ROLE OF HERBAL PRODUCTS IN MANANGEMENT OF HYPERTENSION

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ABSTRACT

The medical term for elevated blood pressure is hypertension (HTN). It is risky because it puts too much strain on the heart and causes atherosclerosis, which is the hardening of the arteries, in addition to raising the risk of heart disease and stroke. Other diseases including congestive heart failure, renal disease, and blindness can also be brought on by HTN. Traditional antihypertensives frequently have a number of adverse effects. Due to its superior tolerance by the human body and fewer adverse effects, around 75–80% of the world's population uses herbal medicines for primary healthcare, primarily in impoverished nations. Research on native plants with hypotensive and antihypertensive therapeutic benefits has received a lot of focus during the past three decades. Research on indigenous plants with hypotensive and antihypertensive therapeutic benefits has received a lot of focused attention. Some of these medicinal plants' hypotensive and antihypertensive properties have been shown effective, while others have been found to be ineffective. To validate the efficacy and clarify the safety profile of such herbal treatments for their antihypertensive potential, additional scientific study must be conducted in conjunction with contemporary medicine and ayurveda expertise.

INTRODUCTION

In a chronic medical disease called hypertension (HTN) or high blood pressure (BP) causes excessive blood pressure in the arteries. Either main (essential) or secondary classifications apply to it. About 90–95% of cases are classified as primary HTN, which is high blood pressure without a known medical reason. (1). Secondary HTN, which affects the remaining 5 to 10% of patients, is brought on by various illnesses that affect the kidneys, arteries, heart, or endocrine system. (2). Steady HTN is one of the gamble factors for strokes, coronary episodes, cardiovascular breakdown, and blood vessel aneurysm, and is a main source of persistent kidney disappointment (3) . Life expectancy decreases when arterial blood pressure rises moderately. BP control can be improved and the risk of associated health complications reduced through dietary and lifestyle changes as well as medication.

CLASSIFICATION

The systolic and diastolic blood pressures are typically used to classify HTN. During a heartbeat, the BP in blood vessels is called systolic BP. Diastolic BP is the tension between pulses. A person is said to be pre-HTN or HTN if their systolic or diastolic blood pressure is higher than the accepted normal values for their age. There are several subcategories of HTN, including isolated systolic HTN, HTN stage I, and HTN stage II. Confined systolic HTN alludes to raised systolic tension with typical diastolic strain and is normal in the old. After averaging a patient's resting blood pressure readings from two or more office visits, these classifications are made. People more seasoned than 50 years are named having HTN assuming that their BP is reliably somewhere around 140 mmHg systolic or 90 mmHg diastolic. Further treatment is required for patients who have blood pressures greater than 130/80 mmHg and diabetes or kidney disease at the same time. If medications do not bring BP levels back to normal, HTN is also considered to be resistant (4). A high blood pressure during exercise is known as exercise HTN (5). Between 200 and 230 mmHg is the normal range for systolic values during exercise (6). HTN during exercise may indicate an individual's risk of developing HTN at rest (7).

CAUSES

1. Essential Hypertension: Essential HTN accounts for 90 to 95 percent of hypertensive patients and is the most common type of HTN. There are numerous factors, including a sedentary lifestyle, stress, visceral obesity, and potassium deficiency (hypokalemia), despite the fact that no single factor has been identified as the direct cause (9). Obesity More than 85 percent of cases affect people with a BMI greater than 25) sensitivity to salt (or

sodium) (11). liquor consumption (12) or on the other hand lack of vitamin D that increment the gamble of creating HTN (13). Alteration also raises risk (14), a few genetic mutations that are inherited (15) or having a history of HTN in the family (16). Another risk factor is an increase in the kidney-secreted enzyme renin (17) and overactivity of the sympathetic nervous system Insulin opposition (18) which is a part of disorder X, or the metabolic condition, is likewise remembered to add to HTN. High fructose corn syrup-containing foods may make you more likely to get HTN (19).

