Research Article

Healing Hypertension: A focus on alternative systems of medicine

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ABSTRACT

High blood pressure is the most prevailing cardiovascular risk factor worldwide. Recent report indicated that nearly one billion adults had hypertension in 2000, and this is predicted to increase to 1.56 billion by 2025. Conventional antihypertensive drugs are usually associated with many side effects. Research has found a variety of alternative therapies to be successful in reducing high blood pressure including ayurveda, homeopathy and acupuncture. About 75 to 80% of the world population use herbal medicines, mainly in developing countries of complementary and alternative medicine (CAM) are common. This review article gives an idea about the various treatment options and pharmacoeconomics of hypertension under alternative system of medicine.

Keywords: Alternative Medicines, Hypertension, Pharmacoeconomics.

INTRODUCTION

Hypertension means high blood pressure. Blood, the connective tissue transports nutrients and oxygen to the organs. Heart pumps blood through the blood vessels, this exerts pressure on the wall of blood vessels, which is called as blood pressure. Blood pressure (BP) mainly measured in two values, systolic and diastolic.[1] Hypertension means transitory or sustained elevation of systemic arterial blood pressure to a level likely to induce cardiovascular damage or other adverse consequences. Only about one-third of patients achieve optimal BP control using drug therapy. A reduction of 5mmHg in systolic B.P has been associated with a 7% reduction in all-cause mortality.[36]

Table 1: classification of hypertension based on blood pressure[6]

	Systolic (mmHg)	Diastolic (mmHg)
Normal	<120	<80
Pre-hypertension	120-139	80-89
Moderate hypertension	140-159	90-99
Severe hypertension	>160	>100

Prevalence of hypertension

According to WHO (world health organisation) report, important cause of premature death in worldwide was hypertension. In 2000, 26.4 % of the world population (26.6 % male and 26.1 % female) was affected by hypertension and developing countries represent the most affected part of the world. In 2015 there will be 1.56 billion adult living with high blood pressure. The incidence of secondary HTN is variably estimated between 5–10% and is linked to diseases of the kidneys, endocrine system, vascular system, lungs and central nervous system. [3]

Pathophysiolgy of hypertension

- Cardiac output and peripheral resistance

Normal blood pressure regulation is dependent on cardiac output and peripheral resistance balance between the cardiac output and peripheral vascular resistance. Peripheral resistance is determined by both large and small arteries. Prolonged smooth muscle contraction is related to increase in intracellular calcium concentration, which may explain the vasodilatory effect of drugs that block the calcium channels. Prolonged smooth muscle constriction increase the chance of thickening of the arteriolar vessel walls possibly mediated by angiotensin leading to an irreversible increase in peripheral resistance. In very early hypertension the peripheral resistance is not responsible for the elevation of the blood pressure is caused by a raised cardiac output.[5]

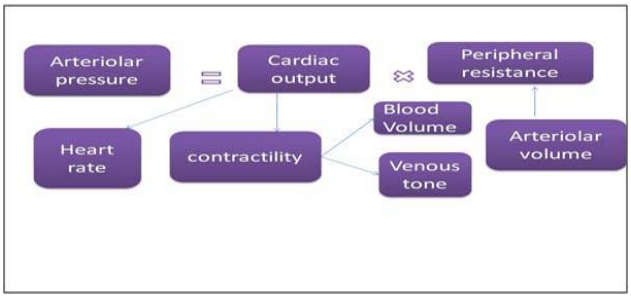

Figure 1: factors influencing blood pressure[2]

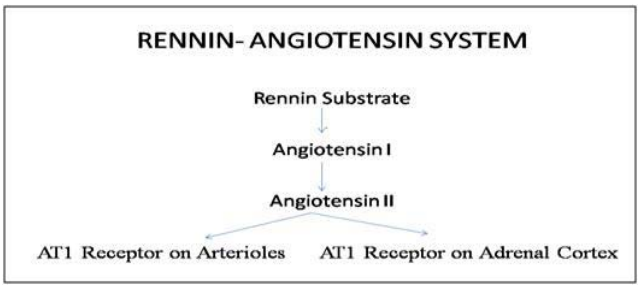

Figure 2: Rennin –angiotensin system[6]

Rennin is secreted from the juxta glomerular apparatus of the kidney in response to glomerular underperfusion or a reduced salt intake. Renin, which convert angiotensinogen to angiotensin I, a physiologically inactive substance which is rapidly converted to angiotensin II in the lungs by angiotensin converting enzyme (ACE). Angiotensin II is a potent vasoconstrictor and thus causes a rise in blood pressure. It stimulates the release of aldosterone from the the adrenal gland, which results in a further rise in blood pressure related to sodium and water retention.[5]

- Autonomic nervous system

Stimulation of sympathetic nervous system causes both arteriolar dilation and constriction. Thus the autonomic nervous system has an important role in the regulation of blood pressure.[5]

Risk factors of hypertension

1. Age: Increase in age increase the chance of affecting cardiovascular disease. Male >55yrs, female >65yrs.
2. Elevated levels of systolic and diastolic pressure.
3. Obesity or overweight: increased body mass index.
4. Dyslipedimia: LDL-cholesterol: >4mmol/l, HDL-cholesterol: M<1.0, F<1.2mmol/l.
5. Chronic kidney failure.
6. Sedentary life style.
7. High heart rate.
8. Smoking.
9. Psychological factors.
10. Family history of CVS.
11. Stress.

