. The Survei Kesehatan Indonesia (SKI) 2023 conducted by the Ministry of Health reported that the measured prevalence of hypertension in adults aged 18 years and above remained exceptionally high at 30.8% (Kemenkes, 2023). Despite this substantial prevalence, the rate of awareness, diagnosis, and sustained control remains alarmingly low. Data indicates that only a small fraction of individuals with hypertension adhere to regular medication or follow-up visits, underscoring a significant public health treatment gap (Kemenkes, 2024). While modern conventional medicine offers highly effective pharmacologic agents, systemic barriers frequently impede successful, long-term adherence in rural communities like Sigi District. These barriers include the high cost of lifelong medication, inconsistent supply chains, vast geographical distances from specialized healthcare centers, and, significantly, deeply ingrained cultural preferences for traditional healing modalities (Setiadi et al., 2022). These complex factors contribute to a significant public health failure, compelling a reliance on established, community-based approaches.

The successful control of chronic conditions, particularly in settings with constrained healthcare access, relies fundamentally on the patient's active engagement in Self-Care Management (Riegel et al., 2019). This conceptual framework posits that effective health

Corresponding author: helmi.rumbo@gmail.com

outcomes are achieved when individuals develop and maintain self-regulatory behaviors related to their disease. In Indonesia, where the traditional practice of Jamu is a deeply embedded social reality, this self-care often manifests using local botanicals. Therefore, understanding and validating these traditional therapies is crucial for nursing practice, particularly when viewed through the lens of Leininger's Theory of Culture Care Diversity and Universality. This nursing theoretical framework mandates that therapeutic interventions must be culturally congruent, meaning they respect, accommodate, or re-pattern local cultural values and health practices to achieve optimal well-being (Nashwan, 2023). By examining the most common local remedies, this study seeks to provide data that supports culturally acceptable and sustainable self-care strategies for the Sigi population.

Our research focuses on three plant species commonly utilized by the hypertensive population in Sigi District: Moringa oleifera (Moringa leaves), Syzygium polyanthum (Bay leaves), and Persea americana (Avocado leaves). Each possesses a pharmacological rationale supporting its traditional use. M. oleifera leaves are recognized for their high antioxidant content, including quercetin, which is hypothesized to exert hypotensive effects through ACE inhibition and vascular protection (Menichetti et al., 2025; Sreelatha & Padma, 2009). Similarly, P. americana leaves contain triterpenes and flavonoids, which have demonstrated vasodilator and cardiotonic actions in preclinical models (Odukoya et al., 2022a; Tabeshpour et al., 2017). Importantly, S. polyanthum leaves are noted for their rich concentration of bioactive compounds, most notably flavonoids and tannins (Hartanti et al., 2019; S et al., 2024), which are potent agents associated with improving endothelial function, smooth muscle relaxation, and possessing significant diuretic properties (Sutiningsih et al., 2022). These dual mechanisms—vasodilation and volume control—provide a strong foundation for the potent antihypertensive effect observed in traditional practice and now quantified in this study.

Although traditional use and early preclinical evidence are promising, major knowledge gaps remain. Existing studies show hypotensive effects of individual plants in vitro, but there is a clear lack of Level I evidence from randomized trials directly comparing their effectiveness. No study has systematically compared the short-term, dose-equivalent antihypertensive effects of Moringa oleifera, Syzygium polyanthum, and Persea americana in a single Indonesian community especially in Central Sulawesi. This study aims to fill that gap and provide evidence to guide local self-care choices. The primary objective of this study was

Corresponding author: helmi.rumbo@gmail.com

therefore to evaluate and directly compare the effectiveness of daily infusions of Moringa oleifera, Syzygium polyanthum, and Persea americana leaves in reducing systolic and diastolic blood pressure among hypertensive adults in the Sigi District of Central Sulawesi, Indonesia.

## METHOD

### Study Design

This study utilized a quantitative quasi-experimental design with a pre-test and post-test approach across three independent intervention groups. The primary aim was to compare the effectiveness of three different herbal interventions on blood pressure reduction. Participants were selected based on specific inclusion criteria and without randomly assigned to one of the three treatment groups.

