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THE ROLE OF GARLIC IN THE MANAGEMENT OF ATHEROSCLEROSIS: A REVIEW

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ABSTRACT

Life style modification diseases are very much common in present era. These diseases are linked with the way people live their life as well as food they eat in day to day life. Atherosclerosis is a common type of life-style disorder where the fatty deposits partially clog or totally block blood flow in large, important vessels of the body such as aorta and the blood vessels to the heart and brain. Atherosclerosis is basically caused by macrophages, white blood cells and fats that accumulate in the various arteries. This causes blockage of arteries and mostly responsible for cardiovascular and stroke incidences. Garlic (Allium sativum) is very much effective in Atherosclerosis and can be taken as single drug therapy due to its benefits and cost effective value. Garlic exhibits direct antiatherogenic as well as antiatherosclerotic effects on the arterial walls. Various studies have been done to evaluate the effects of Garlic and it proved the anti atherosclerotic effect of Garlic. It has both anti-atherogenic and anti-atherosclerotic effects at the level of artery wall. So Garlic seems to be a promising drug for the Atherosclerosis-related diseases in the present era.

KEYWORDS: Atherosclerosis, Garlic, Blood.

INTRODUCTION

Atherosclerosis is the medical condition in which there is hardening and narrowing of the arteries where the body's vital pipe-work of arteries get chocked up with fatty deposits called plaques**.** It is a variable combination of focal accumulation of lipids, complex carbohydrates, blood and its constituents, fibrous tissues and calcium deposits combined with its changes of

the media layer of arteries [1]. Atherosclerosis develops over time, but it causes the restriction to blood flow that damages the vital organs and increases the risk of blood clots, heart attacks and strokes, etc. Most adults are likely to have some degree of Atherosclerosis, especially over the age of 40-50 years. Atherosclerosis is quite more common in males than that of females. The people having habitual sedentary life style and contradictory food habits got easily developed Atherosclerosis. The type of artery which is affected and where the plaque develops differs with every person. Plaque can partially or totally block the flowing blood through a large or medium-sized artery in the heart, kidneys, brain, pelvis, legs, arms, etc. Various medical emergencies may occur due to such blockage of blood flow.

PREVALENCE

Younger age group children of Indian population are seen to be more prone to Atherosclerosis than other ethnic groups[2]. Coronary Artery Disease (CAD) affects the Indian population at a younger age than in other ethnic groups with more severe and extensive angiographic involvement[3]. It is reported that although Kerala has the highest (82.8%) prevalence rate of coronary artery disease in patients above 60 years, states in North West India[4]. Atherosclerosis is the most common cause of the CADs. A study done by Nidhi Puri et.al showed that 86% had atherosclerotic changes in the patients of all CAD patients[5]. As per the World Health Report 2002, 45 million Indian people are suffering from CADs and it is one fifth part contribution of all deaths in India and by the year 2020, CAD will contribute for one third of all deaths[6].

CAUSES OF ATHEROSCLEROSIS

Arteries carry blood from the heart throughout the body and these arteries are lined by the endothelium which is a thin layer cells. The endothelium keeps the inside of arteries well smooth, toned and flexible which helps blood to flow properly. Atherosclerosis is caused by high blood pressure, smoking or hyperlipidaemia which further damage the endothelium. That damage of endothelium leads to the formation of plaque. When bad cholesterol i.e. LDL or VLDL cross the damaged endothelium, the cholesterol enters the wall of the artery which causes WBCs, macrophages to aggregate. Over years, cholesterol, WBCs and macrophages become plaque in the wall of the artery. When amount of plaque increases, it can create a blockage. Atherosclerosis usually doesn't cause significant symptoms until middle or older age. But as narrowing becomes severe, it can choke off blood flow and cause pain. Blockages can also rupture suddenly. That will cause blood to clot inside an artery at the side of

rupture[7]. As the time passes over the years, clots get aggregate and keep on forming large plaques to develop significant atherosclerotic changes.

FACTORS ASSOCIATED WITH ATHEROSCLEROSIS

Atherosclerosis can get worse with time, but it's also preventable by avoiding all these factors given below which help to reduce the Atherosclerosis[8].

1. Smoking
2. High cholesterol
3. High blood pressure
4. Diabetes
5. Abdominal obesity
6. Stress
7. Not eating fruits and vegetables
8. Excess alcohol intake
9. Not exercising regularly

GARLIC AS A POTENTIAL HERB

Garlic (Allium sativum) has an important dietary as well as medicinal role for human beings. The role of Garlic as a potential herb has been mentioned for about 5000 years. Garlic and its various preparations are being consumed as a food and as a spicy ingredient by different cultures for centuries. Ayurveda has already mentioned different potential effects of Garlic. A study suggests Garlic should be recognized for its life saving attributes. Old Garlic extract reduces dangerous plaque build-up in arteries. It has anti-platelet and anti-aggregation properties that inhibit the plaque formation. Garlic juice reduced serum cholesterol and triglycerides in human and help in preventing the rise of cholesterol, thus indicating a cholesterol lowering property. Reduction of serum lipids by ingestion of fresh Garlic preparations may decrease the atherosclerotic process[9].