2. **Secondary hyprtension:** Optional HTN by definition results from a recognizable reason. This type is vital to perceive since it is dealt with uniquely in contrast to fundamental HTN, by treating the basic reason for the raised BP. The pathophysiological mechanisms that control blood plasma volume and heart function, such as the hormone-regulating endocrine system, are compromised or out of balance as a result of HTN. HTN is caused by a lot of things. Some secondary causes are well-known and common, like Cushing's syndrome, in which the adrenal glands overproduce the hormone cortisol (20). Other conditions that alter hormones, such as hyperthyroidism, hypothyroidism, and adrenal gland cancer, can also result in HTN. Kidney disease, obesity/metabolic disorder, pre-eclampsia during pregnancy, the congenital defect known as coarctation of the aorta, and certain prescription and illegal drugs are additional common causes of secondary HTN.

PATHOPHYSIOLOGY OF HYPERTENSION

The pathophysiological mechanisms implicated in the progress of HTN comprise raised vascular resistance, mainly distinguished through decreased vascular diameter because of enhanced vascular contraction and arterial remode (21). Numerous factors contribute to the pathophysiology of HTN, including increases in the renin-angiotensin-aldosterone system (RAAS), stimulation of the sympathetic nervous system, vasopressin, disturbed G protein-coupled receptor signal, inflammation, different T-cell roles, and the diversity of vasoactive peptides secreted by other endothelial cells and smooth muscle cells (22). Expanded blood vessel reactivity as a result of dysregulation in favorable to oxidant chemicals and endothelial nitric oxide synthase (eNOS), expanded basal and enacted calcium levels through calcium channels, and co-event of vascular smooth muscle cell (VSMC) hyperplasia and hypertrophy can cause upgraded vasoconstriction (23). Therapy must focus on vascular stiffness rather than just the modulation of peripheral vascular resistance because augmented vascular stiffness is favorable to HTN and its complications, such as atherosclerosis (24). The cell cycle can be advanced by angiotensin II (Ang II) (25,26). Other possible causes of HTN include hormonal-neurogenic vasoconstriction, genetic disorders of the Na/Ca2+ exchange in artery smooth muscles, and renal sodium secretion disorders (27).

HERBAL MEDICINES USED FOR THE TREATMENT OF HYPERTENSION

1. **AJWAIN (CARUM COPTICUM L.)** Carum copticum is a member of the Apiaceae family. It grows in Central Europe, India, Afghanistan, Pakistan, and Iran, particularly in the eastern parts of Baluchistan. C. copticum plays a significant role in regulating heart rate and blood pressure as a result of its ability to block calcium channels. The fluid methanolic concentrate of C. copticumBenth. In normotensive (NMT) rats, seeds (CSE) reduce BP and heart rate (HR) by 1-30 mg/kg. Bradycardia has been observed at higher doses (10-30 mg/kg) (28).
2. **Bindii (Tribulus terrestris):** Tribulus terrestris is a therapeutic plant utilized for treating HTN. In spontaneously hypertensive (SHR) rats, Bindii lowers BP. It has been demonstrated that its methanolic and aqueous extracts (0.3–15 mg/mL) have vasodilatory properties (29). Because of its diuretic effects, this plant is used. Additionally, this plant's saponins (furostanol, spirostanol, and tigogenin and diosgenin sulphated saponins) prevent the growth of VSM and the production of H2O2.
3. **Black cumin (Nigella sativa) :** The well-known Nigella sativa plant, also known as the "seed of blessing," has been used for a long time in Africa, Europe, and the Middle East. BP decreases as a result of this plant and its components (30). SBP and DBP decrease by 10.6 and 9.6 mm Hg, respectively, after oral administration of N. sativa seed oil extract (100 or 200 mg) to mildly hypertensive male patients for eight weeks (31). Black cumin's ability to block Ca2+ channels also helps lower blood pressure through vasorelaxation. Other potential explanations for N. sativa's hypotensive effects include the diuretic, antioxidant, and anti-inflammatory properties that it possesses (32).The annual Black Jack (Bidens pilosa L.), which belongs to the Asteraceae family and is native to South America, can also be found in tropical and subtropical regions all over the world. In various rat models, Black Jack leaf extract was able to inhibit and reduce HTN (33). SBP decreased by 17% and 21%, respectively, six hours after treatment with 75 and 150 mg/kg of methanolic leaf extract in fructose-fed rats (33). In addition, B. pilosa has anti-cancer and obesity-fighting properties (33).