### Setting and Population

The research was conducted in the Sigi District, Central Sulawesi, Indonesia, a locale chosen due to its high prevalence of hypertension and its population's high reliance on traditional herbal medicine. The target population consisted of adults diagnosed with primary hypertension in three villages: Binagga, Palempea, and Baluase.

### Sampling and Allocation

Participants eligible for inclusion in this study were adults aged 30 to 65 years who had been diagnosed with essential hypertension, defined as a systolic blood pressure of at least 130 mmHg or a diastolic blood pressure of at least 80 mmHg, measured on the day prior to the study. Eligible individuals were not taking any prescribed antihypertensive medication. Additional inclusion criteria required participants to demonstrate nonadherence to previous treatment and to have no diagnosis of chronic kidney disease. Exclusion criteria comprised the development of severe illness or the need for hospitalization during the study, as well as non-compliance with the daily herbal consumption protocol.

The total sample size required was determined to be 78 participants. Non-probability purposive sampling was employed to recruit participants who met the inclusion criteria (without randomly). Seventy-eight participants meeting the criteria were purposively assigned to three intervention groups, with 26 in each group (n=26):

1) Group 1 / Biangga viallage: Received Moringa oleifera (Moringa leaves) infusion.
2) Group 2 / Palempea village: Received Persea americana (Avocado leaves) infusion

Corresponding author: helmi.rumbo@gmail.com

3) Group 3 / Baluase village: Received Syzygium polyanthum (Bay leaves) infusion

**Interventions and Preparation**

The intervention period for all groups lasted 7 consecutive days.

Fresh leaves of the respective plants (Moringa leaves, Avocado leaves, and Bay leaves) were collected locally, authenticated by a local botanist, cleaned, and air-dried to a constant weight. Participants in all three groups were instructed to prepare and consume the herbal infusion daily, at a consistent time (morning) for the duration of the 7-day study period. The specific preparation methods for each group were as follows:

1) Moringa Oleifera (Moringa leaves):
   a) Wash 5 g dried moringa leaves.
   b) Boil 450 ml water for 5 minutes, add leaves, and continue boiling until reduced to 150 ml.
   c) Strain after cooling and drink the full 150 ml infusion once daily.
2) Persea americana (Avocado leaves):
   a) Five fresh avocado leaves, equivalent to around 5 grams of dried material, were washed.
   b) The leaves were boiled in 600 ml of water for about 5 minutes, until the volume decreased to 250 ml.
   c) The resulting infusion was strained, and the entire 250 ml was consumed once per day
3) Syzygium Polyanthum (Bay leaves):
   a) Seven sheets (7) of fresh bay leaves, approximately equivalent to 5 grams (5 g) of dried material, were carefully rinsed.
   b) The leaves were boiled in 300 ml of water at medium heat for eight minutes, resulting in a reduction of the liquid volume to 200 ml.
   c) The infusion was filtered, and a standardized dose of 100 ml was administered once daily.

Corresponding author: helmi.rumbo@gmail.com

All participants were strictly monitored every day to ensure adherence and were instructed to maintain their normal diet and activity levels throughout the study.

**Data Collection and Analysis**

Blood pressure (BP) was measured twice: at baseline (before Day 1 or first dose) and post-test (Day 8, 24 hours after the last dose). A calibrated digital sphygmomanometer was used, with measurements taken after participants sat quietly for at least five minutes and their arm was at heart level. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software, version 30. Since the sample size was relatively small (n=26 per group) and a Shapiro-Wilk test indicated that the distribution of pre- and post-intervention blood pressure changes (D-values) was non-normal ($p<0.05$), non-parametric statistical tests were utilized for the analysis. The level of significance was set at $\alpha=0.05$.

The Wilcoxon Signed-Rank Test was used to determine if there was a statistically significant difference between the pre-test SBP and DBP and the post-test SBP and DBP for each of the three intervention groups. Between-Group Analysis: The Kruskal-Wallis Test was applied to compare the median blood pressure reduction scores (i.e., the difference between pre-test and post-test values) across the three independent intervention groups. Post Hoc Analysis: When the Kruskal-Wallis Test yielded a statistically significant result ($p<0.05$), pairwise comparisons were performed using the Mann-Whitney U Tests to identify exactly which herbal interventions were significantly different from one another.

