

A review of action of commonly used antihypertensive drugs in Ayurveda with special reference to Samprapti Vighatana

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Abstract: Hypertension stands as a disease of high mortality owing to being a major risk factor for cardiovascular diseases, stroke and kidney diseases. Treatment modalities of modern medical science do not have enough efficacies in reducing target organ damage and they have adverse effects as well. So global attention is diverted towards the Ayurveda for safe, effective and economical remedies. A number of Ayurvedic herbs are being used since time immortal to treat hypertension based on the factors involved in the Pathogenesis. So it is the need of the time to validate the claims of antihypertensive herbs on modern parameter regarding its safety and efficacy. This study is made with an aim to review the various studies done on commonly used antihypertensive herbs and their role in breaking the pathogenesis. The various pathological mechanisms contributing the manifestation of hypertension and recent study on antihypertensive herbs are compiled by going through texts, journals and internet search. The obtained data are reviewed critically to understand the actions of herbs in Samprapti Vighatana of Hypertension. It is found that the hypertension is a disorder of Vaata Dosha due to Aavarana. The causative factors are Santarpanjanya Nidaan. The various other factors involved in the manifestation of Hypertension are Rasavaha, Raktavaha, Medovaha and Manovaha Srotas. The treatment of Hypertension should be done with targeting these factors with proper assessment of strength of disease and disesed.

Keywords: Hypertension; Pathogenesis; Rasa-Rakta vaha Srotas; Tridosha; antihypertensive herbs

Introduction:

Hypertension is defined as increase in arterial pressure above the normal limit of blood pressure. Blood pressure measure of cardiac output and peripheral resistance of blood vessels. It is very difficult to set line between normal and raised blood pressure is obscure and depends on individual circumstances. However, it is unanimously accepted that the ideal blood pressure for a physically healthy person is around 120/80 mmHg.[1] Hypertension is a major risk factor for cardiovascular diseases, stroke and kidney diseases. About 2.3 million deaths in India was attributed to cardiovascular diseases in the year 1990 and is projected to double by the year 2020[2]. Hypertension is directly accounted for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India. Epidemiological studies show that hypertension is present in 25% urban and 10% rural subjects in India. At an underestimate, there are 31.5 million hypertensive in rural and 34 million in urban populations. Although the treatment available in Modern science h reduce the blood pressure in short term their long term efficacy i.e. target organ damage reduction is not enough and posses many adverse effects.[3] So global attention has shifted towards Ayurveda to

get safe effective and cost-effective remedies for hypertension in Ayurveda. So it is the need of time to evaluate the commonly used Ayurvedic drugs regarding safety and efficacy which will strengthen to the claim of Ayurveda.

Aims and Objective:

To review the action of commonly used antihypertensive drugs in Ayurveda in respect to Samprapti Vighatana.

Materials and Methods:

This study is carried out by literature search and critical review of the obtained facts. The pathogenesis of hypertension and various studies on Ayurvedic drugs were obtained by searching various medical research databases like pubmed, Google scholar, Embase and other national research databases. The terms entered for search are "hypertension", "essential hypertension", "hypertension pathogenesis", and "hypertension physiology", "physiology of blood circulation", "antihypertensive in Ayurveda" "hypertension and Ayurveda". Manual search was made by going through the reference list of retrieved articles to identify relevant additional study. The study of various Ayurvedic texts were made critically and

an effort is made to understand the actions of antihypertensive Ayurvedic drugs in relation to the Samprapti Vighatana.

Observations and Discussion:

The process of nourishment of various Dhatu and excretion of metabolic waste product of Dhatu are going on continuously within human body. This process is called Rasaraktasambhava (Cardiovascular System). The main organ of this system is Hrudaya (the heart).[4] The functions of heart are readily affected by the signals from nervous system and also by the psychological state of the individual. It is for this reason the Hrudaya is said to be the seat of Mana, Chetana in Ayurveda.

