
**EXPLORING THE MEDICINAL PROPERTIES OF TRADITIONAL
INDIAN MEDICINE FOR TREATING *HYPERTENSION***

***Shrishti Kumari, Sagar Tiwari, Sachin Dixit, Sachin Kumar, Nitin Kumar, Nakul
Gupta**

IIMT College of Pharmacy, Knowledge Park III, Greater Noida, India.

Article Received: 01 April 2026

*Corresponding Author: Shrishti Kumari

Article Revised: 22 April 2026

IIMT College of Pharmacy, Knowledge Park III, Greater Noida, India.

Published on: 12 May 2026

DOI: <https://doi-doi.org/101555/ijrpa.9077>

ABSTRACT

Tradition-al medicine refers to health practices rooted in ancient cultures and used before modern science was applied to medicine. These practices have been around for centuries and often involve the use of medicinal plants.

Medicinal plants are commonly used to treat cardiovascular diseases, which include conditions that affect the heart and blood vessels, such as heart attacks, stroke, high blood pressure, and heart failure. High blood pressure can make the heart work harder and increases the risk of atherosclerosis, which in turn raises the chances of heart attack and stroke.

While many drugs are available for these conditions, typical antihypertensive medications often come with significant side effects. Medicinal herbs, on the other hand, contain multiple active compounds that have both healing and preventive properties and can be useful in treating high blood pressure. This review gives an overview of some medicinal plants that have been found to help lower blood pressure.

KEYWORDS: Traditional medicine, Hyperten-sion management, Herbal medicine, Persian medicine, Cardiovascular diseases.

INTRODUCTION

The two primary causes of cardiovascular diseases are atherosclerosis and hypertension. Hypertension is one of the most talked about and prescribed conditions in the 21st century. It is called the "silent killer" because it often shows no symptoms and is easily overlooked. According to the National Institutes of Health, hypertension is diagnosed when diastolic blood pressure is above 90 mmHg or systolic blood pressure is above 140 mmHg. Several

factors can increase the risk of developing hypertension, such as stress, a high- salt diet, family history, excess belly fat, and drinking too much alcohol.

Other chronic conditions like kidney disease, diabetes, and sleep apnea can also increase the risk [1-3]. Hypertension is a chronic condition that usually doesn't show symptoms, but it puts extra strain on the heart and arteries, making it harder for the heart to pump blood through the body[11]. This extra strain can lead to serious problems like heart failure, heart attacks, pulmonary embolism, cerebral aneurysms, and kidney failure over time. People can take steps to prevent and manage hypertension by making lifestyle changes such as losing weight, exercising more, and eating healthily. Doctors often recommend lifestyle changes before prescribing medication.

Currently, the Dietary Approaches to Stop Hypertension (DASH) diet is recommended by medical professionals to help reduce the risk of hypertension.

It advises limiting saturated fats, cholesterol, and total fat, while also reducing salt intake. It promotes a diet rich in fruits, vegetables, lean meats and poultry, low-fat dairy products, nuts, seeds, legumes, and essential vitamins and minerals[18].

The traditional approaches have not been very effective in reducing the number of people suffering from this serious condition in recent years.

The growing number of people with hypertension could be reduced through the use of natural therapies. Various strategies, including diet, exercise, stress management, vitamins, and herbal remedies, have shown effectiveness in treating high blood pressure. Research on natural treatments for hypertension has been increasing every year[3,16,19].

Natural remedies have also helped in the development of modern pharmaceuticals.

Many natural plants contain phytochemicals that can act as potential blood pressure-lowering agents and may have future use in drug development.

Today, traditional treatments are being replaced by newer synthetic treatments that researchers and doctors claim are more reliable and effective[21,22].

Several natural herbs, such as barberry, garlic, ginger, ginseng, and arjuna, are used to treat hypertension. These plants can be used carefully as medicinal treatments for hypertension. This review highlights herbs that have been scientifically proven to be effective in treating hypertension[35].

Pathophysiology of Hypertension

Hypertension develops mainly because there is increased resistance in the blood vessels.

This usually happens when the diameter of the blood vessels decreases due to stronger contractions and structural changes in the arteries[25,27].

Several factors contribute to the development of hypertension.

These include increased activity of the renin-angiotensin-aldosterone system (RAAS), stimulation of the sympathetic nervous system, and the effects of vasopressin[35]. Problems in G protein-coupled receptor signaling, inflammation, the role of different types of T-cells, and various vasoactive peptides released by endothelial cells and smooth muscle cells also play a role.

