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REVIEW ON EFFECT OF GARLIC (ALLIUM SATIVUM) ON BLOOD PRESSURE

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ABSTRACT

The principle focus of Ayurveda is on maintaining good health of a person. Due to the rapid modernization, world population at large is leading towards more stressful life. As a consequence, human race is suffering from various diseases grouped under a common umbrella of 'Lifestyle disorders'. Increased blood pressure i.e. hypertension, is one of the widespread lifestyle disorders. India is considered as global capital of hypertension. Hypertension has been globally acknowledged as most prevailing risk factor for life threatening cardiovascular disorders. Today, we observe that in spite of availability of various antihypertensive drugs in modern medicine; overall percentage of patients suffering from hypertension is rising sharply. Over twenty-five centuries ago, Hippocrates, the father of medicine, stated "Let food be thy medicine and let medicine be thy food". In this article we have collected data from various researches carried out at National and International organizations on Garlic (*Allium sativum*) and its effect on blood pressure. From the above review we can say that appropriate use of *Allium sativum* can control hypertension up to certain extent.

KEYWORDS: Blood pressure, *Lahsoon*, Lifestyle disorder, Garlic, Hypertension.

INTRODUCTION

Hypertension, one of the most prevailing lifestyle disorders is also known as a silent killer. It is a major risk factor for the development of coronary artery diseases, congestive heart failure and stroke.[1] In 2000, about 26.4% of the world adult population had hypertension and 29.2% were projected to have this condition by the year 2025. India is considered as global capital of hypertension.[2]

Hence it is need of hour to find a natural and sustaining way to deal with hypertension.

Aims and Objectives

Despite of number of available antihypertensive drugs in modern medical science; total percentage of patients suffering from hypertension is rising day by day. Almost 25 centuries ago, Hippocrates, the father of medicine, stated that "*Let food be thy medicine and let medicine be thy food"*.[3] In context to the above statement this review is a sincere attempt to put forth efficacy of Garlic (*Allium sativum*) in HTN.

MATERIAL AND METHODS

Initially a brief description of hypertension and *Allium sativum* is stated in this paper. Further we have collected data from various researches carried out at National and International organizations on *Allium sativum*. Probable mode of action of *Allium sativum* is also discussed based on scientific facts.

Literature review

Hypertension

Hypertension is an outcome of various reasons like stress, obesity, genetic factors, over use of the salt in the diet and ageing as well. At present hypertension has been globally recognized as most prevalent cardiovascular disorders. Hypertension means transitory or sustained elevation of systemic arterial blood pressure to a level likely to induce cardiovascular damage or other adverse consequences.[3] It is a medical condition in which the blood pressure of the subject is elevated above 140/90 mm Hg. More than 90% of cases of hypertension are observed as "primary hypertension" which means high blood pressure with no obvious basic medical cause.[4] WHO has classified hypertension as one of the most important cause of premature deaths worldwide.[5]

Furthermore, hypertension is also termed as a silent killer because it rarely exhibits symptoms before it damages the heart, brain or kidney.[6] In India hypertension is responsible for the 57% of stroke deaths and also 24% of all cardiac deaths.[7]

Importance of controlling hypertension

Hypertension means transitory or sustained elevation of systemic arterial blood pressure to a level which is likely to cause cardiovascular damage or other adverse consequences. A reduction of 5 mmHg in systolic B.P has been associated with a 7% reduction in all-cause mortality. This fact reveals the importance of controlling blood pressure for a disease free life.[8]

Types of hypertension

There are two types of hypertension:

1. Primary or essential hypertension- (About 97-98%) has no clear underlying cause but appears to be the result of interplay of complex genetic and environmental factors.
2. Secondary hypertension- (About 2-3%) is caused by another underlying condition usually involving kidneys or endocrine system.

Factors affecting blood pressure

1. Blood volume
2. Blood vessel elasticity.
3. Cardiac Output
4. Peripheral resistance.

Further peripheral resistance depends upon blood viscosity, vessel diameter and length ot the blood vessel. Many other factors play an important role in development of high blood pressure such as smoking, obesity, lack of physical activity, excessive salt intake, excessive alcohol consumption, stress and family history of high blood pressure.[9]

Garlic (Allium sativum)

The English word garlic is derived from the Anglo‑Saxon "gar‑leac" or spear plant, mentioning to its flowering stalk.[10] The name "*Allium sativum*" is derived from the Celtic word 'all', meaning burning or stinging, and the Latin "*sativum*" means cultivated. In olden days in Greece, they used garlic as a diuretic, which was recorded by Hippocrates.[11]

Garlic is a member of the *Liliaceae* family. It is a perennial rhizome, thought to be indigenous to Central Asia, Siberia and West of the Himalayas. It is now widely cultivated all over the world.[12]

Species: *Allium sativum*

Botanical family: *Liliaceae/Alliaceae/Amaryllidaceae*

Common names (Synonyms): Garlic (Eng.), *Lasun* (Hindi), *Rasonam* and *Lahsuna* (Sanskrit).[13]

Composition

Raw garlic is composed of 59% water, 33% carbohydrates, 6% protein, 2% dietary fibre, and less than 1% fat.[14] It contains carbohydrates (arabinose, galactose), protein 3.6% , vitamins (folic acid, niacin, thiamine, Vit. C), amino acids (arginine, asparagic acid, methionine), enzymes (allinase), volatile compounds (allylalchohol, allylthiol, allylpropyl disulphide), prostaglandins A2, D2, F2, and E2. Mn= 23.5%, Vit. B6= 17.5, Vit. C= 14.7, tryptohan= 6.2%, selenium= 7.5%, calcium= 5.1%. Phosphorus= 4.5% and Cu= 4%.[15]

