

INTERNATIONAL JOURNAL OF AYURVEDA360



**AYURVEDA
360**

**PEER-REVIEWED
BIMONTHLY JOURNAL**



| www.journals.ayurveda360.in/

ISSN

PRINT:

3048-7382

ONLINE:

3048-7390

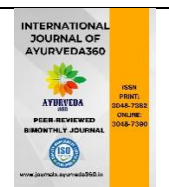
2026

VOLUME 2

ISSUE 4

JANUARY-

FEBRUARY



Review Article

Integrative Review of an Ayurvedic Polyherbal Formulation for the Management of Hypertension: Ayurvedic and contemporary Perspectives

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ARTICLE INFO	Abstract
Keywords: Hypertension Ayurveda Polyherbal formulation Cardiovascular disease Integrative medicine Manuscript: Received: 01/01/26 Updated: 01/02/26 Accepted: 8/2/26 Published: 15/2/26  Quick Response: 	Introduction: Hypertension is a major global health disorder contributing significantly to cardiovascular morbidity and mortality. Although several antihypertensive drugs are available, long-term therapy is frequently associated with adverse effects, economic burden, and poor patient compliance. Ayurveda describes conditions comparable to hypertension through concepts such as Vyānabala Vaiṣamya, Sirāgata Vāta, and Raktagata Vāta, emphasizing systemic balance and cardiovascular stability. Methods: A narrative review of classical Ayurvedic literature and contemporary biomedical studies was conducted to evaluate a polyherbal formulation containing Tagara (<i>Valeriana wallichii</i>), Arjuna (<i>Terminalia arjuna</i>), Jatāmāṁsī (<i>Nardostachys jatamansi</i>), Śaṅkhapuṣpī (<i>Convolvulus pluricaulis</i>), Rasona (<i>Allium sativum</i>), Aśvagandhā (<i>Withania somnifera</i>), and Gokṣura (<i>Tribulus terrestris</i>). Results: Literature suggests these herbs possess antihypertensive, cardioprotective, antioxidant, anxiolytic, adaptogenic, and vasorelaxant activities through autonomic modulation, endothelial protection, and oxidative stress reduction. Ayurvedic interpretation indicates normalization of Vāta and Rakta Duṣṭi with enhancement of Hṛdaya Bala. Discussion: The review demonstrates convergence between Ayurvedic concepts and modern hypertension pathophysiology, supporting future experimental and clinical evaluation of the formulation.

DOI: <https://doi.org/10.63247/3048-7390.vol.2.issue4.10>

Introduction

Hypertension is a chronic medical condition characterized by sustained elevation of arterial blood pressure and is considered a silent killer due to its asymptomatic progression. According to JNC-8 guidelines, hypertension is defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg [1].

Globally, cardiovascular diseases account for nearly one-third of total deaths, and hypertension contributes significantly to ischemic heart disease, stroke, renal failure, and metabolic disorders [2]. The prevalence of hypertension has increased rapidly in developing countries due to lifestyle transitions, dietary changes, stress, and urbanization. In India, hypertension represents one of the leading contributors to disease burden and premature mortality [3].

Modern antihypertensive drugs effectively control blood pressure but often require lifelong administration and may produce adverse effects such as fatigue, electrolyte imbalance, cough, metabolic disturbances, and reduced adherence. Hence, exploration of safer, multi-target therapeutic approaches is necessary.

Āyurveda emphasizes prevention and restoration of physiological balance through individualized treatment and multi-component herbal formulations. Classical texts advocate treating diseases based on pathogenesis even when a specific nomenclature is absent [4]. Cāraka states that unnamed diseases should be diagnosed through Doṣa, Duṣya, and Samprāpti analysis. Therefore, hypertension can be interpreted through functional disturbances of Vāta, Rakta, and Manas.