Higher arterial reactivity can occur due to imbalances in pro-oxidant enzymes and endothelial nitric oxide synthase (eNOS)[19,29].

Also, increased calcium levels inside cells through calcium channels, along with the growth (hyperplasia) and enlargement (hypertrophy) of vascular smooth muscle cells (VSMCs), can lead to stronger narrowing of blood vessels (vasoconstriction)[8,16].

Increased stiffness of blood vessels also contributes to hypertension and its complications, like atherosclerosis[10,13,14].

Therefore, treatment should not only focus on reducing peripheral vascular resistance but also on improving vascular stiffness.

Another factor is angiotensin II (Ang II), which can stimulate the progression of the cell cycle, leading to cell growth.

Genetic issues affecting kidney sodium excretion, genetic problems related to the $\text{Na}^+/\text{Ca}^{2+}$ exchange in arterial smooth muscle, and hormonal or nerve-related vasoconstriction can also contribute to hypertension[15].

Ajwain (*Carum copticum L.*).As shown in (figure.1)

Ajwain, scientifically known as *Carum copticum L.*, belongs to the Apiaceae family and is grown in different regions such as Central Europe, Iran (especially the eastern parts of Baluchistan), India, Afghanistan, and Pakistan[33,30].

Due to its calcium channel blocking effect, ajwain plays a significant role in regulating heart rate and blood pressure. The aqueous-methanolic extract of ajwain seeds (CSE) at doses of 1–30 mg/kg causes a decrease in blood pressure and heart rate in normotensive rats. At higher doses (10–30 mg/kg), it has been reported to cause bradycardia[29,28].



Figure.1:- Ajwain(*Carum coptimum.L*)

Table.1:- The properties and details of Ajwain (*Carum optimum.L*)

Properties

Primary actions: Health benefit:

Origin: Note:

Details

Has a calcium channel blocking effects Helps control heart race and reduces blood pressure

Found in India, Afghanistan, Pakistan, Iran, and Central Europe

Taking large amounts may slow heart rate too much (bradycardia)

Bindii (*Tribulus terrestris*)

1. Lowering Blood Pressure

The plant helps lower blood pressure in two major ways:

Relaxing Blood Vessels : It contains extracts that act as "vasodilators." This means they help relax and widen the walls of blood vessels, allowing blood to flow more easily through them, similar to widening a narrow pipe To reduce pressure, this plant helps the body remove extra salt and water through urine[13,14,18]. When there's less fluid in the body, there's less pressure on the artery walls.

2. Protecting the Arteries

As shown in (figure.2) This plant has special compounds called saponins. These act like the plant's own defense system and help the heart by: Reducing Stress: They stop the production of harmful molecules, such as hydrogen peroxide, that cause stress in the cells[22].

- Preventing Thickening: They stop certain cells in blood vessels from growing too quickly. If these cells grow too much, the arteries can become thick and stiff. These compounds help keep the walls of the blood vessels flexible and open.



Figure.2:- Bindii (Tribulus terrestris)

Table.2:- The properties of Bindii and it's details.

Properties Primary actions:

Health benefit:

Key compound:

Note:

Details

Works as a blood vessels opener and natural water remover

Helps blood vessels relax and removes extra salt and water from the body

tChoant tains saponins protect heart cells from stress

Helps keep artery walls flexible and tops

Black Cumin (*Nigella sativa*)

Also known as the "seed of blessing," this plant has been used for a long time as a natural remedy, as shown in (figure.3).

It's very effective at lowering blood pressure[18].

- Proven Results: A study with men who had mild high blood pressure showed that taking a small amount of Black Cumin oil for eight weekslowered their systolic blood pressure by about 10 points and diastolic by nearly 10 points.

- How it Works:
- Relaxing Arteries: It acts like a calcium channel blocker, stopping calcium from entering cells in the heart and blood vessels, which allows them to relax and open.
- Flushing Fluids: It helps the body get rid of extra water through urine.
- Body Shield: It has antioxidant and anti-inflammatory properties that protect the cardiovascular system from damage[19,22,34].



Figure.3:-Black Cumin (*Nigella sativa*).

Black - Jack (*Bidens Pilosa*)

This plant is commonly found in tropical regions like South America.

It is known for preventing and treating high blood pressure, as shown in (figure.4)

-Fast-Acting: In animal studies where high blood pressure was caused by a high-sugar (fructose) diet, the leaf extract began working in just six hours, lowering blood pressure by up to 21%.

-Extra Health Benefits: Beyond heart health, Black-Jack is used for:

Fighting Cancer: It contains compounds that may stop cancer cells from growing.