**RESULTS**

**Comparative Effectiveness of Herbal Interventions**

The primary comparison of the three interventions was performed using the Kruskal-Wallis H Test on the median reduction scores (Pre-test minus Post-test BP).

**Table 1**. Kruskal-Wallis Test Results for Blood Pressure Reduction Scores

| Blood Pressure | Kruskal-Wallis | df | Asymp. Sig. (p-value) |
|---|---|---|---|
| Systolic Blood Pressure (SBP) | 43.890 | 2 | <0.001 |
| Diastolic Blood Pressure (DBP) | 38.012 | 2 | <0.001 |

Corresponding author: helmi.rumbo@gmail.com

As shown in Table 1, the Kruskal-Wallis test indicated a highly significant difference in the median SBP reduction (H=43.890, p <0.001) and DBP reduction (H=38.012, p<0.001) across the three intervention groups. This shows the three herbal remedies varied in effectiveness.

**Table 2**. Ranking of Herbal Interventions Based on Median Blood Pressure Reduction

| Group | N | SBP Mean Rank | DBP Mean Rank |
|---|---|---|---|
| Bay Leaves (S. polyanthum) | 26 | 57.96 | 60.35 |
| Avocado Leaves (P. americana) | 26 | 43.48 | 22.40 |
| Moringa Leaves (M. oleifera) | 26 | 17.06 | 35.75 |
| Total | 78 | | |

Table 2 illustrates the median rank ordering of blood pressure reduction. For SBP and DBP, Bay Leaves (S. polyanthum) demonstrated the highest Mean Rank, indicating it was the most effective intervention in reducing both systolic (57.96) and diastolic (60.35) pressure. Higher Mean Rank indicates a greater reduction in blood pressure. The ranking order for effectiveness was determined as follows:

SBP Reduction: Bay Leaves > Avocado Leaves > Moringa Leaves

DBP Reduction: Bay Leaves > Moringa Leaves > Avocado Leaves

**Post Hoc Analysis (Pairwise Comparisons)**

Given the highly significant result from the Kruskal-Wallis Test, post hoc Mann-Whitney U Tests were performed to identify the specific pairwise differences between the three groups, applying a Bonferroni correction for multiple comparisons. The complete results of all three comparisons are summarized in Table 3.

**Table 2**. Summary of Post Hoc Mann-Whitney U Test Results (Pairwise Comparisons)

| Comparison Pair | BP | Mann-Whitney U | Z | Asymp. Sig. (p-value) |
|---|---|---|---|---|
| Bay Leaves vs. Moringa Leaves | SBP | 22.000 | - 5.790 | < 0.001 |
| | DBP | 88.000 | - 4.581 | < 0.001 |
| Bay Leaves vs. Avocado Leaves | SBP | 174.000 | - 3.029 | 0.002 |
| | DBP | 46.000 | - 5.409 | < 0.001 |
| Avocado Leaves vs. Moringa Leaves | SBP | 70.500 | - 4.958 | < 0.001 |
| | DBP | 185.500 | - 2.851 | 0.004 |

Corresponding author: helmi.rumbo@gmail.com

**Bay Leaves (S. polyanthum) vs. Moringa Leaves (M. oleifera)**

The comparison between Bay Leaves and Moringa Leaves showed a statistically significant difference in favor of Bay Leaves for both SBP and DBP reduction (Mean Ranks: SBP 38.65 vs. 14.35; DBP 36.12 vs. 16.88), confirming that Bay Leaves provided a significantly greater hypotensive effect.

**Bay Leaves (S. polyanthum) vs. Avocado Leaves (P. americana)**

Similarly, the Bay Leaves group was significantly more effective than the Avocado Leaves group in reducing both SBP and DBP (Mean Ranks: SBP 32.81 vs. 20.19; DBP 37.73 vs. 15.27).

**Comparison between Moringa Leaves (M. oleifera) and Avocado Leaves (P. americana)**

The comparison between the two less effective groups (Moringa and Avocado) revealed differing results based on the type of blood pressure measured. SBP: There was a highly significant difference in SBP reduction ($p<0.001$), where the Avocado Leaves group achieved a significantly greater median SBP reduction than the Moringa Leaves group. DBP: A significant difference was also found for DBP reduction ($p=0.004$), where the Moringa Leaves group achieved a significantly greater median DBP reduction than the Avocado Leaves group.