Types of hypertension

1. Essential hypertension: Also called primary hypertension or idiopathic hypertension. There is an increasing BP above the normal level but no signs of secondary hypertension including renal failure, pheochromocytoma etc. Aetiology of essential hypertension was not known. It may be due to family history or life style.

2. Secondary hypertension: secondary hypertension is less common (5%), usually the result of disease conditions like kidney failure, Cushing syndrome, pheochromocytoma and hyper aldosteronism.

What can be done against hypertension? [12]

- Loosing excess weight can help to reduce the blood pressure. Less weight less work for the heart.
- Use less salt. Salt causes the body to secrete less water and increases blood pressure.
- Avoid excessive alcohol consumption.
- Physical activity burns calories and helps to strengthen your heart.
- Stop smoking. Smoking increases blood pressure by narrowing the blood vessels.
- Avoid stress because stress increases blood pressure.

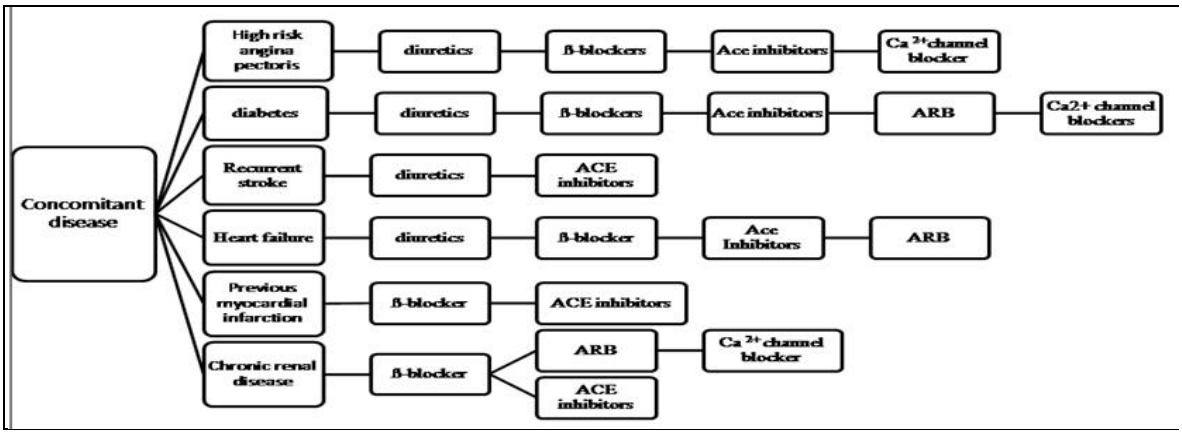

Figure 3: Drug classes in hypertension treatment in allopathic system of medicine[2]

Diuretics

Drug treatment of hypertension starts with diuretics, commonly thiazide diuretics except the patient suffering with diabetes & gout. Reduction in blood volume via facilitation of sodium excretion is the basic beneficial response to diuretic administration, usually leading to a significant drop in blood pressure.[6] Various clinical studies found that diuretics included therapeutic regimen in hypertension has been useful in prevention of stroke & cardiac disease. But the major side effect associated with it is frequent urination which leads to flushing out of salt and water from the body. Also the side effect include diabetes mellitus, blurred vision, abnormal heart rate, tiredness, dizziness, muscle cramps, skin rashes etc.

Thiazide diuretics: Hydrochlorothiazide & chlorthalidone is usually preferred drug in thaizide diuretics and considered most appropriate for mild - moderate hypertension and kidney function. Numerous attendant side effects include hypokalemia (corrected by using potassium supplements), hyperlipidemia; risk of hyperglycaemia (inhibition of insulin release) &cholesterol level.[8]

Loop diuretics: This category includes drugs like furosemide relied on for severe hypertension, congestive

heart failure etc.[6] Adverse effects include hypokalemia, can be minimized by the use of potassium sparing diuretics or potassium supplements.