- Weight Management: It has effects that can help with obesity.
- Cleaning the Blood: It helps remove harmful toxins from the body that can lead to aging and disease[30-35].



Figure.4:- Black-Jack (Bidens Pilosa)

Apiaceae-Apium graveolens L.

A Traditional Remedy for Modern Problems

Celery has been used in traditional medicine for centuries.

People have used it not just as food, but also as a natural treatment for digestion, muscle spasms, joint pain, and to calm the nerves. It's also widely used to treat high blood pressure and the uncomfortable symptoms that come with it, such as dizziness, headaches, and shoulder pain.

Proven Results in Humans and Animals

The healing power of celery is supported by several studies.

Researchers found that extracts from celery seeds, stalks, and roots successfully lowered blood pressure and heart rate in various animal tests. More importantly, human patients who drank celery juice or took concentrated seed extracts saw a big drop in their blood pressure readings.

The "Secret" Ingredients

Scientists have discovered that the same compounds that give celery its unique smell and taste are responsible for its health benefits[46-50].

Two main chemicals, called 3-n-butylphthalide and sedanolide, are key. In fact, one of these, 3-n-butylphthalide, is so effective at improving blood flow that it has been approved as a medical treatment in China for patients recovering from strokes, as shown in (figure.5).

How Celery Works in the Body

Celery helps the heart and blood vessels in three main ways:

- **Widening Blood Vessels:** It helps the walls of the arteries relax and open up, allowing blood to flow more easily.
- **Acting as a Natural Flush:** It works as a diuretic, helping the body remove extra salt and water through urine.
- **Blocking "Tightening" Enzymes:** It contains a natural substance (Junipediol) that acts like common blood pressure medications (ACE inhibitors).
- This stops the body from making a chemical that usually causes blood vessels to tighten[52-55].



Figure.5:- Apiaceae-*Apium graveolens* L.

Table.5:- The Properties and details of Apiaceae-*Apium graveolens* L.

Properties

Primary actions: Health benefits: Key compounds: Note:Details

Act as a natural ACE inhibitor and helps remove extra water

Treats high blood pressure, dizziness, and headaches

Contains 3-n-butylphthalide, which is used medically for stroke recovery Traditionally used

for joint pain and to calm nerves.

Malvaceae – Hibiscus sabdariffa L.

*The plant Hibiscus sabdariffa (roselle) has bright red calyces, and many parts of the plant—such as young shoots, leaves, roots, and seeds—are used in making food colorings, drinks, dishes, cooking oil, soaps, and shrubs, as shown in (figure.6).

The calyces are especially important and are widely used in traditional medicine for their possible antimicrobial, antioxidant, antidiabetic, diuretic, and blood pressure-lowering effects.

* Scientific studies support some of these uses, especially for heart protection and reducing high blood pressure.

In animal studies, extracts of the calyces lowered blood pressure, increased urine production, and improved heart conditions. These effects may be due to actions similar to acetylcholine and histamine.

* Human studies also showed that roselle tea or extracts can reduce systolic and diastolic blood pressure.

In some cases, it worked as well as certain medicines like captopril, though not as strong as lisinopril. However, some of these studies had limitations in their design[56-58].

* The beneficial effects are mainly due to natural compounds such as chlorogenic acids, flavonoids (kaempferol and quercetin), and anthocyanins. These compounds help relax blood vessels, improve kidney function, increase urine production, and lower blood pressure.

* Overall, roselle may lower blood pressure by relaxing blood vessels, increasing diuresis, and possibly acting like ACE inhibitors, which are commonly used drugs for hypertension[58-61].



Figure.6:- Malvaceae – Hibiscus sabdariffa L.

Garlic (*Allium sativum* L.)

Garlic supplements have been shown to be effective in treating hypertension (high blood pressure).

They can lower blood pressure by about 10 mm Hg systolic and 8 mm Hg diastolic, which is similar to standard blood pressure medications. Garlic is also known for its antibacterial, antioxidant, anti-inflammatory, anti-cancer, and cholesterol-lowering effects.

One study showed that garlic was about 80% effective in treating hypertension[59,62,64].

Aged garlic extract (AGE) produces a more consistent reduction in blood pressure compared to other forms of garlic. In addition, garlic supplements can significantly reduce both systolic blood pressure (SBP) and diastolic blood pressure (DBP) by about 3.75 mm Hg and 3.39 mm Hg, respectively. In another study, patients with hypertension who took garlic tablets (300–1500 mg per day) for 24 weeks experienced a significant decrease in systolic blood pressure by 9.2 mm Hg and diastolic blood pressure by 6.27 mm Hg.