The post hoc analysis unequivocally establishes that Bay Leaves (S. polyanthum) is the most effective intervention for reducing both SBP and DBP. The ranking of effectiveness after Bay Leaves varies depending on whether SBP (Avocado > Moringa) or DBP (Moringa > Avocado) is considered

## DISCUSSION

This study demonstrates that traditional medicinal plants—specifically bay leaves, avocado leaves, and moringa leaves—have varying degrees of effectiveness in reducing blood pressure among hypertensive individuals in Sigi District, Central Sulawesi. The findings revealed that bay leaves produced the most significant reduction in both systolic and diastolic blood pressure, followed by avocado leaves for systolic and moringa leaves for diastolic pressure.

Corresponding author: helmi.rumbo@gmail.com

The study's findings clearly demonstrate that Bay Leaves (Syzygium polyanthum) produced the most substantial reductions in both systolic and diastolic blood pressure. This aligns with previous phytochemical analyses indicating that Bay Leaves contain flavonoids, tannins, and essential oils that may exert vasodilatory and diuretic effects (Aekthammarat et al., 2019). These compounds likely contribute to reduced vascular resistance and improved endothelial function, mechanisms that are central to blood pressure regulation. This high efficacy is pharmacologically plausible, attributed to the flavonoids, tannins, and saponins in S. polyanthum that promote vasorelaxation via the Nitric Oxide (NO) pathway and modulate autonomic receptors, thereby reducing peripheral vascular resistance (Ismail & Wan Ahmad, 2017; Kumolosasi et al., 2021).

A key distinction emerged between the two other agents: Avocado Leaves (Persea americana) showed a significantly greater effect on SBP, while Moringa Leaves (Moringa oleifera) was significantly more effective on DBP. This differential effect suggests distinct mechanisms of action (Aekthammarat et al., 2020; Mayhob & Hashim, 2019). P. americana's preferential SBP reduction may stem from its reported Angiotensin-Converting Enzyme (ACE) inhibitory properties, which directly influence the renin-angiotensin system and arterial stiffness (Odukoya et al., 2022b; Sutiningsih et al., 2022). Conversely, M. oleifera's stronger DBP reduction is consistent with its established role in alleviating vascular dysfunction and oxidative stress through compounds like thiocarbamate glycosides, leading to improved endothelial function and peripheral vasodilation (Menichetti et al., 2025). This provides a data-driven rationale for choosing herbal therapies based on a patient's specific hypertension profile (e.g., isolated systolic vs. mixed hypertension). Avocado Leaves are known for their antioxidant and anti-inflammatory properties, which may influence arterial stiffness and systolic pressure. Moringa Leaves, rich in potassium and nitrates, may better modulate peripheral resistance, impacting diastolic pressure (Tabeshpour et al., 2017).

The findings have profound implications for the nursing process, particularly in managing chronic conditions like hypertension, where patient self-management and adherence behavior are critical determinants of outcomes (Hussien et al., 2021; Riegel et al., 2019). The incorporation of traditional herbal remedies into hypertension management requires a deep grounding in nursing theory to ensure care is holistic, culturally sensitive, and promotes patient autonomy.

Corresponding author: helmi.rumbo@gmail.com

Madeleine Leininger's theory posits that culturally congruent care is essential for the health and well-being of individuals (Leininger & McFarland, 2002). The use of local herbs (Bay, Avocado, Moringa) is an expression of Culture Care Diversity—a learned and transmitted value embedded in the patient's way of life. Cultural Care Preservation/Maintenance: The nurse's role is to support the beneficial use of these herbs. Since the study confirms their antihypertensive effect, the nurse can endorse and preserve the practice of consuming Bay leaf decoction, integrating it with conventional medical advice. This is critical when patients use herbs as a substitute for prescribed medication, which poses a safety risk. The nurse must sensitively negotiate with the patient, for example, accommodating their desire to use Avocado leaf tea while emphasizing the necessity of adhering to their pharmacologic regimen, thereby negotiating a safe, integrated plan. The nurse acts as a bridge between popular (traditional) and professional (scientific) knowledge (Leininger & McFarland, 2002).