Potassium sparing diuretics: Spironolactone, a mineralocorticoid receptor inhibitor is the most preferred drug in this category. This is effective in patient with refractory hypertension in combination with thaizide diuretics. Gynecomastia is the side effect which is seen in men very rarely.[8]

Peripherally acting sympathetic inhibitors

A. Beta blockers

This category of drug is effective in the treatment of all types of hypertension. Major action is decreasing cardiac output and inhibiting rennin release.[6] This is given in combination with thiazide diuretics to accelerate therapeutic action. Adverse effects include bradycardia, heart block, cardiac failure, bronchospasm, Reynaud's phenomenon, hallucination, disturbed sleep, fatigue and muscle cramp. Sudden withdrawal results in cardiac arrhythmia, rarely myocardial infarction.

B. Selective alpha1 blockers

E.g. prasozin; terazosin are the major drugs used as anti hypertensives. These drugs block alpha1 receptors in arterioles and venules and cause significant vasodilatation, with empirically less tachycardia as found with non-selective blockers or direct-acting vasodilators; some risk of significant postural hypotension

C. Reserpine

It is used for mild- moderate hypertension, acts by blocking uptake of biogenic amines (DA, NE, E, and 5-HT) into synaptic vesicles largely in peripheral synapses, leading to depletion of these neurotransmitters loss of NE from sympathetic nerve endings on vessels leads to net vasodilatation (with little postural hypotension at normal doses) . Central action accounts for most side effects: sedation, depression, Parkinsonism .[6]

Ace inhibitors/Angiotensin receptor antagonists

These classes of drug are preferred along with diuretics or ß-blockers. Influence the blood pressure by dilating (relaxing) the blood vessels and by reducing the water retention. They also have a positive influence on the heart after a heart attack and can prevent heart failure.[1] Angiotensin-converting enzyme (ACE) inhibitors (e.g. captopril) are very effective in reducing hypertension caused by renal artery stenosis, renal disease and malignant hypertension (arteriole inflammation), where excessive levels of rennin is released, causing high levels of angiotensin II, a potent vasoconstrictor and releaser of aldosterone. ACE inhibitor lowers circulating angiotensin II and increases bradykinin, a potent vasodilator. Cardiac output is unaffected in patients with normal heart function, but is significantly increased in individuals with congestive heart failure (CHF). Hence, the other major use for ACE inhibitors is for CHF. Side effects include hyperkalemia, angioedema and dry cough (due to increased bradykinin) antagonists of angiotensin receptors (e.g. losartan) are potentially more selective.[6]

Centrally-acting sympathetic inhibitors

In moderate to severe hypertension, reduction of sympathetic outflow would usually be beneficial, but attendant side effects can be significant, greatly limiting the use of this class of drugs. Drugs in this class fall into two basic subclasses: vasomotor centrally -acting (e.g.: Methyldopa, Clonidine) and ganglionic blockers (e.g. mecamylamine).[8]

Vasodilators

These drugs in this class act by dilating arterioles, reducing after load. Vasodilatation by itself will, however, cause significantly increased sympathetic outflow to the heart (via baroreceptors and rennin release), leading to tachycardia and increased contraction, which may oppose their hypotensive action. Consequently, these drugs are used in combination with beta blockers and diuretics to minimize any compensatory physiological responses. Orally active drugs (hydralazine and minoxidil) may be useful for long-term treatment, whereas parenteral drugs (nitroprusside, nitro-glycerine and diazoxide) are used for hypertensive emergencies. E.g. Hydralazine which primarily dilates arteriolar resistance vessels, causing significant drop in BP. Adverse effects include strong sympathetic reflex can be minimized by co-administration of beta blocker and the risk of lupus-like syndrome in 10-20% of patients receiving high dosages.[8]

Calcium channel inhibitors

These drugs like Verapamil (diphenylalkylamine) act by blocking voltage-gated calcium channels in arterioles and in cardiac muscle, resulting in vessel relaxation and decreased heart rate and contractility, the latter minimizing compensatory responses to decreased BP. Main use of calcium channel blockers is in monotherapy (where appropriate) for mild-moderate hypertension, as alternatives to diuretics or beta-blockers, particularly in the elderly.

Ayurvedic Approach Towards Hypertension Therapy

Ayurveda ("ah-yur-VAY-dah") is an alternative medical system that has been practiced primarily in the Indian subcontinent for 5,000 years. Ayurveda includes diet and herbal remedies and emphasizes the use of body, mind, and spirit in disease prevention and treatment.[31] In ayurveda hypertension is considered as the dysfunction of all 3 doshas, vata, pitta & kapha called as Rakta capa vriddhi. Kapha dosha is the major etiology in hypertension. Kapha aggregating factors are day time sleep, lazy and sedentary work which induces the chance of hypertension. Ayurvedic treatment of hypertension involves two steps.

Firstly they identified the symptoms and progression and identified the structural and functional factors that got imbalanced in the disease state. Secondly they were

correlated these factors with disease, thus helping them to apply treatment and medicines. Along with herbal drugs, ayurvedha also provides healthy life styles, diet, yoga etc.