Further-more, aged garlic extract has antioxidant properties, such as removing harmful superoxide molecules in human neutrophils.

Daily intake of 150 or 400 mg/kg of garlic extract increased the activity of endothelial nitric oxide synthase (eNOS) and reduced the activity of NADPH oxidase in the aorta of fructose-fed rats, as shown in (figure.7).

The active compounds in garlic help lower blood pressure by several mechanisms. They inhibit ACE (angiotensin-convert-ing enzyme) activity, reduce vasoconstriction caused by angiotensin II, prevent the growth of vascular smooth muscle cells (VSMCs), block vasoconstriction caused by endo-thelin-1, and inhibit the activation of NF- κ B[61-65].

Table.7:- The Properties and details of Garlic (*Allium sativum* L.)Properties



Figure.7:- *Allium sativum* L.

Primary actions : Health benefit : Properties: Note: Details
Blocks ACE activity and reduces blood vessels tightening
Lowers systolic blood pressure by about 10mm Hg and diastolic by 8mm Hg
Has antibacterial ,anti- inflammatory and cholesterol lowering effect
Aged garlic extract (AGE) gives the most consistent result

Ginseng (*Panax spp.*)

Ginseng is used in many forms such as capsules, tablets, extracts, dried roots, oil, and tea, and it has blood pressure-lowering (hypotensive) effects, as shown in (figure.8).

At low doses, ginseng may increase blood pressure, while at higher doses it lowers blood pressure. Because of this, it can help regulate blood pressure in people with low blood pressure, possibly by affecting blood vessel function, controlling the autonomic nervous system, or adjusting the arterial baroreflex.

In patients with mild hypertension, *Panax* ginseng extract has been shown to reduce systolic blood pressure (SBP) by about 3.1 mm Hg and diastolic blood pressure (DBP) by about 2.3 mm Hg[66,68].

One of the active components, ginsenoside Rg3 (found in red ginseng), increases the activity

of endothelial nitric oxide synthase (eNOS), which raises nitric oxide (NO) and cyclic GMP (cGMP) levels, and activates calcium-dependent potassium (Ca^{2+} -gated K^+) channels.

Ginseng also slows down the growth of vascular smooth muscle cells (VSMCs), and has both antihypertensive and anti-atherosclerotic effects. Red ginseng can also reduce the growth of VSMCs caused by angiotensin II (Ang II).

Another way ginseng lowers blood pressure is through its antioxidant properties, possibly by increasing antioxidant enzymes and removing harmful free radicals.

In addition, ginseng has anti-inflammatory effects.

It helps reduce the release of tumor necrosis factor-alpha ($\text{TNF-}\alpha$) and decreases the activity of NF- κ B and p38 MAPK pathways[62,65,67,68].



Figure.8:- Ginseng (Panax spp.)

Table.8:- The Properties and Details of Ginseng (Panax spp.)
Properties

Primary action: Health benefit:

Key compound: Note:

CONCLUSION

Detail

Boosts nitric oxide to help blood vessels relax

Keeps blood pressure in check and prevents arteries from hardening

Contains ginsenosides, especially Rg3 Low doses may increase pressure, while high doses lower it

The present review focused on 9 medicinal plants that are commonly used for the management of hypertension.

These plants are widely known in traditional medicine for their potential blood pressure-lowering effects.

The therapeutic benefits of these plants are mainly due to their active chemical compounds, which may contribute to effects such as vasodilation, antioxidant activity, and improved cardiovascular function. Because of these properties, they can be considered promising candidates for further scientific research.

However, more studies are needed to confirm their pharmacological effects and ensure their safety.

Proper scientific validation will help support the use of these traditional remedies and may lead to the discovery of new and effective treatments for hypertension.

Overall, the information gathered in this review can serve as a useful base for future research and drug development aimed at controlling High Blood Pressure.