Black plum (Vitex doniana) Within 45 minutes of taking the fresh black plum fruit by mouth, both SBP and DBP significantly decreased. After two hours, BP began to return to normal (34).

4. **Greater Burdock (Arctium Lappa):** It is used to treat HTN. This plant can inhibit vascular inflammation, stimulate vasorelaxation, and scavenge reactive oxygen species (ROS) (35). One bioactive component in the dry burdock seeds that increases NO production and decreases superoxide anion levels is arctigenin, a dietary phytoestrogen (36).
5. **Burhead (Echinodorus grandifloras):** Burhead is used in Brazilian folk medicine as a diuretic drug. The aqueous extracts of this plant can cause a decline in the mean arterial pressure (MAP) in addition to cardiac output and vascular resistance in SHRs. Echinodorus grandifloras also induces persistent diuresis and decreased BP by activating muscarinic and bradykinin receptors with effects on prostaglandins and nitric oxide pathways (37).

6. **Cardamom (Elettaria cardamomum):** Cardamom fruit powder has been assessed for its antihypertensive capability. In powder form (3 g), it has been shown to reduce mean MAP as well as SBP and DBP by 19 and 12 mm Hg, respectively in pre-hypertensive subjects by increasing the total antioxidant status (38).

7. **CATS CLAW HERB UNCARIA RHYNCHOPHYLLA**: Cat's claw is an herb used in traditional Chinese medicine to treat HTN. This plant causes a decrease in BP and relieves different neurological symptoms. Hirsutine (an indole alkaloid) is responsible for thehypotensive function of Uncariarhynchophylla, which decreasesintracellular Ca2+ levels through its effect on the Ca2+ store and its effects on the voltage-dependent Ca2+ channel (39).

8. **Celery (Apium graveolens):** The seed extract of celery has been shown to have a BP-reducing effect in deoxycorticosterone acetate (DOCA)–induced hypertensive rats. The hexane extract is considerably more effective in reducing BP, probably by reducing levels of circulating catecholamines and diminishing vascular resistance. Extraordinarily, it has antioxidant effects due to the virtue of its flavonoid content (40).
9. **Chakshushya (Cassia absus L.):** Cassia absus is a plant of the family Fabaceae with Ayurvedic ethnomedical records. This plant occurs in tropical areas and all over India. Intravenous administration of the alkaloid isolated from the seeds of Cassia absus Linn (1-30 mg/kg) reduces BP in rats. At higher doses (10 and 30 mg/kg), it causes a decline in HR. Frequent injection of a similar dose induces tachyphylaxis (41).

10. **Chinese Sage (Salvia miltiorrhiza):** A conventional Chinese spice, Salvia miltiorrhiza, has been uncovered to cardioprotectively affect creatures and people. Chinese sage has anti-hypertensive properties in addition to its ability to vasodilate. These include antioxidative effects due to decreased ROS production, increased antioxidative enzymes, and anti-proliferative activities due to the inhibition of TNF- and NF-B production by platelet-derived growth factor (PDGF)-induced proliferation of VSMCs (42, 43).

11. **Cinnamon (Cinnamomum zeylanicum)**: It is another plant that is used to treat HTN. In numerous rat models and in individuals with prediabetes and type 2 diabetes (T2D), cinnamon reduced blood pressure. The aqueous extract of its stem bark reduces SBP and prevents contractions induced by NO, ATP-sensitive K+ channel, and potassium chloride (also known as KCl) related to the endothelium. The bark's methanolic extract raises NO levels (44).

12. **Cocoa beans (Theobroma cacao):** It is used to prevent cardiovascular disease (CVD) by encouraging the production of NO, promoting vasodilatation, and reducing endothelial dysfunction. SBP and DBP can be reduced by approximately 3 mm Hg and 5 mm Hg, respectively, by consuming 40 to 105 g of dark or milk chocolate daily (45).