Hypertension is a leading risk factor for cardiovascular disease. Nurses play a pivotal role in health promotion by educating patients about lifestyle modifications, including dietary changes and safe herbal use. Herbal remedies like Bay Leaves could be recommended as adjuncts to conventional therapy, especially in communities with limited access to pharmaceuticals (Hoenders et al., 2024; WHO, 2019).

The principal challenge for nursing care is managing the potential for herb-drug interaction and, crucially, non-adherence to conventional therapy (WHO, 2019). Research indicates that the use of herbal medicine is sometimes associated with poor medication adherence, as patients may stop taking prescribed drugs when using herbs (Qadi et al., 2025; Thangsuk et al., 2021). The nurse's role transforms from merely administering care to a health collaborator and educator: Nurses must incorporate non-judgmental questioning about Complementary and Alternative Medicine (CAM) use, including Bay, Avocado, and Moringa leaves, into their standard history taking. This open dialogue is crucial for patient safety and establishing trust (Hussien et al., 2021; Ruswati, 2024).

Based on the patient's CAM preference, the nurse uses the study's results for evidence-based counseling (WHO, 2019). For a patient already using Moringa, the nurse can positively reinforce the behavior while educating on its specific DBP benefits, or, if the patient has a high SBP, gently recommend S. polyanthum or the importance of combining it with

Corresponding author: helmi.rumbo@gmail.com

pharmacological therapy. The intervention must be individualized to address factors like knowledge, health literacy, and social support (S et al., 2024). The nurse's core concept is to promote overall treatment adherence. This is achieved through structured interventions like telephone follow-ups or personalized education to simplify medication regimens and manage side effects, all while ensuring the patient understands that the herbal remedy is a complementary aid, not a substitute for prescribed antihypertensives, unless explicitly authorized by a physician (Georgiopoulos et al., 1906, 2018).

This study provides scientific backing for a common traditional practice, empowering nurses to integrate these cultural remedies into a holistic and patient-centered care plan. By understanding the differential efficacy of these herbs and focusing on behavioral concepts, nurses are uniquely positioned to improve patient compliance, bridge the gap between traditional and conventional medicine, and ultimately achieve better blood pressure control.

Despite the promising results, this study has several limitations that should be considered. The sample size was relatively small and limited to hypertensive individuals in Sigi District, Central Sulawesi, which may restrict the generalizability of the findings to broader populations with diverse genetic, dietary, and environmental backgrounds. Additionally, the study did not account for potential confounding variables such as participants' concurrent use of other medications, dietary sodium intake, physical activity levels, or comorbid conditions that could influence blood pressure outcomes. The duration of herbal intervention was also relatively short, making it difficult to assess the long-term efficacy and safety of Bay, Avocado, and Moringa leaves in hypertension management.

Further research is warranted to address these limitations. Future studies should employ larger, multi-center cohorts and longer follow-up periods to validate and expand upon these findings. Randomized controlled trials comparing herbal interventions with standard antihypertensive therapies could provide more robust evidence regarding their effectiveness and safety profile. Additionally, mechanistic studies exploring the pharmacokinetics, pharmacodynamics, and potential herb-drug interactions are needed to ensure safe integration into clinical practice. Investigating the impact of these herbal remedies on specific patient subgroups and exploring their effects on cardiovascular outcomes beyond blood pressure reduction will further enrich the evidence base and inform nursing practice.

Corresponding author: helmi.rumbo@gmail.com

## CONCLUSION(S)

Bay Leaves (Syzygium polyanthum) are the most effective among the three herbal interventions tested for reducing both systolic and diastolic blood pressure. The statistically significant differences observed across all pairwise comparisons underscore the therapeutic potential of Bay Leaves as a complementary approach to hypertension management.

These results highlight how vital it is for nurses to incorporate culturally appropriate, evidence-based herbal remedies into holistic care. As primary health educators and advocates, nurses are well-suited to help patients use herbal treatment safely and knowledgeably. By acknowledging traditional practices and aligning them with scientific evidence, nurses can foster trust, improve adherence, and promote patient-centered care. Furthermore, the study highlights the need for continued research into the pharmacodynamics of herbal therapies, their interactions with conventional medications, and their long-term safety profiles. In conclusion, the use of Bay Leaves as a hypotensive agent offers a promising, accessible, and culturally congruent option for patients seeking alternative or adjunctive treatments for hypertension

## Conflict of Interest

The authors state clearly that they have no conflicts of interest related to this study. Their results and interpretations are presented independently and without any external influence. Readers can trust that the findings are unbiased and solely supported by the research evidence.