REFERENCES

1. A. E. Schutte, N. Srinivasapura Venkateshmurthy, S. Mohan, and D. Prabhakaran, "Hypertension in Low-and Middle-Income Countries," *Circulation Research* 128, no. 7 (2021): 808–826.
2. N. Dorji, N. Dorji, and N. Samartkit, "Factors Influencing Lifestyle Modification Among Persons With Hypertension in Punakha, Bhutan," *Burapha University* 17, no. 1 (2021): 1–8.
3. T. P. Helelo, Y. A. Gelaw, and A. A. Adane, "Prevalence and Associated Factors of Hypertension Among Adults in Durame Town, Southern Ethiopia," *PLoS One* 9, no. 11 (2014): e112790.
4. M. M. Asemu, A. W. Yalew, N. D. Kabeta, and D. Mekonnen, "Prevalence and Risk Factors of Hypertension Among Adults: A Community Based Study in Addis Ababa, Ethiopia," *PLoS One* 16, no. 4 (2021): e0248934.
5. C. Andrade, N. G. M. Gomes, S. Duangrisai, P. B. Andrade, D. M. Pereira, and P. Valentão, "Medicinal Plants Utilized in Thai Traditional Medicine for Diabetes Treatment: Ethnobotanical Surveys, Scientific Evidence and Phytochemicals," *Journal of Ethnopharmacology* 263 (2020): 113177.
6. E. d'Avigdor, H. Wohlmuth, Z. Asfaw, and T. Awas, "The Current Status of Knowledge of Herbal Medicine and Medicinal Plants in Fiche, Ethiopia," *Journal of Ethnobiology*

- and Ethnomedicine 10 (2014): 38.
7. R. R. Dhungana, "Hypertension Treatment and Control in Nepal: Health Care Challenges and the Potential of Nonpharmacological Interventions in the Management of High Blood Pressure," Victoria University, 2021.
 8. L. Melaku, "The Pharmacology and Therapeutic Value of Conventional Antihypertensive Drugs in the Management of
 9. Hypertension: An Ethno-Botanical Review of Commonly Used Antihypertensive Medicinal Plants in Arsi Zone, South-East Ethiopia," *Journal of Plant Pathology and Microbiology* 12 (2021):549.
 10. M. A. Tola, F. Ibrahim, H. Melak, T. Tafesse, M. Alemayehu, and G. Nigussie, "Traditional Herbal Remedies in the Management of Metabolic Disorders in Ethiopia: A Systematic Review of
 11. Ethnobotanical Studies and Pharmacological Activities," *Evidence-Based Complementary and Alternative Medicine* 2023, no. 1 (2023): 1413038.
 12. A. Meresa, N. Fekadu, S. Degu, A. Tadele, and B. Geleta, "Medicinal Plants Used for the Management of Hypertension," *An Ethno Botanical Review* on 7 (2017): 2.
 13. E. Kumolosasi, C. Cheng, A. Abdullah, et al., "Antihypertensive Activities of Standardised *Moringa oleifera* Lam.(Merunggai) Extracts in Spontaneously Hypertensive Rats," *Sains Malaysiana* 50, no. 3 (2021): 769–778.
 14. L. D. Brace, "Cardiovascular Benefits of Garlic (*Allium sativum* L)," *Journal of Cardiovascular Nursing* 16, no. 4 (2002): 33–49.
 15. V. Londhe, A. Gavasane, S. Nipate, D. Bandawane, and P. Chaudhari, "Role of Garlic (*Allium sativum*) in Various Diseases: An Overview," *Angiogenesis* 12, no. 13 (2011): 129–134.
 16. P. Adegbola, I. Aderibigbe, W. Hammed, and T. Omotayo, "Antioxidant and Anti-Inflammatory Medicinal Plants Have Potential Role in Health Science Reports, 2025 7 of 9 the Treatment of Cardiovascular Disease: A Review," *American Journal of Cardiovascular Disease* 7, no. 2 (2017): 19–32.
 17. A. Bekele, H. Teklie, M. Tadesse, A. Defar, T. Getachew, and K. Amenu, "Pattern and Trend of Medical Admissions of Patients of Chronic Non-Communicable Diseases In Selected Hospitals in Addis Ababa, Ethiopia," *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)* 13, no. 1 (2015): 34–48.
 18. C. Sohrabi, T. Franchi, G. Mathew, A. Kerwan, M. Nicola, and M. Griffin, "PRISMA 2020 Statement: What's New and the Importance of Reporting Guidelines," *International*