Dosage and Dosage form

In market Garlic preparations are available in oil, extract, powder, capsules and tablet forms. It is observed that chemical composition of these preparations may not reflect the composition of fresh garlic clove. Hence it is always advisable to take daily dose equivalent to 4 g of fresh garlic cloves, which is about the size of one usual garlic clove.[16] Average daily dosage: fully-dried powder 400-1200 mg; fresh (air-dried) bulb 2-5 g; garlic oil, 2-5 ml.[17]

Garlic *rasona* in *ayurveda*

In *Charaka Samhita* and in *Sushruta Samhita*, *Lashoona* is mainly advocated in *Vataja* disorders in the form of *Rasayana*.[18]

The word *Rasona* itself is formed by two words; *Rasa* and Oona i.e., 'devoid of one *Rasa Amla Rasa*'(sour) out of six mentioned *Rasa*.[19] In *Kashyapa Samhita* there is a chapter called *Lashoona Kalpa Aadhyaya*, which contains many references and systematic explanation on the origin, method of administration and benefits of the plant.[20]

Types: In *Kashyapa Samhita* there is description of two types of garlic. The one which grows in the hills i.e., is *Girija*. It is like nectar used by the Gods, *Vaidyas* and *Brahmins* for various accomplishments and other is *Ksetraja* which grows in the plains.[21]

Probable mode of action

Obstruction of the coronary arteries causes more deaths than any other factors. The arteries, which supply the heart with blood and oxygen, gradually become narrower as plaque builds up over time. Due to this blood supply is restricted in the coronary artery and that portion of the heart is deprived of oxygen which leads to IHD.

Two main causes of heart diseases are high blood pressure and high blood serum cholesterol levels; which are directly impacted by the therapeutic action of Garlic.

The relevant role of Garlic in coronary heart disease was observed on rabbits and found that even pre-existing atherosclerotic deposits and lesions could be reversed if garlic was consistently consumed.[22]

Red blood cells take sulphur containing molecule in Garlic, called polysulphide and use them to produce hydrogen sulphide. This hydrogen sulphide in turn helps blood vessels to expand and keep our blood pressure in check.[23]

Various mechanisms for antihypertensive effect of Garlic have been reported. These include- vaso-relaxation through H_2S production,[24] endothelium-derived relaxing and constricting factors,[25] in vitro inhibition of angiotensin-converting enzyme,[26] and beta-adrenoceptor blocking action.[27]

However, there is a possibility that Garlic may act through other mechanisms especially the inhibition of the renin-angiotensin system.

Current research

A latest in vitro study has confirmed the vasoactive ability of Garlic sulphur compounds whereby RBCs convert Garlic's organic polysulfide into hydrogen sulphide, a known endogenous cardio-protective vascular cell signalling molecule.[28]

One research has been conducted by C. R. Nwokocha et al, at department of basic medical sciences, University of the West Indies, Mona campus, Kingston entitled, 'Antihypertensive

properties of Allium sativum (garlic) on normotensive and two kidney one clip hypertensive rats'. In this research, they studied the cardiovascular effects of aqueous garlic extracts (AGE) on normotensive and hypertensive rats using the two-kidney one-clip (2K1C) model. Mean arterial blood pressure (MAP) and heart rate (HR) were measured in normotensive and 2K1C rat models. The jugular vein was cannulated for administration of drugs. Intravenous injection of AGE (5-20 mg/kg) caused a significant ($p<0.05$) decrease in both MAP and HR in both the normotensive and 2K1C models, with more effects on normotensive than 2K1C rat model.

Dose of 20mg/kg of AGE had significantly ($p<0.05$) reduced systolic (16.7 ± 2.0%), diastolic (26.7 ± 5.2%), MAP (23.1 ± 3.6%) and HR (38.4 ± 4.3%) in normotensive rats. In 2K1C group, it has significantly ($p<0.05$) reduced systolic (22.2 ± 2.1 %), diastolic (30.6 ± 3.2%), MAP (28.2 ± 3.1%) and HR (45.2 ± 3.5%) from basal levels.

These results shows that garlic at higher doses (15 and 20 mg/kg) induced marked hypotension and bradycardia when injected intravenously whereas at a lower doses (5 and 10 mg/kg) it produced only a slight fall in MAP.[29]

One more similar study has demonstrated that use of 2400 mg garlic tablet containing 31.2 mg allicin has reduced diastolic pressure by 16 mmHg after 5 hours of administration.[30] Also one meta-analysis made on pooled data from 415 patients showed reduction of 7.7 mmHg diastolic pressure.[31]

CONCLUSION

Natural dietary products of animal and plant origin have been used by mankind since thousands of years either in the pure forms or simple extracts to treat many diseases. For issues related with life style disorders judicious use of natural products is gaining popularity. To deal with several pathological threats including cardiovascular complexities modern society is selecting use of natural products over synthetically prepared chemicals. This review emphasizes on antihypertensive action of Garlic; the worldwide most commonly used food material having medicinal properties.

After reviewing many scientific researchers conducted in recent times, we found that Garlic reduces blood pressure in normotensive persons as well as in hypertensive patients. From the

above review we can say that proper use of Garlic can control hypertension up to certain extend if used judiciously.

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