Concept of Hypertension in Modern Medicine & Experimental Basis of Hypertension

Blood pressure regulation is a complex physiological process maintained through coordinated interactions among cardiac output, peripheral vascular resistance, the renin–angiotensin–aldosterone system (RAAS), the sympathetic nervous system, and endothelial function. These mechanisms operate through integrated neurohumoral and vascular responses that ensure adequate tissue perfusion and circulatory homeostasis. Cardiac output determines the volume of blood delivered into the arterial system, whereas peripheral vascular resistance regulates vascular tone and systemic pressure. The RAAS plays a pivotal role in long-term blood pressure regulation by modulating sodium balance, fluid retention, and vasoconstriction through angiotensin II and aldosterone activity. Simultaneously, sympathetic nervous system activation influences heart rate, myocardial contractility, and vascular constriction, thereby contributing to acute and chronic blood pressure control. Endothelial cells further regulate vascular tone through the release of vasoactive mediators such as nitric oxide, prostacyclin, and endothelin [5].

Persistent dysregulation or overactivation of these regulatory systems leads to pathological consequences. Chronic stimulation of RAAS and sympathetic pathways promotes sustained vasoconstriction, increased intravascular volume, and structural alterations within the vascular wall. These changes result in vascular remodeling characterized by smooth muscle hypertrophy, reduced arterial elasticity, and progressive arterial stiffness. Over time, such alterations impair vascular compliance and contribute to sustained hypertension, ultimately leading to end-organ damage affecting the cardiovascular, renal, cerebrovascular, and retinal systems [6].

The development of hypertension is strongly influenced by multiple risk factors, many of which are modifiable. Excessive dietary salt intake contributes to fluid retention and increased vascular resistance, while obesity—particularly central adiposity—induces metabolic and inflammatory disturbances that exacerbate vascular dysfunction. A sedentary lifestyle further impairs metabolic regulation and endothelial health. Chronic psychological stress activates neuroendocrine pathways, especially sympathetic overactivity and hypothalamic–pituitary–adrenal axis stimulation, which elevate blood pressure over prolonged periods. Additionally, dyslipidemia and insulin resistance play central roles in the pathogenesis of hypertension by promoting oxidative stress, endothelial dysfunction, and low-grade systemic inflammation. These factors frequently coexist as components of metabolic syndrome, thereby amplifying cardiovascular risk through interconnected pathophysiological mechanisms [7].

Experimental models that combine a high-fat diet with fructose administration have been widely utilized to simulate metabolic syndrome–associated hypertension. Such models closely resemble human metabolic abnormalities by inducing insulin resistance, lipid dysregulation, oxidative stress, and endothelial dysfunction. Excess fructose intake enhances hepatic lipogenesis and metabolic imbalance, while high dietary fat promotes adiposity and inflammatory signaling. Together, these metabolic disturbances increase sympathetic nervous system activity and impair vascular relaxation, ultimately resulting in elevated systemic vascular resistance and sustained hypertension [8].

In addition to metabolic induction, neurogenic stress components can be incorporated into experimental

hypertension models through pharmacological agents. Metachlorophenylpiperazine (mCPP), a serotonergic receptor agonist, is known to activate central serotonergic pathways and provoke neuroendocrine stress responses. This activation enhances sympathetic outflow and stress-related pressor mechanisms, leading to further elevation of blood pressure. The combined use of high-fat and fructose dietary intervention along with mCPP administration therefore represents a comprehensive experimental model that reproduces both metabolic and neurogenic aspects of hypertension, making it particularly suitable for investigating multifactorial mechanisms underlying elevated blood pressure and evaluating potential therapeutic interventions [9].

Āyurvedic Perspective of Hypertension: Concept of Vyānabala Vaiśamya

Hypertension does not appear as a single disease entity in Āyurvedic classics; however, its symptom complex closely resembles several pathological conditions.

In Āyurveda, hypertension does not correspond to a single disease entity; rather, it is understood through functional disturbances of physiological principles governing circulation and vascular dynamics. The concept of Vyānabala Vaiśamya provides an important explanatory framework for understanding altered blood pressure regulation. Vyāna Vāyu, a subtype of Vāta Doṣa, is primarily responsible for circulation, cardiac activity, rhythmic movement of blood, and maintenance of vascular tone throughout the body [10,11]. It regulates the force, velocity, and distribution of blood flow, ensuring proper perfusion of tissues. When Vyāna Vāyu becomes vitiated or functionally imbalanced, irregularity in circulatory dynamics occurs, which can be

correlated with increased arterial pressure and hemodynamic instability observed in hypertension [12].