Life style modifications include:

- Reduce the body weight.
- Eat diet rich foods like fresh fruits and vegetables.
- Reduce the salt intake through your food.
- 30 minutes exercise.
- Stop smoking &the consumption of alcohol.

Antihypertensive herbs

Symptoms of high blood pressure are headaches, heart palpitations, catching your breath after exertion, fatigue, flushed face, blurry vision, nosebleeds, strong need to urinate often, ringing in ears and dizziness. These symptoms can be resolved by herbals. Herbs do not cause side effect like weakness, tiredness, drowsiness, impotence, cold hands and feet, depression, insomnia, abnormal heartbeats, skin rash, dry mouth, dry cough, stuffy nose, headache, dizziness, swelling around eyes, constipation or diarrhoea, fever or anaemia alone and associated with pressure medicines. 100% natural herbs are completely safe. Herbal medicines do not interfere with medications including diuretics, blood thinners, β-blockers and calcium channel blockers. [11,13]

i. Diuretic: punarnava
ii. Vasodilators: garlic ,ginseng, olive
iii. ACE inhibitors: garlic
iv. Centrally acting: withania ,rauwolfia.[12]

1. Punarnava (*Boerhaavia diffusa*)

This is a drug of family Nyctaginaceae is widely seen in tropical and subtropical zones of India. “Punarnavine”, an alkaloid is the active principle in its extract. Liridodendrin & Hypoxanthine are active antihypertensive agents and the former is Calcium channel antagonist. Boerhaavia diffusa is a diuretic by increasing renal blood flow, which contributes to its antihypertensive actions. Both the herbs are antihyperlipidaemic also, that is a property which helps in improvement of hypertension. Dosage: 1–10g/day dried or 3–15ml of a 1:3 at 25% tincture is the preferred formulation of punarnava as diuretic. [13, 22]

2. Garlic (*Allium sativum)*

Garlic is used as important dietary as well as medicament in human. Allicin content liberated from alliin and the alliinase this has angiotensin 2 inhibiting and vasodilating action. Garlic powder tablet, oil of steam distilled garlic, oil of macerated garlic, ether extracted oil of garlic, aged garlic extract are the supplements for cardiovascular disease. In animal & preliminary human trials garlic reduces the blood pressure by inhibiting platelet nitric oxide synthase. Nitric oxide is an important vasodilator which control cardiovascular actions. [14,38]

3. Olive oil

The arteriolar blood pressure lowering effect of olive is mediated through calcium channel blockade action. The blood pressure lowering effect of olive oil is attributed by the presence of a poly phenolic content .[26]

4. Ginseng (Panax Ginseng)

It is popular plant root grown originally in China and today also seen in all over the world. Ginseng is commonly used as an adaptogenic agent for fatigue, insomnia, anxiety, depression and immune enhancement. The active ingredients of ginseng mainly include ginsenoid saponins. Ginseng is marketed either as a single herb compound or in combination with other herbs. The single herb compound is available in tablet as well as in alcoholic extracts (known as tinctures). Experiments in dogs showed that intravenous administration of ginseng extract caused an immediate drop in blood pressure. The effect was long lasting effect by Calcium channel blocking effect and interference with calcium mobilization into vascular smooth muscle cells. One of the active ingredients in Ginseng can stimulate the production and release of nitric oxide (NO) from endothelial cells. Another ingredient, Ginsenoside Rb1 lowers blood pressure and acts as a CNS depressant.

5. *Rauwolfia serpentina*

It is a large climbing herb in apocynaceae family .The essential chemical constituent reserpine (0.15%) is a pure crystalline indole alkaloid present in the roots of the herb useful for the treatment of hypertension. Rauwolfia having an ability to lower both Systolic and diastolic blood pressure and this has only mild toxic effects. Reserpine may be available in oral, intravenous and intramuscular formulations. Parenteral formulations are used only when the oral administration is not possible. Dose of reserpine is 500mg once a day for one to two weeks. [15]

6. *Withania somnifera*

This is a traditionally used medicinal plant of solanacea family. Withania contain steroidal alkaloids & lactones including wthanolides. Withaferin A and withanolide D are the major withanolides responsible for the pharmacological activities including the anti hypertensive effect. The daily dose of 4-6 g is safe and non toxic. Autonomic ganglionic blocking action and a depressant action on the higher cerebral center contributes to the hypotensive effect of withanolides. [16]

7. Soya bean (*Glycine max*)

The soya bean is a species of legume belonging to the family of fabacea native to East Asia.

Soya bean can lower the risk of chronic diseases like cardiovascular disorders and cancer. Bioactive peptides from soy bean having beneficial properties like hypotensive, hypocholesteromic, Hypolipidemic etc.