- Journal of Surgery 88 (2021): 105918.
19. M. Megersa and N. Tamrat, "Medicinal Plants Used to Treat Human and Livestock Ailments in Basona Werana District, North Shewa Zone, Amhara Region, Ethiopia," Evidence-Based Complementary and Alternative Medicine: eCAM 2022, no. 1 (2022): 5242033.
 20. F. Tessema, Y. Gonfa, T. Asfaw, M. Tadesse, and R. Bachheti, "In Silico Molecular Docking Approach to Identify Potential Antihypertensive Compounds From *Ajuga Integrifolia* Buch.-Ham. Ex D. Don (Armagusa)," Advances and Applications in Bioinformatics and Chemistry 17 (2024): 47–59.
 21. A. Tesfaye and W. Mengesha, "Traditional Uses, Phytochemistry and Pharmacological Properties of Garlic (*Allium sativum*) and Its Biological Active Compounds," International Journal of Engineering Sciences & Research Technology 1 (2015): 142–148.
 22. T. Abiyot, K. Birhanu, and K. Firew, "Ethnobotanical Study of Medicinal Plants Used to Treat Human Ailment in Guduru District of Oromia Regional State, Ethiopia," Journal of Pharmacognosy and Phytotherapy 10, no. 3 (2018): 64–75.
 23. G. Chekole, "Ethnobotanical Study of Medicinal Plants Used Against Human Ailments in Gubalafto District, Northern Ethiopia," Journal of ethnobiology and ethnomedicine 13 (2017): 55.
 24. A. Yimer, S. F. Forsido, G. Addis, and A. Ayelign, "Nutritional Composition of Some Wild Edible Plants Consumed in Southwest Ethiopia," Heliyon 9, no. 6 (2023): e16541.
 25. A. Wendimu, W. Tekalign, and B. Asfaw, "A Survey of Traditional Medicinal Plants Used to Treat Common Human and Livestock Ailments From Diguna Fango District, Wolaita, Southern Ethiopia," Nordic Journal of Botany 39, no. 5 (2021): e03174.
 26. S. Dubale, N. Abdissa, D. Kebebe, A. Debella, A. Zeynudin, and S. Suleman, "Ethnomedicinal Plants and Associated Indigenous Knowledge for the Treatment of Different Infectious Diseases in Ethiopia," Journal of Herbal Medicine 40 (2023): 100669.
 27. B. N. Tefera and Y.-D. Kim, "Ethnobotanical Study of Medicinal Plants in the Hawassa Zuria District, Sidama Zone, Southern Ethiopia," Journal of Ethnobiology and Ethnomedicine 15 (2019):
 28. 25. 26. G. Nigussie, M. Tola, and T. Fanta, "Medicinal Uses, Chemical Constituents and Biological Activities of *Rumex Abyssinicus*: A Comprehensive Review," International Journal of Secondary Metabolite 9, no. 4 (2022): 440–456.

29. G. Alemayehu, Z. Asfaw, and E. Kelbessa, "Ethnobotanical Study of Medicinal Plants Used by Local Communities of Minjar-Shenkora District, North Shewa Zone of Amhara Region, Ethiopia," *Journal of Medicinal Plants Studies* 3, no. 6 (2015): 1–11.
30. H. Haji, E. Makonnen, A. Debela, and B. Geleta, "Evaluation of Diuretic and Antihypertensive Activity of Leaf Extracts of *Thymus Schimperii* in Rats," 2016.
31. D. Alemneh, "Ethnobotanical Study of Plants Used for Human Ailments in Yilmana Densa and Quarit Districts of West Gojjam Zone, Amhara Region, Ethiopia," *BioMed Research International* 2021, no. 1 (2021): 6615666.
32. Z. Tilahun, A. I. Bilal, D. Teshome, B. M. Habte, M. Y. Yeshak, and T. G. Fenta, "Concomitant Use of Medicinal Plants and Conventional Medicines Among Adult Patients With Diabetes in Ethiopia: A Cross- Sectional Study," *Ethiopian Pharmaceutical Journal* 33, no. 2 (2018): 131–140.
33. R. Regassa, "Assessment of Indigenous Knowledge of Medicinal Plant Practice and Mode of Service Delivery in Hawassa City, Southern Ethiopia," *Journal of Medicinal Plants Research* 7, no. 9 (2013): 517–535.
34. A. Tesfaye, A. Anjulo, A. Fekadu, et al., "Ethno-Pharmacological Investigations of *Moringa Stenopetala* Bak. Cuf. and Its Production Challenges in Southern Ethiopia," *PLoS One* 17, no. 9 (2022): e0274678.
35. M. Megersa, Z. Asfaw, E. Kelbessa, A. Beyene, and B. Woldeab, "An Ethnobotanical Study of Medicinal Plants in Wayu Tuka District, East Welega Zone of Oromia Regional State, West Ethiopia," *Journal of Ethnobiology and Ethnomedicine* 9, no. 1 (2013): 68.
36. H. Belay and T. Wondimu, "Functional Food Plants in Debre Markos District, East Gojjam, Ethiopia," *Asian Journal of Ethnobiology* 2, no. 1 (2019): 8–20.
37. T. Beyene, "Ethnobotany of Medicinal Plants in Erob and Gulomahda Districts, Eastern Zone of Tigray Region," Addis Ababa University, Ethiopia, 2015.
38. M. Tahir, H. Asnake, T. Beyene, P. Van Damme, and A. Mohammed, "Ethnobotanical Study of Medicinal Plants in Asagirt District, Northeastern Ethiopia," *Tropical Medicine and Health* 51, no. 1 (2023): 1.
39. N. Gonfa, D. Tulu, K. Hundera, and D. Raga, "Ethnobotanical Study of Medicinal Plants, Its Utilization, and Conservation by Indigenous People of Gera District, Ethiopia," *Cogent Food & Agriculture* 6, no. 1 (2020): 1852716.
40. L. Kidane, G. Gebremedhin, and T. Beyene, "Ethnobotanical Study of Medicinal Plants in Ganta Afeshum District, Eastern Zone of Tigray, Northern Ethiopia," *Journal of Ethnobiology and Ethnomedicine* 14 (2018): 64.