Several Āyurvedic disease entities described in classical texts resemble the pathological manifestations of hypertension. Conditions such as Sirāgata Vāta and Raktagata Vāta involve vitiation of Vāta Doṣa within vascular channels and blood tissue, leading to impaired circulation and vascular rigidity [11,13]. Pittāvṛta Vāta reflects obstruction of Vāta by aggravated Pitta, resulting in increased heat, irritability, and vascular reactivity [10]. Similarly, Hṛdroga encompasses disorders of cardiac function, while vascular complications associated with Prameha (metabolic disorders) parallel modern descriptions of metabolic syndrome–related cardiovascular disease [11,14]. Collectively, these conditions illustrate how Āyurvedic pathology conceptualizes circulatory disturbances analogous to hypertension.

Nidāna

The etiological factors (Nidāna) described in Āyurveda show remarkable similarity to modern risk factors for hypertension. Excessive consumption of Lavaṇa (salt) is associated with fluid retention and increased vascular tension, comparable to high dietary sodium intake [10,15]. Intake of Sneha and Guru Āhāra (unctuous and heavy foods) promotes Medovṛddhi (adiposity), corresponding to high-fat diets and obesity [11]. Emotional factors such as Krodha (anger) and Cintā (worry) contribute to psychological stress, which activates neuroendocrine responses affecting cardiovascular regulation [16]. Lack of physical activity (Avyāyāma) further aggravates metabolic imbalance and circulatory dysfunction [10]. These classical descriptions closely parallel contemporary understanding of lifestyle-related risk factors in hypertension.

Lakṣaṇa

Clinical manifestations (Lakṣaṇa) associated with disturbed Vyāna Vāyu also resemble symptoms commonly observed in hypertensive individuals. Patients may experience Śirāśūla (headache), Bhrama (dizziness), Krodha (irritability), Klama (fatigue), and Dāha (burning sensation), reflecting both vascular and neuropsychological involvement [11,13]. Although hypertension is often asymptomatic in early stages, these features correspond to symptomatic phases associated with elevated vascular tension and autonomic imbalance [17].

Samprāpti

The Āyurvedic pathogenesis (Samprāpti) of hypertension can be understood as a sequential process beginning with exposure to causative factors such as excessive salt intake, heavy dietary habits, and chronic psychological stress. These factors impair digestive and metabolic fire (Agnimāndya), leading to the formation of Āma (metabolic toxins) [10,11]. Accumulated Āma causes vitiation of Rasa and Rakta Dhātu, resulting in impaired circulation and vascular channel dysfunction. Subsequent aggravation of Vāta Doṣa, particularly Vyāna Vāyu, increases resistance within the vascular system, ultimately manifesting as elevated blood pressure [12,14]. This progression conceptually aligns with modern mechanisms involving metabolic dysfunction, endothelial impairment, and increased peripheral vascular resistance [17].

Management Principle

Based on this understanding, Āyurvedic management principles emphasize correction of underlying systemic imbalance rather than symptomatic blood pressure reduction alone. Therapeutic approaches include Vāta-śamana (pacification of aggravated

Vāta), Medohara interventions aimed at reducing metabolic excess and adiposity, Hṛdya (cardiotonic) therapies supporting cardiac function, and Manas-prasādana measures that promote psychological balance and stress reduction [10,11,16]. These strategies demonstrate significant conceptual parallels with modern integrative approaches targeting lifestyle modification, metabolic correction, cardiovascular protection, and stress management in hypertension [17].

Thus, the Āyurvedic concept of Vyānabala Vaiṣamya provides a comprehensive physiological and pathological framework that closely parallels contemporary biomedical understanding of hypertension, supporting the relevance of traditional principles in modern cardiovascular research.

Need for the Study

Hypertension requires lifelong therapy, creating economic and safety concerns, especially in low-resource settings. Polyherbal formulations may provide multi-mechanistic action, better tolerability, metabolic correction, and stress reduction. Scientific validation through preclinical models is essential to establish safety and efficacy.