Angiotensin converting enzyme present in soybean (dipeptidyl carboxy peptides) plays an important role in blood pressure regulation by the inhibition of angiotensin converting enzyme that reduce the action of angiotensin II and increases the bradykinin level, thus reducing the blood pressure .[17, 18]

8. *Centella Asiatica*

It is a medicinal plant used in the Indian system of medicine as memory enhancer. The leaf juice of this plant is having vasodilator action by altering blood pressure and increase the blood flow towards organs.[19]

9. *Terminalia arjuna*

This is a deciduous tree used in Indian system of medicine used as a remedy of cardiovascular disease including coronary artery diseases, hypercholesteremia, and heart failure. The primary mechanism of action of arjuna includes improvement of cardiac muscle function and enhancing the pumping activity of heart.[20, 21]

10**.** Celery (*Apium graveolens*)

Celery is a vegetable usually included in human diet belonging to the family umbelliferaceae. Plant sticks and seed extract are commonly used as medicine. The active constituent 3-n-butylthalide is responsible for blood pressure lowering effect of celery. In experiments on animals they reported as, by eating a quarter pound of celery every day for a week reduced the blood pressure about 12-14%. 3-n -butylthaide helps to decrease the blood pressure by acting as diuretic and vasodilator through impacting the production of prostaglandin. Drug also reduces the calcium ions flow through the smooth muscle cells, which decreases the chances of artery muscle spasm. This also helps to reduce the excess cholesterol level in the body. Celery seed extract act as a diuretic altering the sodium and potassium levels in blood. Ingesting 8 stokes of celery per day or consumption of 70-85mg capsule/day is recommended for blood pressure.[27]

11. Bhringraj (*Eclipta Alba)*

This is a perennial herbaceous plant belonging to the family Asteraceae mostly seen in moist place all over India. Culumbin, a active constituent responsible for the remarkable anti-hypertensive activity. This herb increases endothelium-dependent vaso-dilation in hypertensive patients. Diuretic effect, which contributes to its anti-hypertensive action, can be due to the potassium content of the leaves, as potassium is known to reduce BP through diuresis. Dried *Eclipta Alba* leaf powder (3 g/day) is the dose for hypertensive patients. This is also helpful for the reduction of total cholesterol level, low density lipoprotein fraction, plasma lipid peroxides & triglycerides.[22]

12. Green Oats (*Avena Sativa*)

This is an eating soluble-fibre-rich whole-grain of Poaceae /Gramineae family every day cause a significant reduction in BP readings. The cardiovascular benefit of oats consumption is due to its hypocholesterolemic effect. Oats can reduce the incidence of cardiovascular risk factors like diabetes, obesity and direct vasoprotective activity. The DASH (Dietary Approaches to Stop Hypertension) is rich in high amounts of soluble fibres vegetables and restricted fat. Use of oats is supported in DASH as a whole grain. Fibre intakes of more than 24 gm/day were associated with a 57% reduction in risk for the development of hypertension in comparison to those who consumed less than 12 gm/day.

13. Carrot (*Daucus carota*)

It is a member of Umbelliferae family used in traditional medicine to treat hypertension. Activity of aerial parts of Carrot resulted due to the presence of two Cumarin glycosides coded as DC-2 and DC-3. DC-2 and DC-3 may be acting through blockade of calcium channels and this effect may be responsible for the blood pressure lowering effect of the compounds. Dose (1–10 mg/kg) in IV route helps to fall in arterial blood pressure.[13]

14. Gokshura (Tribulus terrestris)

Gokhshura of Family Zygophyllaceae is an indigenous plant which has been mentioned in Ayurveda with several clinical properties. It is useful in disorders of nervous system, respiratory system and urinary system. The diuretic property of this plant is due to the presence of large quantities of the nitrates present as well as the essential oil which occurs in the seeds.

15. Ginger (Zingiber Officinale)

Ginger or ginger root is the rhizome of the plant *Zingiber officinale inthe family* zingiberaceae consumed as a delicacy, medicine, or spice. It acts on Kapha, vata and pitta. A dose-dependent (0.3—3 mg/kg) decrease in arterial BP was noted, which proves role of ginger in BP regulation.[22] It improves the function of heart and blood vessels and is useful in angina, cardiomyopathy, rheumatic fever and heart burn problems. Ginger may also decrease blood pressure by preventing blood clots formation in arteries and blood vessels.[25]

Homeopathic approach towards hypertension therapy

The word Homeopathy derived from the Greek words homios (like) and pathos (suffering). The word homeopathy means treating like with like (Law of Similars) in other words a substance that can create the symptoms in a healthy body is also the substance that will effectively treat the condition in a sick body.[41] Homeopathy provides convenient and natural remedies for high blood pressure without side effects like synthetic remedies. The effective treatment requires a thorough study by a qualified homeopath about the patient's lifestyle, behaviours, and overall personality. Using homeopathy for hypertension involves stimulating the body's natural healing process using watered-down or weakened natural medications. Many homeopathic practitioners assert that homeopathy is effective for

treating hypertension when focused on the underlying causes of the condition. The homeopathic approach towards hypertension focus individual as a whole. It is also supported by modern physiology and psychosomatic medicine.