## Acknowledgment

Gratitude is extended to the organizations and individuals whose support made this research possible. Special appreciation is given to STIK Indonesia Jaya and all civitas academia who contributed to and participated in this research.

## REFERENCES

Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I., Abegaz, K. H., Abolhassani, H., Aboyans, V., Abreu, L. G., Abrigo, M. R. M., Abualhasan, A., Abu-Raddad, L. J., Abushouk, A. I., Adabi, M., Adekanmbi, V., Adeoye, A. M., Adetokunboh, O. O., … Murray, C. J. L. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, *396*(10258), 1223–1249. https://doi.org/10.1016/S0140-6736(20)30752-2

Corresponding author: helmi.rumbo@gmail.com

Aekthammarat, D., Pannangpetch, P., & Tangsucharit, P. (2019). Moringa oleifera leaf extract lowers high blood pressure by alleviating vascular dysfunction and decreasing oxidative stress in L-NAME hypertensive rats. *Phytomedicine*, *54*, 9–16. https://doi.org/10.1016/j.phymed.2018.10.023

Aekthammarat, D., Pannangpetch, P., & Tangsucharit, P. (2020). Moringa oleifera leaf extract induces vasorelaxation via endothelium-dependent hyperpolarization and calcium channel blockade in mesenteric arterial beds isolated from L-NAME hypertensive rats. *Clinical and Experimental Hypertension*, *42*(6), 490–501. https://doi.org/10.1080/10641963.2020.1714640

Aloufi, B. H., Atwan, M. A., & Alshammari, A. M. (2022). Treatment of Hypertension by Using Natural Herbs and their Mechanism of Action. *Journal of Biochemical Technology*, *13*(2), 19–28. https://doi.org/10.51847/wx7mN3flrC

Azizah, N., Halimah, E., Puspitasari, I. M., & Hasanah, A. N. (2021). Simultaneous use of herbal medicines and antihypertensive drugs among hypertensive patients in the community: A review. *Journal of Multidisciplinary Healthcare*, *14*, 259–270. https://doi.org/10.2147/JMDH.S289156

Dian Kurniati, F., Viantika Kusumasari, R., Tinggi Ilmu Kesehatan Surya Global, S., & Ringroad Selatan Blado, J. (2025). Effectiveness of Daun Kelor (Moringa Oleifera Leaf) Decoction on Lowering Blood Pressure in the Elderly. In *Pharmacy Sciences and Health Practice* (Vol. 1, Issue 1).

Georgiopoulos, G., Kollia, & Z., Katsi, & V, Oikonomou, & D., Tsioufis, & C., & Tousoulis, & D. (1906). *Implementation To Increase Blood Pressure Control: What Works? (J Brettler And K Reynolds, Section Editors) Nurse's Contribution to Alleviate Non-adherence to Hypertension Treatment*. https://doi.org/10.1007/s11906-018-0862-2

Georgiopoulos, G., Kollia, Z., Katsi, V., Oikonomou, D., Tsioufis, C., & Tousoulis, D. (2018). Nurse's Contribution to Alleviate Non-adherence to Hypertension Treatment. In *Current Hypertension Reports* (Vol. 20, Issue 8). Current Medicine Group LLC 1. https://doi.org/10.1007/s11906-018-0862-2

Hartanti, L., Yonas, S. M. K., Mustamu, J. J., Wijaya, S., Setiawan, H. K., & Soegianto, L. (2019). Influence of extraction methods of bay leaves (Syzygium polyanthum) on antioxidant and HMG-CoA Reductase inhibitory activity. *Heliyon*, *5*(4), e01485. https://doi.org/10.1016/J.HELIYON.2019.E01485

Hoenders, R., Ghelman, R., Portella, C., Simmons, S., Locke, A., Cramer, H., Gallego-Perez, D., & Jong, M. (2024). A review of the WHO strategy on traditional, complementary, and integrative medicine from the perspective of academic consortia for integrative medicine and health. *Frontiers in Medicine*, *11*, 1395698. https://doi.org/10.3389/FMED.2024.1395698