41. Z. Kassa, Z. Asfaw, and S. Demissew, "An Ethnobotanical Study of Medicinal Plants in Sheka Zone of Southern Nations Nationalities and Peoples Regional State, Ethiopia," *Journal of Ethnobiology and Ethnomedicine* 16 (2020): 7.
42. M. A. Eshete and E. L. Molla, "Cultural Significance of Medicinal Plants in Healing Human Ailments Among Guji Semi-Pastoralist People, Suro Barguda District, Ethiopia," *Journal of Ethnobiology and Ethnomedicine* 17 (2021): 61.
43. Beevers, Gareth, Gregory YH Lip, and Eoin O'Brien. "ABC of hypertension: the pathophysiology of hypertension." *BMJ: British Medical Journal*, Vol. 322, No. 7295, 2001, pp. 912-16.
44. Mills, Katherine T., et al. "Global disparities of hypertension prevalence and control clinical perspective: a systematic analysis of population-based studies from 90 countries." *Circulation*, Vol. 134, No. 6, 2016, pp. 441-50.
45. Cohen, Jerome D. "Hypertension epidemiology and economic burden: refining risk assessment to lower costs." *Managed Care*, Vol. 18, No. 10, 2009, pp. 51-58.
46. Weber, Michael A., et al. "Clinical practice guidelines for the management of hypertension in the community: a statement by the American Society of Hypertension and the International Society of Hypertension." *The Journal of Clinical Hypertension*, Vol. 16, No. 1, 2014, pp. 14-26.
47. Pinto, Isabel C., and Débora Martins. "Prevalence and risk factors of arterial hypertension: A literature review." *Journal of Cardiovascular Medicine and Therapeutics*, Vol. 1, No. 2, 2017, pp. 1-7.
48. Esler, Murray, Elisabeth Lambert, and Markus Schlaich. "Point: Chronic activation of the sympathetic nervous system is the dominant contributor to systemic hypertension." *Journal of Applied Physiology*, Vol. 109, No. 6, 2010, pp. 1996-98.
49. Navar, L. Gabriel. "Counterpoint: Activation of the intrarenal renin-angiotensin system is the dominant contributor to systemic hypertension." *Journal of Applied Physiology*, Vol. 109, No. 6, 2010, pp. 1998-2000.
50. Al Disi SS, Anwar MA, Eid AH. Anti-hypertensive herbs and their mechanisms of action: part I. *Front Pharmacol.* 2015;6:323. doi: 10.3389/fphar.2015.00323.
51. Wang J, Xiong X. Control strategy on hypertension in Chinese medicine. *Evid Based Complement Alternat Med.* 2012;2012:284847. doi: 10.1155/2012/284847.
52. Anwar MA, Al Disi SS, Eid AH. Anti-hypertensive herbs and their mechanisms of action: part II. *Front Pharmacol.* 2016;7:50. doi: 10.3389/fphar.2016.00050.
53. Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM. et al. Heart