Homeopathy dosage directions

Homeopathic principles suggest selecting the remedy that most closely matches the symptoms. In conditions where self-treatment is appropriate, unless otherwise directed by a physician, a lower potency (6X, 6C, 12X, 12C, 30X, or 30C) should be used. Many homeopathic physicians suggest that remedies be used as follows: Take one dose and wait for a response. If improvement is seen, continue to wait and let the remedy work. If improvement lags significantly or has clearly stopped, another dose may be taken. The frequency of dosage varies with the condition and the individual. Sometimes a dose may be required several times an hour, other times a dose may be indicated several times a day and in some situations, one dose per day (or less) can be sufficient.[40] Homeopathy provides convenient and natural remedies for hypertension without side effects like synthetic remedies for the most effective treatment by proper administration of medicine under homeopathy.

Table 2: Drugs for high blood pressure at a glance [41]

Drug	Condition
Belladonna	sudden hypertension remedy
Aurum metallicum	stress related high BP remedy
Argentum nitricum	anxiety-related hypertension remedy
Calcarea carbonica	frightful hypertensive remedy
Lachesis Mutus	psychological hypertension remedy
Natrum muriaticum	high BP remedy for more responsible individuals
Lycopus Virginicus	heart related high BP remedy
Glonoinum	heart related high-pressure remedy
Nux vomica	easily tempted hypertension remedy
Phosphorus	sensitive person high blood pressure remedy
Plumbum Metallicum	nerve and artery-related hypertension remedy

1. Arg-n*:* It is also called as silver nitrate. If blood pressure rises with anxiety and nervousness, this medicine may be prescribed. "Stage fright" or anticipation of a stressful event can bring on dizziness, headache, diarrhoea, and a pounding pulse. People who are typically warm-blooded, imaginative, impulsive, claustrophobic and have cravings for sweets and salt need this medicine. Homeopaths also prescribe it for people who experience upset stomach, loose bowels and headache in relation.[32]

2. Belladonna: This is the most useful medicine in hypertension treatment when symptoms come on suddenly, with high intensity. The person's face is flushed, with dilated pupils, and pulsations and throbbing may be felt in various parts of the body. Despite the general heat, the person's hands and feet may be cold. Vertigo and pounding headaches, worse from jarring and worse from light, may also occur. Suggested dosage is -first to thirtieth potency and higher. In acute conditions, this remedy needs to repeat.[29, 30, 32]

3. Calcarea carbonica: This is often used as a hypertension remedy for the people who easily get tired and poor stamina. Suggested dosage is sixth trituration, should not repeat this remedy too often in elderly people. They are typically responsible types who feel overwhelmed when ill and fear a breakdown. Palpitations and breathing problems can be worse from walking up a slope or stairs, and also when lying down. A general chillness with clammy hands and feet (the feet may heat up in bed at night) and sweat on the head during sleep are other indicators. The person may have cravings for sweets and eggs and tend toward weight problems.[29, 30, 32]

4. Phosphorus: This is a typical remedy used for a person who is sensitive, suggestible, and sympathetic with tendency towards weakness, dizziness, a spaced-out feeling and fearfulness. Frequent signs are nosebleeds, facial flushing, palpitations, a feeling of heaviness or pain in the chest, and left-sided problems. A strong wish for cold drinks and refreshing and a marked improvement after eating and sleeping are other signs for Phosphorus. Suggested dosage is third to thirtieth potency.[30,32]

5. Sanguinaria: Remedy for high BP with a feeling of blood flushes. A person with feeling that blood is rushing to the head, with flushed red cheeks and pulsing in the neck, may be suggest this remedy. The person may have headaches or migraines (usually on the right and worse in the presence of light and noise). Frequent signs are right-side neck and shoulder problems. As well as allergies, heartburn, digestive problems, and burning pains are typical. Symptoms get worse when in motion and relief may achieved by being in the dark and sleeping. A craving for spicy food and a severe tendency to eat sweets are other signs for Sanguinaria. Suggested dosage is -Tincture in headaches, sixth potency in rheumatism.[32]

6. Lachesis mutus: it is the remedy for psychological hypertension. Lachesis is one of our most useful remedies in heart troubles, acute or chronic; the peculiar suffocation, cough, and aggravation from constriction being the guiding symptoms. [46] A person who needs this remedy typically is intense and talkative, with inner passion and agitation that need to be proved out. Suggested dosage is eighth to 200th potency, this remedy should not repeat too often. If well suggested, a single dose is enough to exhaust its action.[32]