The circulation of Rasa Rakta within vasculature need certain amount of pressure which is influenced by the pumping action of Hrudaya, the state of wall of the Sira, size of lumen and volume of blood.[5] To ensure proper supply of nutrients and excretion of waste as per requirements during variations in external and internal environments, the pressure within the Sira and Dhamani needs to be change accordingly. This dynamic change of pressure is regulated by the complex interaction of Tridosha as all the functions of the body are regulated by TriDoshha.[6] The various Dosha involved in this regulation process are Prana Vata, Vyana Vata, Apana Vata, Samana Vata, Sadhaka Pitta, Pachak Pitta, Avalambaka Kapha.

Role of Vata in the manifestation of hypertension:

Generation of force during cardiac output relies on interaction of Prana and Vyana Vayu. Force generated during cardiac output, is mediated by the sympathetic outflow of the nervous system. Sympathetic nervous over activity causes increased fluid volume, venous constriction which increases the preload. [7] This causes increased contractility of the Hrudaya as well. Increased preload and increased contractility of heart influence the cardiac output. Functional constriction of arteriole also results from sympathetic nervous system activity leading to increased peripheral resistance.

Excretory function in the body is mediated by Apana Vayu. Its main site is Vasti (kidney). The blood pressure is maintained within normal limit by the regulation of excretion of Na⁺ and water through urine[8]. It is for this reason the function of Mutra is said to be "Kledavahanam" (removing extra fluid from body). Various study show that in hypertension there is disturbance in excretion of Na⁺ in response to Na⁺ overload[9] and pressure rise.

Samana Vayu helps in Ahara Pachana which as per Ayurveda is a broad term. It includes the process of digestion, absorption as well as assimilation of food to various tissues. Due to abnormality of this Vayu proper transformation of

food to Dhatu hampered so that excessive transformation to Apakva Meda Dhatu occurs. This manifest as dyslipidemia and increased free fatty acid in blood. They cause endothelial dysfunction and get deposited in blood vessel leading to manifestation of hypertension.[10]

Role of Pitta in the manifestation of hypertension:

Metabolic transformation of various Dhatu is mediated by Pitta. Aberrant Pitta function leads to excessive production of bad cholesterol which causes insulin resistance and hyperinsulinemia. Hyperinsulinemia is responsible for increased blood pressure by various pathological processes.[11]

Sadhak Pitta is responsible for the strength of contraction of myocardium. Abnormality of this Pitta causes increased cardiac contractility leading to increased cardiac output.

The property of Pitta is to induce liquidity and spreading properties (Drava and Sara) to body elements. Increased blood volume in the pathogenesis of hypertension[12] may be inferred as abnormality of Pitta Dosha.

Role of Kapha in the manifestation of hypertension:

Smooth transport of Rasa-rakta through blood vessel is ensured by Avalambaka Kapha. When it vitiate, it causes sticking of lipids in cardiovascular system. This augments peripheral resistance and lead to manifestation of hypertension. Kapha vitiation may influence the viscosity of blood. Due to increased viscosity hypertension may set up.[13]

Role of Rasa in the manifestation of hypertension:

Hrudaya and ten Dhamani are described as Mula of Rasavaha Srota. Cardiovascular system is the main system deranged in hypertension. In Hrudroga also the main Dhatu affected is Rasa. These facts support the vitiation of Rasa and Rasavaha Srota in hypertension.

Role of Rakta in the manifestation of hypertension:

As per Acharya Sushruta the Mulasthan of Rasavaha Srota is Rakta Vahini Dhamani (Vascular System).the symptomatology of Raktavaha Srotodushti as per Acharya Charaka closely relates to the symptoms of hypertension.[14] The complications of hypertension are encephalopathy, transient ischemic attacks and strokes. These disorders are closely resembles to the disease Mada, Murchha and Sanyasa which are described in Vidhisonitiya Adhyaya of Charaka Samhita. The Srotas vitiates in these disorders are Rasavaha, Raktavaha and Samgyaavaha Srotas.[15] This supports affection of Raktavaha Srotas in

association of Rasa and Manaovaha Srotas in hypertension.