Review of Selected Drugs

The selected polyherbal formulation is designed on the principle of Doṣa-Pratyānīka Cikitsā and Samprāpti-Vighaṭana, targeting Vāta predominance, Rakta Duṣṭi, Manovaha Srotas imbalance, and Meda Duṣṭi involved in hypertension. Classical Āyurvedic texts emphasize the use of Hṛdya, Medhya, Rasāyana, Mutrala, and Vāta-śāmaka drugs in disorders involving abnormal circulation and psychological stress [18][19].

Table 1. Āyurvedic Pharmacodynamic Properties of Selected Herbs

Herb	Rasa	Guṇa	Virya	Vipāka	Prabhāva / Classical Karma
Tagara (<i>Valeriana wallichii</i> DC.)	Tikta, Kaṭu	Laghu, Snigdha	Uṣṇa	Kaṭu	Nīdrajanana, Vātahara, Mānas-śāmaka
Arjuna (<i>Terminalia arjuna</i> Roxb.)	Kaṣāya	Laghu, Rūkṣa	Śīta	Kaṭu	Hṛdya, Rakta-stambhaka
Jaṭāmāmsī (<i>Nardostachys jatamansi</i> DC.)	Tikta, Kaṣāya	Laghu, Snigdha	Śīta	Kaṭu	Medhya, Rasāyana, Tridoṣahara
Śaṅkhaṇṇī (<i>Convolvulus pluricaulis</i> Choisy)	Tikta, Kaṣāya	Laghu, Snigdha	Śīta	Madhura	Medhya, Mānas-prasādana
Rasona (<i>Allium sativum</i> Linn.)	Kaṭu, Tikta	Snigdha, Tīkṣṇa	Uṣṇa	Kaṭu	Dīpana, Vāta-Kapha-śāmaka, Hṛdya
Aśvagandhā (<i>Withania somnifera</i> Dunal)	Tikta, Kaṣāya, Madhura	Laghu, Snigdha	Uṣṇa	Madhura	Rasāyana, Balya, Vātahara
Gokṣura (<i>Tribulus terrestris</i> Linn.)	Madhura	Guru, Snigdha	Śīta	Madhura	Mutrala, Balya, Rasāyana

Tagara (*Valeriana wallichii*)

Tagara was selected for the review due to its classical indication as a

Nīdrajanana and Mānas-śāmaka drug acting primarily on Manovaha Srotas [20]. Since psychological stress and sympathetic

overactivity are major contributors to hypertension, drugs capable of calming aggravated Vāta and stabilizing mental activity are therapeutically relevant [21]. Modern evidence supporting its anxiolytic and sedative effects through GABAergic modulation further justifies its inclusion as a neuroregulatory component targeting stress-induced elevation of blood pressure [22].

Arjuna (*Terminalia arjuna*)

Arjuna was included based on its classical classification under Hṛdya Mahākaśāya, indicating a direct action on cardiac function and circulation [23]. Āyurveda emphasizes strengthening of Hṛdaya in disorders involving altered blood flow and vascular integrity [24]. Extensive modern pharmacological evidence demonstrating cardioprotective, antioxidant, anti-ischemic, and endothelial-stabilizing properties makes Arjuna a core component for addressing structural and functional cardiovascular changes associated with hypertension [25].

Jaṭāmāṁsī (*Nardostachys jatamansi*)

Jaṭāmāṁsī was selected due to its established role as a Medhya Rasāyana and Mānas Rogahara drug indicated in conditions of mental agitation, anxiety, and Vāta-Pitta imbalance [26]. Neurogenic stress plays a significant role in hypertension pathogenesis; therefore, a herb capable of modulating autonomic activity and reducing psychological disturbances is essential [27]. Experimental studies reporting antioxidant and neuroprotective actions support its potential in mitigating stress-mediated hypertensive responses [28].