7. Natrum muriaticum: this is used for more responsible individuals. A person who needs this remedy seems reserved and responsible, but may have strong feelings of grief, disappointment, anger, lingering grudges and a fear of misfortune in inner mind. Headaches and palpitations are common, as well as a feeling of tension (even coldness) in the chest. The person feels worse from being in the sun, around midmorning and better from being alone in a quiet place. A craving for salt and strong thirst can help to confirm the choice of this remedy. Suggested dosage is - Twelfth to thirtieth and higher.[30,32]

8. Nux vomica**:** This remedy is usually recommended for the person who is impatient and driven easily frustrated, angered and offended. A strong wish for coffee and other stimulants, sweets and alcohol or medications may aggravate blood pressure problems. Frequent signs are palpitations, constricting feelings in the chest, constipation, and haemorrhoids. The person is typically sensitive to light, noise, odours, and interference. Suggested dosage is first to thirtieth potency and higher. Nux vomica can act best, if given in the evening.[32]

9. Glonoinum: A flushed face with a pounding headache and a visible throbbing in the blood vessel of the neck may indicated the need for this remedy. Chest can feel congested or hot with irregular heart beat. A feeling of "being lost in a familiar place" is a strong indicator for this remedy.[32]

Acupuncture treatment towards hypertension

Acupuncture literally means to puncture with a needle. However, the application of needles is often used in combination with moxibustion—the burning on or over the skin of selected herbs—and also involves the application of other kinds of stimulation to certain points. The term "acupuncture" is used in its broad sense to include traditional body needling, moxibustion, electric acupuncture (electro-acupuncture), laser acupuncture (photo-acupuncture), microsystem acupuncture such as ear (auricular), face, hand and scalp acupuncture, and acupressure (the application of pressure at selected sites). In general, acupuncture is believed to stimulate the nervous system and cause the release of neurochemical messenger molecules. The resulting biochemical changes influence the body's homeostatic mechanisms, thus promoting physical and emotional well-being.

The possible mechanism of acupuncture in the blood pressure reduction include

1. Acupuncture increased the contents of calcitonin gene-related peptide (CGRP) and nitric oxide (NO) in rats with stress-induced hypertension, thereby causing a fall in blood pressure.
2. Regulating endothelium-derived vasoconstrictors (endothelin-1) and vasodilators (calcitonin gene-related peptide, nitric oxide and nitric oxide synthase)
3. Acting on areas of the brain known to reduce sensitivity to pain and stress, as well as promoting relaxation and deactivating the 'analytical' brain, which is responsible for anxiety and worry.
4. Increasing the release of adenosine, this has antinociceptive properties.
5. Reducing inflammation, by promoting release of vascular and immunomodulatory Factors.[35]

In the case of primary hypertension acupuncture is a good treatment tool. The influence of acupuncture on hypertension might be related to its regulatory effect on the level of serum nitrogen monoxide. For mild and moderate essential hypertension, the hypotensive effect of acupuncture is much more potent than that of placebos and is comparable with that of certain conventional hypotensive agents. In addition, acupuncture is often effective for relieving subjective symptoms, and it has no side-effects.[34] From a systemic review concluded that four randamized controlled trials of moxibustion is effective for hypertension treatment. Two of the trials failed to report favourable effects of moxibustion on blood pressure (BP) compared to the control (antihypertensive drug treatment alone). A third trial showed significant effects of moxibustion as an adjunct to antihypertensive drug therapy compared to drug therapy alone. The fourth trial addressed the immediate blood pressure-lowering effects of moxibustion compared to no treatment.[35] From another controlled trials it was estimated that the acupuncture does not show any statistically significant change in systolic blood pressure reduction but it marginally reduced diastolic blood pressure by 3mmHg. When given with hypertensive medicine, acupuncture significantly reduced systolic blood pressure by 8mm Hg and diastolic blood pressure by 4mmHg.[36] But no benefit was seen in measures of dyslipidemia, renal function, glucose control or weight gain. Acupuncture can enhance clinical management of hypertension if used in combination with antihypertensive agents over longer periods.[47]

Naturopathic treatment for high blood pressure

Naturopathy focuses on naturally occurring substances, minimally invasive methods, and encouragement of natural healing. Prevention through stress reduction and a healthy diet and lifestyle is emphasized, and pharmaceutical drugs, ionizing radiation, and surgery are generally minimized. The tenet of naturopathic practice is self-described by six core value.

1. First, do no harm; provide the most effective health care available with the least risk to patients at all times.
2. Recognize, respect and promote the self-healing power of nature inherent in each individual human being.
3. Identify and remove the causes of illness, rather than eliminate or suppress symptoms.
4. Educate, inspire rational hope and encourage self-responsibility for health.
5. Treat each person by considering all individual health factors and influences. (*Treat the Whole Person*).
6. Emphasize the condition of health to promote well-being and to prevent diseases for the individual, each community and our world. (Health Promotion, the Best Prevention).[45]

Natural remedy for high blood pressure in naturopathy deals with the elimination of poisons from the system which causes disease. Natural cure for blood pressure is following a well balanced routine of proper diet, exercise and rest.[43] Hypertensive people can remarkably reduce their blood pressure through nutritional changes. Increasing the amount of vegetables and fruit and reducing the amount of fat and cholesterol will not only reduce blood pressure but can help with weight loss, which also lowers blood pressure.