Role of Medovaha Srotas in the manifestation of hypertension:

Lipid metabolism can be closely related to the Function of Medovaha Srotas. Abnormal lipid metabolism such as hypercholesterolemia, decreased HDL, increased triglyceride, increased LDL bring about endothelial dysfunction, atherosclerosis leading to manifestation of hypertension.[16]

Role of Manovaha Srotas in the manifestation of hypertension:

Peoples repeatedly exposing to repeated psychogenic stress have more tendencies to develop hypertension. Stress activates the sympathetic nervous system directly and sympathetic over activity in turn interact with high sodium intake, rennin-angiotensin and insulin resistance to mediate the pathogenesis of hypertension.[17]

Studies on commonly used antihypertensive Ayurvedic drugs

Boerhaavia diffusa

The aqueous extract of Boerhaavia diffusa root is found to be effective in ethylene glycol-induced hyperoxaluric oxidative stress and renal injury in rat kidney. It inhibits the renal cell damage and show antioxidant activity. Exhibit significant free radicals scavenging activity. Renal cell damage prevention and free radical scavenging activity may help in management of hypertension[18].

Ethanol extract of Boerhaavia diffusa is effective in angiotensinII-induced hypertrophy in cardiac myoblast cells. It also reduced intracellular reactive oxygen species generation, lipid peroxidation and protein carbonyls in cells. In addition, the expression patterns of NF-kb and transforming growth factor b1 are also reduce on treatment with ethanolic extract of Boerhaavia diffusa[19].

In Boerhaavia diffusa, Liriodendrin & Hypoxanthine are active antihypertensive agents and the former is Ca²⁺ channel antagonist. Boerhaavia diffusa is diuretic by increasing renal blood flow, which contributes to its antihypertensive actions[20].

Terminalia arjuna

Terminalia arjuna bark extract shows improvement in myocardial function in streptozotocin-induced diabetic rats by decline in left ventricular pressure(LVP), Cardiac Contractility Index[21].

T. arjuna bark extract normalizes the altered baroreflex sensitivity in diabetic rats possibly through maintaining endogenous antioxidant enzyme activities and decreasing cytokine levels[22]. Normalizing baroreflex sensitivity may help in normalizing impaired blood pressure.

Nardostachys jatamansi DC.

The [sesquiterpene](#) valeranone (= Yatamanson) isolated from the subterranean parts of [Nardostachys jatamansi](#) (DC) is found to having sedative, tranquilizing and [antihypertensive](#) properties in animal experiment[23].

Bacopa monieria

Alcoholic (ethanol) extract of Bacopa monieria act as renoprotective agent by attenuating the renal oxido-lipidemic stress and thereby protects the nephron in hypercholesterolemic rats[24]. This renoprotective action against hyperlipidemic stress may helpful in management of hypertension.

The active compound bacosides of Bacopa monieria show antistress effects through modulation of Hsp70 expression, superoxide dismutase and cytochrome P450 activity in rat brain. This antistress activity may be helpful in management of hypertension[25].

Allium sativum

Aqueous garlic extract reduces blood pressure and heart rate in both hypertensive and normotensive rats in a dose-dependent manner by mechanisms that may not involve the cholinergic pathway[26].

Gastric administration of encapsulated garlic powder to anaesthetized dog produce diuretic, natriuretic and hypotensive effect[27].

Seven dipeptides with ACE inhibitory properties were identified in a concentrate of an aqueous extract of Allium sativum L. (garlic) which are responsible for the observed antihypertensive effect of garlic in animals and human[28].

Conclusion:

All the three Dosha along with Vitiation of Rasavaha, Raktavaha, Medovaha and Manovaha Srotas play a vital role in the manifestation of Hypertension. The Ayurvedic drugs targeting these Srotas may prove useful in Hypertension. Boerhaavia diffusa, Terminalia arjuna, Nardostachys jatamansi DC, Bacopa monieria, Allium sativum are the commonly used antihypertensive drugs which target various factors involved in the pathogenesis of hypertension

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