Hussien, M., Muhye, A., Abebe, F., & Ambaw, F. (2021). The role of health care quality in hypertension self-management: A qualitative study of the experience of patients in a public hospital, north-west ethiopia. *Integrated Blood Pressure Control*, *14*, 55–68. https://doi.org/10.2147/IBPC.S303100

Ismail, A., & Wan Ahmad, W. A. N. (2017). Autonomic Receptors and Nitric-Oxide Involvements in Mediating Vasorelaxation Effect Induced by <i>Syzygium polyanthum</i> Leaves Extract. *Pharmacognosy Research*, *9*(Suppl 1), S9—S14. https://doi.org/10.4103/pr.pr_69_17

Corresponding author: helmi.rumbo@gmail.com

Kemenkes. (2024). *Profil Kesehatan Indonesia 2024*. https://kemkes.go.id/id/profil-kesehatan-indonesia-2024

Kumolosasi, E., Wei, C. C., Abdullah, A. Z., Manap, N. S. A., Lee, W. L., Yusuf, M. H., Ying, L. S., Buang, F., Said, M. M., Mohamad, H. F., & Jasamai, M. (2021). Antihypertensive activities of standardised moringa oleifera lam (merunggai) extracts in spontaneously hypertensive rats. *Sains Malaysiana*, *50*(3), 769–778. https://doi.org/10.17576/jsm-2021-5003-18

Leininger, M. M., & McFarland, M. R. (2002). *Transcultural nursing : concepts, theories, research, and practice* (3rd ed.). McGraw-Hill, Medical Pub. Division.

Mayhob, M. M., & Hashim, S. (2019). EJHC Individualized Nursing Intervention: Its Effect on Enhancing Patients' Adherence to Hypertensive Treatment Plan 1. In *Original Article Egyptian Journal of Health Care* (Vol. 10).

Menichetti, F., Berteotti, C., Schirinzi, V., Poli, C., Arrighi, R., & Leone, A. (2025). Moringa oleifera and Blood Pressure: Evidence and Potential Mechanisms. In *Nutrients* (Vol. 17, Issue 7). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/nu17071258

Nashwan, A. J. (2023). Culturally competent care across borders: Implementing culturally responsive teaching for nurses in diverse workforces. *International Journal of Nursing Sciences*, *11*(1), 155. https://doi.org/10.1016/J.IJNSS.2023.09.001

Odukoya, J. O., Odukoya, J. O., Mmutlane, E. M., & Ndinteh, D. T. (2022a). Ethnopharmacological Study of Medicinal Plants Used for the Treatment of Cardiovascular Diseases and Their Associated Risk Factors in sub-Saharan Africa. *Plants*, *11*(10), 1387. https://doi.org/10.3390/plants11101387

Odukoya, J. O., Odukoya, J. O., Mmutlane, E. M., & Ndinteh, D. T. (2022b). Ethnopharmacological Study of Medicinal Plants Used for the Treatment of Cardiovascular Diseases and Their Associated Risk Factors in sub-Saharan Africa. *Plants*, *11*(10), 1387. https://doi.org/10.3390/plants11101387

Park, D., Shin, M. J., Després, J. P., Eckel, R. H., Tuomilehto, J., & Lim, S. (2023). 20-Year Trends in Metabolic Syndrome Among Korean Adults From 2001 to 2020. *JACC: Asia*, *3*(3), 491–502. https://doi.org/10.1016/j.jacasi.2023.02.007

Pokharel, Y., Karmacharya, B. M., & Neupane, D. (2022). Hypertension—A Silent Killer Without Global Bounds: What Next? In *Journal of the American College of Cardiology* (Vol. 80, Issue 8, pp. 818–820). Elsevier Inc. https://doi.org/10.1016/j.jacc.2022.05.043

Qadi, W. S. M., Fadzel, N. T., Mediani, A., Sarian, M. N., Tong, X., Han, R., Jam, F. A., Bakar, Z. H. A., & Hamezah, H. S. (2025). An insight review on the potential anti-hypertensive effects of Moringa oleifera. In *Biomedicine and Pharmacotherapy* (Vol. 191). Elsevier Masson s.r.l. https://doi.org/10.1016/j.biopha.2025.118500