- disease and stroke statistics--2011 update: a report from the American Heart Association. *Circulation*. 2011;123(4):e18–e209. doi: 10.1161/CIR.0b013e3182009701.
54. Hashemi V, Dolati S, Hosseini A, Gharibi T, Danaii S, Yousefi M. Natural killer T cells in preeclampsia: an updated review. *Biomed Pharmacother*. 2017;95:412–8. doi: 10.1016/j.biopha.2017.08.077.
55. Sinha AD, Agarwal R. Clinical pharmacology of antihypertensive therapy for the treatment of hypertension in CKD. *Clin J Am Soc Nephrol*. 2019;14(5):757–64. doi: 10.2215/cjn.04330418.
56. Singh P, Mishra A, Singh P, Goswami S, Singh A, Tiwari KD. Hypertension and herbal plant for its treatment: a review. *Indian J Res Pharm Biotechnol*. 2015;3(5):358–66.
57. Rastogi S, Pandey MM, Rawat AK. Traditional herbs: a remedy for cardiovascular disorders. *Phytomedicine*. 2016;23(11):1082–9. doi: 10.1016/j.phymed.2015.10.012.
58. Agrawal M, Nandini D, Sharma V, Chauhan NS. Herbal remedies for treatment of hypertension. *Int J Pharm Sci Res*. 2010;1(5):1–21. doi: 10.13040/ijpsr.0975-8232.1(5).1-21.
59. Jacob B, Narendhirakannan RT. Role of medicinal plants in the management of diabetes mellitus: a review. *3 Biotech*. 2019;9(1):4. doi: 10.1007/s13205-018-1528-0.
60. Shayganni E, Bahmani M, Asgary S, Rafieian-Kopaei M. Inflammaging and cardiovascular disease: management by medicinal plants. *Phytomedicine*. 2016;23(11):1119–26. doi: 10.1016/j.phymed.2015.11.004.
61. Kaur R, Khanna N. Pathophysiology and risk factors related to hypertension and its cure using herbal drugs. *Spatula DD*. 2012;2(4):245–56. doi: 10.5455/spatula.20121223101221.
62. R. A. Sylver -Francis, “Medicinal Plants Use in Nigeria for the Management of Hypertension and Diabetes,” University of London, University College London (United Kingdom), 2022.
63. N. Debelo and M. Afework, “Assessment of Hematological, Biochemical and Histopathological Effects of Acute and Sub-Chronic Administration of the Aqueous Leaves Extract of *Thymus Schimperii* in Rats,” *Journal of Clinical Toxicology* 06, no. 286.
64. R. A. C. Palozzi, M. I. Schaedler, C. Tirloni, et al., “Roles of Nitric Oxide and Prostaglandins In the Sustained Antihypertensive Effects of *Acanthospermum hispidum* DC. on Ovariectomized Rats With Renovascular Hypertension,” *Evidence-Based Complementary and Alternative Medicine* 2017, no. 1.

65. E. Irondi, S. Agboola, G. Oboh, and A. Boligon, "Inhibitory Effect of Leaves Extracts of *Ocimum basilicum* and *Ocimum gratissimum* on Two Key Enzymes Involved in Obesity and Hypertension In Vitro, " *Journal of Intercultural Ethnopharmacology* 5, no. 4 (2016): 396.
66. M. Eddouks, M. Maghrani, A. Lemhadri, M. -L. Ouahidi, and H. Jouad, "Ethnopharmacological Survey of Medicinal Plants Used for the Treatment of Diabetes Mellitus, Hypertension and Cardiac Diseases in the South -East Region of Morocco (Tafilalet), " *Journal of Ethnopharmacology* 82, no. 2 –3 (2002): 97 –103.
67. A. R. Althaher, S. A. Oran, and Y. Jarrar, "Phytochemical Investigation and Biological Activities of *Ruta chalepensis* Methanolic Extract: Antioxidant, Anti -Inflammatory, Anticollagenase, and Antielastase Properties, " *Journal of Food Biochemistry* 2024, no. 1.
68. B. Geleta, E. Makonnen, A. Debella, A. Abebe, and N. Fekadu, "In Vitro Vasodilatory Activity and Possible Mechanisms of the Crude Extracts and Fractions of *Moringa Stenopetala* (Baker F.) Cufod. Leaves in Isolated Thoracic Aorta of Guinea Pigs, " *Journal of Experimental Pharmacology* 8 (2016): 35 –42.
69. M. Teshome, F. Kebede, and T. Yohannes, "An Ethnobotanical Survey of Indigenous Knowledge on Medicinal Plants Used by Communities to Treat Various Diseases Around Ensaro District, North Shewa Zone of Amhara Regional State, Ethiopia, " (in English), " *Scientifica* 2023.
70. N. Amsalu, Y. Bezie, M. Fentahun, A. Alemayehu, and G. Amsalu, "Use and Conservation of Medicinal Plants by Indigenous People of Gozamin Wereda, East Gojjam Zone of Amhara Region, Ethiopia: An Ethnobotanical Approach, " *Evidence - Based Complementary and Alternative Medicine* 2018.