13. **Coffee Weed (Cassia occidentalis):** It Reduces blood pressure as well. This plant's leaf is used to treat high blood pressure. It has been discovered that coffee weed lowers blood pressure, probably by preventing external Ca2+ influx. The leaves of coffee weed have anti-inflammatory, anti-oxidant, and diuretic properties. They inhibit phospholipase A2 activity and reduce lipid peroxide content (46).

14. **Coriander (Coriandrum sativum):** Coriander (Coriandrum sativum) is a traditional herb that is used to treat gastrointestinal and cardiovascular conditions. It has been demonstrated to have antioxidant properties (47). SBP, DBP, and MABP are reduced by intravenous administration of the seeds' aqueous methanolic extract (1–30 mg/mL), possibly through the Ca2+ antagonist. Furthermore, this extract has diuretic properties (48).

15. **Dogbane (Apocynum venetum)** The leaves of the dogbane plant appear to be loaded with quercetin variants and flavonoids, both of which have been found to aid in the treatment of HTN. Concentrates of dogbane leaves (10 µg/mL) actuate vasorelaxation by upgrading NO, causing the searching of ROS. As an antihypertensive, the extracts of this plant improve renal function 49).

16. **Cynanchum wilfordii** (Dog-strangling Vine): Cynanchum wilfordii is used in traditional Chinese medicine. Nearly all of the plant's parts are thought to be beneficial for various vascular diseases. C. wilfordii ethanolic extracts (100 and 200 mg/kg/day) decreased VCAM-1 and endothelin-1 (ET-1) expression, as well as increased NO and cyclic guanosine monophosphate (cGMP) production, which in turn decreased BP in rats fed high fat/cholesterol diets (50).

17. **Harmel (Peganum harmala)**: Wild Syrian Rue, a member of the Zygophyllaceae family, is referred to as "Espand." Various components of this plant, including its seeds, bark, and root, have been utilized in traditional medicine (51). Espand is utilized for HTN treatment. Endothelial cells and VSMCs are the channels through which Peganum harmala induces relaxation. Harmine, harmaline, and harmalol—the active constituents of espand—have demonstrated vasodilatory properties by increasing NO production.

18. **Fang Ji** (Stephania tetrandra): Stephania tetrandra inhibits Ca2+ channels and reduces the expression of inducible nitric oxide synthase (iNOS) to regulate high blood pressure. Tetrandrine, the bioactive component of this plant, is an alkaloid with anti-inflammatory and anti-oxidant properties, likely contributing to the plant's antihypertensive effects (53).

19. **Garden Cress (Lepidium sativum L.):** The hypotensive impact of nursery cressis related with the increased urinary expulsion of sodium, potassium, and chlorides. It has been discovered that lepidium sativum has anti-inflammatory properties. Lepidium sativum's antihypertensive effects can be attributed to its diuresis-inducing and potent antioxidant properties (54).

20. **Garden Nasturtium** (Tropaeolum majus L.): The genus Tropaeolum is a member of the Tropaeolaceae family. Studies have affirmed that Tropaeolum majus affects the circulatory framework. Garden nasturtium hydroethanolic extracts have been shown to lower MAP in SHR rats. Diuretic properties can be found in the ethanolic extract of T. majus (300 mg/kg), cure element (100 mg/kg), and isoquercitrin (10 mg/kg). Plasma ACE levels can be decreased by any or all of the aforementioned components. An active flavonoid called isoquercitrin boosts NO production (55).