Riegel, B., Jaarsma, T., Lee, C. S., & Strömberg, A. (2019). Integrating Symptoms Into the Middle-Range Theory of Self-Care of Chronic Illness. *ANS. Advances in Nursing Science*, *42*(3), 206–215. https://doi.org/10.1097/ANS.0000000000000237

Rikmasari, Y., Kristina, S. A., Endarti, D., Andayani, T. M., & Trung, V. Q. (2025). Self-efficacy, Self-management, and Their Impact on Hypertensive Patients' Outcomes: A Study from Primary Health Centers in Indonesia. In *Indonesian Journal of Pharmacy Indonesian J Pharm* (Vol. 36, Issue 2).

Corresponding author: helmi.rumbo@gmail.com

Ruswati. (2024). *The Role of Nurses in Enhancing Medication Adherence and Patient Outcomes in Hypertension Management* (Vol. 2, Issue 3). https://journals.iarn.or.id/index.php/ners/article/view/286/225

S, I., Rosdianah, R., Wahyuningsih, T. Y., & Yunus, M. (2024). Decoction of bay leaf (syzygium polyanthum) against the reduction of high blood pressure in 3-month injectable birth control receptors. *Jurnal Ilmiah Kesehatan Sandi Husada*, *13*(2), 257–264. https://doi.org/10.35816/jiskh.v13i2.1212

Setiadi, A. P., Widiyastuti, S., Mariati, I. D., Sunderland, B., & Wibowo, Y. I. (2022). Socioeconomic impacts on medication adherence among patients with hypertension: A multicentre cross-sectional study in Lombok, Indonesia. *Pharmacia*, *69*(1), 143–149. https://doi.org/10.3897/PHARMACIA.69.E78441

Sreelatha, S., & Padma, P. R. (2009). Antioxidant activity and total phenolic content of Moringa oleifera leaves in two stages of maturity. *Plant Foods for Human Nutrition (Dordrecht, Netherlands)*, *64*(4), 303–311. https://doi.org/10.1007/S11130-009-0141-0

Kemenkes. (2023). *Survei Kesehatan Indonesia (SKI) 2023 - Badan Kebijakan Pembangunan Kesehatan | BKPK Kemenkes*. https://www.badankebijakan.kemkes.go.id/hasil-ski-2023/

Sutiningsih, D., Sari, D. P., Adi, M. S., Hadi, M., & Azzahra, N. A. (2022). Effectiveness of avocado leaf extract (Persea americana Mill.) as antihypertensive. *F1000Research*, *11*, 1100. https://doi.org/10.12688/f1000research.124643.1

Tabeshpour, J., Razavi, B. M., & Hosseinzadeh, H. (2017). Effects of Avocado (Persea americana) on Metabolic Syndrome: A Comprehensive Systematic Review. In *Phytotherapy Research* (Vol. 31, Issue 6, pp. 819–837). John Wiley and Sons Ltd. https://doi.org/10.1002/ptr.5805

Thangsuk, P., Pinyopornpanish, K., Jiraporncharoen, W., Buawangpong, N., & Angkurawaranon, C. (2021). Is the association between herbal use and blood-pressure control mediated by medication adherence? A cross-sectional study in primary care. *International Journal of Environmental Research and Public Health*, *18*(24). https://doi.org/10.3390/IJERPH182412916

WHO. (n.d.). *Traditional, complementary and integrative medicine (TCI)*. Retrieved October 5, 2025, from https://www.who.int/teams/integrated-health-services/traditional-complementary-and-integrative-medicine

WHO. (2019). *WHO global report on traditional and complementary medicine 2019*. https://www.who.int/publications/i/item/978924151536

WHO. (2023). *Global report on hypertension: the race against a silent killer*. Https://Www.Who.Int/Publications/i/Item/9789240081062.

World Health Organization. (2019). WHO Global report on traditional and complementary medicine 2019. *World Health Organization*, 1–228. https://apps.who.int/iris/bitstream/handle/10665/312342/9789241515436-eng.pdf?ua=1

Corresponding author: helmi.rumbo@gmail.com