- Eat whole, fresh, unrefined, and unprocessed foods. Include fruits, vegetables, garlic, onion, whole grains, soy, beans, seeds, nuts, olive oil, and cold-water fish.
- Low sodium-high potassium diet. Restricting sodium intake to lower blood pressure appears to work better if accompanied by increasing potassium intake.
- Avoid salt, sugar, dairy products, refined foods, fried foods, junk foods, and caffeine.

Drink 50% of your body weight in ounces of water daily (e.g., if you weigh 150 lbs, drink 75 oz of water daily).

Table 3: Naturopathic treatments for hypertension [43]

	Drug	Dose	Mechanism of action
Botanicals	Cratageus	5ml tid	Proanthrocyanidins inhibit ace, lower BP
	Olive		Iridoids dilate coronary arteries, reduce BP
	Rauwolfia		Reserpine depletes catecholamine and serotonin
	Valerian		Iridoids dilate coronary arteries, anti-arrhythmic
Vitamins	Vitamin C, Ascorbate	2 g qd	Free radical scavenger , lowers BP
	Vitamin E	500 iu qd	Reduce LDL cholesterol
Minerals	Calcium citrate	250 mg bid	Normalise BP
	Magnesium	250 mg bid	Vasodilator, decrease LDL cholesterol
	Potassium	3000 mg qd	Decrease in metabolic acidosis and diuretic use
	Selenium	200 µg qd	Directly lowers BP
Nutrition	Chitosan	500 mg tid	Absorbs dietary fat, Inhibits LDL cholesterol
	Co Q 10	50 mg bid	strengthen and oxygenate heart muscle
	Essential fatty acid	1 tbsp tid	decreases blood pressure and plasma lipids
	Fiber	5 g qd	significantly lowers cholesterol
	Taurine	500 mg tid	Decreases BP, reduces arrhythmias
Dietary restrictions	Alcohol		produces acute hypertension via increased catecholamine secretion
	coffee		Elevates blood pressure, but it's not the caffeine
	Sugar		elevates blood pressure (may be a primary cause in some people

Pharmacoeconomic Consideration in the Management of Hypertension

High cost is one of the well-known factors retarding the intended effect, especially if paid out of pocket for the treatment of chronic diseases like hypertension. Effective control of hypertension is limited by availability, cost and adverse effects of antihypertensive medications.[47]

According to the reports the annual cost of high blood pressure treatment with allopathic drugs, which are taken daily averages from Rs.50,000 in the first year of treatment, Rs.26,000 in the second year and Rs.19,000 per year thereafter. In the first stage of hypertension diuretics may be the best choice. In second stage of hypertension, diuretics along with beta blocker, ACE inhibitors and calcium channel blockers are preferred. If none of these medicines are effective in lowering BP, a combination of two drugs generally works faster than a single drug. This increases the duration of treatment and make it more expensive than treatment with other systems. Also the most popular hypertensive drugs may be responsible for heart attacks and number of and heart

disorders. Dr. Marco Pahor, professor of medicine at Wake Forest University School of Medicine said that the long term use of calcium channel blockers leads to around 85000 heart attack tragedies worldwide in each year.[48]

Alternative medicine can show their clinical effects with or without proved pharmacologic or immunologic modes of action. In Ayurveda, the drugs are obtained from the natural sources like plants, animals and minerals and mainly administered in the form of crude extracts. In Indian system of medicine Ayurveda is considered as important system. In India, the annual cost for mild to moderate hypertension treatment is about Rs.10000-Rs.25000 and in severe cases price depends on the patient related factors too. Ayurvedic system is considered as cost effective system but long term therapy is needed for the control of blood pressure.

The data of pharmacoeconomic studies shows that twice weekly acupuncture for 6-8 weeks is considered to be cost-effective relative to available pharmacological treatments for hypertension. In Homeopathic system, highly diluted preparations, cheaper cost of treatment makes it a more attractive option at the community level. The annual cost of homeopathic medicines for hypertension ranges from Rs.1500 - Rs. 3000.

In Naturopathic system, since there are no drugs for regulating hypertension, only expense in the management of proper diet only.

CONCLUSION

Though there are many approaches to treat hypertension, their acceptability by the patients vary because of the different possible side effects, treatment style, cost and duration of treatment. The recent surveys showed 20% prevalence of the use of complementary and alternative medicine in India. Ayurveda, homoeopathy, naturopathy and acupuncture, were among the most popular compared to the conventional allopathic treatment for hypertension.

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