Śaṅkhapuṣpī (*Convolvulus pluricaulis*)

Śaṅkhapuṣpī was incorporated owing to its classical use as a Medhya Rasāyana that enhances cognitive stability

and promotes mental calmness [29]. Hypertension frequently coexists with stress, insomnia, and emotional imbalance, which aggravate Vyāna Vāyu [30]. The herb's traditional indication in anxiety and mental fatigue, along with modern findings of anxiolytic and neuroendocrine regulatory effects, supports its selection for restoring psychophysiological balance influencing blood pressure regulation [31].

Rasona (*Allium sativum*)

Rasona was chosen because of its strong indication in Vāta-Kapha disorders and conditions involving Srotorodha (channel obstruction) [32]. Hypertension associated with dyslipidemia and vascular stiffness parallels this concept [33]. Classical descriptions emphasize its circulatory and metabolic corrective actions, while modern studies demonstrating lipid-lowering effects, nitric oxide enhancement, and vasodilatory activity provide scientific justification for its inclusion as a vascular protective agent [34].

Aśvagandhā (*Withania somnifera*)

Aśvagandhā was selected as a principal Rasāyana drug known for improving Bala, Ojas, and adaptation to stress [35]. Chronic stress and autonomic imbalance are recognized contributors to hypertension progression [36]. Its traditional use in debility and stress-related disorders, combined with modern evidence of adaptogenic activity, cortisol reduction, and autonomic stabilization, makes it relevant for regulating neuroendocrine mechanisms underlying elevated blood pressure [37].

Gokṣura (*Tribulus terrestris*)

Gokṣura was included due to its classification under Mutravirecanīya Mahākaśāya, indicating diuretic and fluid-regulating properties [38]. Fluid retention and increased circulatory volume contribute to hypertension

pathophysiology [39]. Classical indications in urinary and cardiovascular disorders, along with modern evidence of diuretic and endothelial protective actions, justify its role in reducing vascular load and supporting blood pressure regulation [40].

Rationale for Selection of Herbs

The selected herbs were chosen based on classical Āyurvedic indications related to Vāta-pradhāna disorders, Hṛdroga, Manovaha Srotas imbalance, and metabolic disturbances resembling hypertension [41]. Classical texts describe these drugs as Medhya, Hṛdya, Rasāyana, Mutrala, or Vāta-śāmaka, suggesting actions on cardiovascular regulation, mental stress, and systemic metabolism [42]. From a modern perspective, hypertension is multifactorial, involving autonomic dysregulation, endothelial dysfunction, oxidative stress, dyslipidemia, and fluid imbalance [43]. Therefore, a polyherbal formulation targeting neurogenic, metabolic, vascular, and psychological components was selected to

achieve Samprāpti-vighaṭana (multi-level correction) [44]. The combination integrates stress modulation, cardioprotection, lipid regulation, diuretic activity, and vascular stabilization, aligning Āyurvedic principles with contemporary pharmacological understanding [45].

The formulation collectively addresses hypertension through multiple complementary mechanisms. Vāta-śāmaka herbs regulate circulatory dynamics and autonomic balance, while Hṛdya drugs strengthen cardiac function and improve vascular integrity. Medohara actions correct lipid metabolism, and Mānas-prasādana drugs reduce psychological stress contributing to sympathetic overactivity. Additionally, Mutrala effects assist in reducing fluid retention and vascular pressure. Thus, the formulation simultaneously targets Śārīrika (somatic) and Mānasika (psychological) components of hypertension.

Table 2. Functional Role of Selected Herbs in Hypertension

Herb	Therapeutic Action in Hypertension	Modern Pharmacological Evidence	Scientific Correlation
Tagara	Calms aggravated Vāta and stabilizes Vyāna Vāyu	Sedative, anxiolytic, GABA modulation	Reduces stress-induced sympathetic activation
Arjuna	Strengthens Hṛdaya and improves Rakta Gati	Cardioprotective, antioxidant, lipid-lowering	Improves endothelial function and arterial compliance
Jaṭāmāmsī	Reduces mental agitation and autonomic imbalance	Neuroprotective, antioxidant	Attenuates neurogenic hypertension
Śaṅkhaṇḍī	Restores Manovaha Srotas balance	Anti-stress, anxiolytic, cognitive enhancer	Neuroendocrine regulation of BP
Rasona	Removes Srotorodha and Meda accumulation	Nitric oxide enhancement, hypolipidemic	Vasodilation and reduced peripheral resistance
Aśvagandhā	Vāta stabilization and stress reduction	Adaptogenic, cortisol-reducing	Improves autonomic balance
Gokṣura	Reduces fluid overload through Mutrala action	Diuretic, endothelial protective	Decreases vascular volume load