21. **Garlic (Allium sativum):** It supplements have been shown to be effective in the treatment of HTN, lowering blood pressure by approximately 10 mm Hg systolic and 8 mm Hg diastolic, comparable to the effects of standard BP medications. The antibacterial, antioxidant, anti-inflammatory, anti-cancer, and hypocholesterolemic properties of this herb are well-known (56). According to one study, garlic was effective for the treatment of HTN by about 80%. When compared to other types of garlic, aged garlic extract (AGE) results in a constant drop in blood pressure. Additionally, garlic supplements cause a significant drop in SBP and DBP of 3.75 and 3.39 millimeters of mercury, respectively (57). Patients with HTN who took garlic tablets (300–1500 mg/d) for 24 weeks experienced a significant drop in SBP of 9.2 mm Hg and DBP of 6.27 mm Hg in another study. 52 Besides, AGE has superoxide searching capacities in human neutrophils, and everyday utilization of 150 or 400 mg/kg of garlic remove provoked an expansion in eNOS action and a decrease in nicotinamide adenine dinucleotide phosphate (NADPH)- oxidase in the aortas of fructose-took care of rodents (58). Garlic's components antagonize endothelin-1-induced vasoconstriction, inhibit NF-B stimulation, prevent VSMC proliferation in smooth muscles, and reduce Ang II-induced vasoconstrictor responses (59).
22. **GAINT DODDER(CUSCUTA REFLEXA):** Cuscuta, more commonly referred to as dodder, is a genus in the convolvolaceaceae family. In anesthetic rats, the ethanolic extract of C. reflexa decreased SBP and DBP. Antihypertensive activity and bradycardia occurred in a dose-dependent manner (60).
23. **Coleus forskohlii's Makandi**: The Coleus forskohlii plant is a potent activator of adenylyl cyclase. Makandi raised intracellular degrees of cAMP, setting off the enactment of protein kinase A (PKA), which sequentially provoked the unwinding of VSMCs, consequently causing a reduction in BP (61).
24. **Maritime Pine (Pinus pinaster)**: Pycnogenol (200 mg/d) has been shown to significantly lower blood pressure in mild HTN patients, possibly by inhibiting angiotensin-converting enzymes (62).

25. **Mistletoe (Agelanthus dodoneifolius)**: In normotensive rats, mistletoe ethanolic extracts (0.01–10 mg/mL) decreased SBP and DBP. Vasorelaxation was induced by the dodoneine mechanism, which inhibited carbonic anhydrase and stimulated KCa channels (63).
26. **Melon-Gubat (Melothria maderaspatana)**: Melothria maderaspatana lowers blood pressure in people with high blood pressure. Melon-gubat tea was used for 45 days to significantly lower systolic and diastolic BP by 23.8 and 15.5 mm Hg, respectively, in subjects with mild HTN (64).
27. **Pomegranate (Punica granatum)**: The pomegranate is a fruit-bearing deciduous shrub that belongs to the family Lythraceae and can be found in the region that stretches from Iran all the way to northern India. The activity of ACE is reduced by pomegranate by nearly 36%. One review showed an unobtrusive reduction in SBP in the wake of drinking 50 ml/day of its juice for a year (65).

Limitations of the study

Although animal studies and clinical trials have precisely confirmed a small number of traditionally used plants, the specific mechanisms of action of these plants remain unknown. Restorative plants are fruitless in accomplishing the expected scale because of a lack of logical information on their security and effectiveness. As a result, comprehensive validation studies are required.

Conclusion

A vicenna had a significant impact on cardiology, with his contribution having the greatest impact on the development of cardiological science. Avicenna provided definitions for a wide range of cardiovascular conditions and disorders in the third volume of the Canon of Medicine. Despite the fact that it can be regulated or prohibited, HTN is one of the world's most common diseases and presents numerous challenges for affected patients. High blood pressure can be controlled with a variety of easy methods, including pharmacotherapy or both.

FUTURE VIEW:

Perspective for the future Traditional botanical research on medicinal plants suggests novel areas of investigation into the effects of medicinal plants on blood pressure. The processing of medicinal plants can yield natural medications that are both safe and effective; However, clinical trials and pharmacological research should be used to confirm their effect. The long-term effects of medicinal plants may be better understood with the assistance of future studies that will focus on extended randomized trials. In addition, research on a variety of herbs that have antihypertensive effects has been promising thus far, and in the near future, new herbal medicines that treat hypertension will be discovered.

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