CHEMICAL COMPOSITION OF GARLIC[10]

The main bioactive compounds present in Garlic are Allicin and sulphur as a main constituent which gives Garlic its characteristic odor on breaking or crushing. Alliinase enzyme present in Garlic gets activated after crushing or chopping of raw Garlic which actually produces odor. Allinase is inactivated due to heat more than 60°C leaving behind alliin. The composition of Garlic powder is the same as that of raw Garlic and alliinase activity is also preserved.

Other important sulfur-containing compounds present in Garlic are allyl methyl thiosulfonate, 1-propenyl allyl thiosulfonate, and γ-L-glutamyl-S-alkyl-L-cysteine[11].

VARIOUS PREPARATIONS OF GARLIC IN AYURVEDIC CONTEXTS WITH THEIR DOSING[12]

1. Rason Swaras (Garlic juice) - 10 to 20 ml
2. Rason Kalka (Garlic paste) - 5 to 10gm
3. Rason Kshirpak (Decoction of Garlic in milk) - 20ml
4. Rasonadi vati (tablets) – 250 to 1000mg

DISCUSSION

Garlic is useful in hyperlipidaemia, hypertension, mild to moderate CADs, Atherosclerosis, etc. The various effects of Garlic formulations have been studied by so many researchers. The some of its actions are given below.

1. Anti–platelet aggregatory and Anti thrombotic action

Garlic and its constituents inhibit platelets aggregation and subsequent thrombus formation significantly by inhibiting platelet-activating factor (PAF) induced platelet aggregation[13]. It also found that another Garlic component, sodium 2-propenyl thiosulfate, to modulate cyclo oxygenase activity and hence preventing their aggregation[14].

2. Anticoagulatory and fibrinolytic action

Garlic enhances thrombolysis resulting in dissolution of thrombus plaques and thus helps in Atherosclerosis. Some invitro studies have been demonstrated that extract of old Garlic improves circulation by preventing lipid peroxidation and hemolysis in oxidized RBCs[15]. One study on hypecholesterolemic rats has showed that Garlic improves the fluidity of erythrocytes and help to restrict thrombus formation[16].

3. Anti hyperlipidaemic and anti cholesterol action[17,18,19,20]

Some studies have showed that Garlic and its constituents inhibit important enzymes which are involve in cholesterol and fatty acid. Garlic and its various constituents inhibit HMG-CoA reductase and human squalene monooxygenase. These enzymes are involved in the synthesis of cholesterol[21].

4. Antioxidant effects[22,23]

Garlic has been found to prevent the oxidation of human LDL by inhibiting superoxide (SOD) and inhibiting the formation of lipid peroxides. Many in vitro studies have shown that Garlic is effective to reduce parameters which are associated with cardiovascular disease.

5. Antihypertensive action

A Garlic extract is seen to modulate the production as well as function of both constricting factors (endothelin-1) and endothelium derived relaxing factor (NO)[24]. Garlic juice also has some beneficial effect on heart rate [25]. γ-Glutamyl cysteines are compounds found in Garlic inhibit angiotension-converting enzyme and thus may lower blood pressure[26].

MECHANISM OF ACTIONS OF GARLIC

1. Protective mechanism of Garlic against Atherosclerosis is due to its antilipadaemic action in the arterial walls.
2. Garlic shows direct antiatherogenic effect by preventing platelets aggregation and WBCs at arterial walls[27].
3. It shows antiatherosclerotic effects on thrombotic plaques by its thrombolytic action [28] and causing regression effect at arterial walls.
4. Garlic inhibits lipogenesis and cholesterogenic enzymes such as malic enzyme, fatty acid synthase, glucose-6 phosphate dehydrogenase and 3-hydroxy-3-methyl-glutaryl-CoA (HMG CoA) reductase[29] at the hepatocellular sites and thus indirectly preventing from Atherosclerosis.
5. Garlic also increases the excretion of excessive cholesterol by enhancing excretion of acidic and neutral steroids[30].
6. Garlic suppresses LDL oxidation which is the powerful protective mechanism of it against Atherosclerosis[31, 32, 33].
7. Allicin, S-Allyl Cysteine (SAC), Di Allyl-Di-Sulfide (DADS) were identified as the active compounds responsible for antiatherosclerotic effect as well as potent inhibitors of cholesterol synthesis[34].

CONCLUSION

Garlic reduces Atherosclerosis indirectly by reduction of hyper-lipidemia, hypercholesterolaemia, hypertension, platelets aggregation, etc. and thus restricts thrombus formation. It has both anti-atherogenic and anti-atherosclerotic effects at the level of artery wall. So Garlic is excellent, cost effective drug for the Atherosclerosis related diseases and

can be practiced for the preventive purpose as well as protective purpose against Atherosclerosis.

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