Preclinical Model Justification

Hypertension associated with metabolic syndrome is a multifactorial disorder influenced by dietary habits, metabolic imbalance, and neurogenic stress. Diet-induced experimental models are widely accepted because they closely mimic lifestyle-related hypertension observed in humans. In the present study, hypertension is induced using a combination of a high-fat diet, fructose administration, and meta-chlorophenylpiperazine (mCPP), each targeting distinct pathogenic mechanisms. A high-fat diet produces dyslipidemia and endothelial dysfunction, while fructose induces insulin resistance and metabolic disturbances. mCPP, a serotonergic agonist, triggers neurogenic stress responses and sympathetic activation. Together, these factors reproduce metabolic and stress-induced hypertension similar to clinical conditions.

Despite extensive traditional use of Āyurvedic formulations in cardiovascular disorders, systematic scientific validation remains limited. Standardized experimental evidence regarding safety, dose optimization, and mechanistic pharmacology is necessary, particularly for polyherbal formulations. Preclinical studies using Wistar rat models provide controlled conditions for evaluating therapeutic efficacy, toxicity profiling, and dose standardization, thereby offering translational insight between traditional knowledge and modern biomedical research.

Declarations

Conflict of Interest: The author declares that they have no conflicts of interest related to this work.

Funding / Financial Support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions: GK (Dr. Gaurav Kumar) conceptualized the study, conducted literature review, interpreted Ayurvedic concepts, and drafted the manuscript. URS (Prof. (Dr.) Udai Raj Saroj) supervised the research work, provided academic guidance, and critically revised the manuscript for important intellectual content. GS (Gaurav Sharma) contributed to pharmacological interpretation, biomedical correlation, and scientific validation of the reviewed formulation. MS (Dr.

From an integrative perspective, Āyurveda considers hypertension a manifestation of systemic imbalance rather than an isolated vascular disorder, emphasizing restoration of physiological harmony and metabolic correction. Modern medicine primarily focuses on numerical blood pressure control. Integrating both approaches may provide holistic cardiovascular protection, reduce long-term drug burden, improve quality of life, and support preventive cardiology strategies.

Future research should focus on molecular pathway analysis, biomarker evaluation, chronic toxicity assessment, pharmacokinetic profiling, network pharmacology studies, and well-designed clinical trials to establish evidence-based integration of Āyurvedic therapeutics.

Conclusion

Hypertension represents a multifactorial disorder requiring multi-target therapeutic strategies. Āyurvedic concepts of Vāta imbalance and Rakta Duṣṭi closely parallel modern pathophysiological understanding. The reviewed polyherbal formulation demonstrates strong theoretical and pharmacological justification for antihypertensive potential through cardioprotective, anxiolytic, antioxidant, and metabolic regulatory actions.

As preclinical evaluation is currently underway, this review establishes the scientific and classical foundation supporting further experimental and clinical investigation of this formulation as an integrative antihypertensive therapy.

Meenakshi Sharma) assisted in literature compilation, clinical interpretation, and manuscript editing. All authors reviewed and approved the final version of the manuscript for publication.

Ethical Approval: Not Applicable

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgements: The authors would like to acknowledge the support of their institution, colleagues, and technical staff who contributed to this work.

Disclaimer / Views and Opinions: The opinions expressed in this article are solely those of the author and do not reflect the views of the International Journal of Ayurveda360 or its editorial board.

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How to cite this article:

Kumar G, Saroj UR, Sharma G, Sharma M. Integrative Review of an Ayurvedic Polyherbal Formulation for the Management of Hypertension: Ayurvedic and Contemporary Perspectives. Int J Ayurveda360. 2026;2(4):1009–1018. DOI: <https://doi.org/10.63247/3048-7390.vol.2.issue4.10>

		
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