

# Miracle of Allicin, a Case Report

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**Abstract-** Hypertension is a chronic and end stage disease . The biomolecular mechanism involved in the pathogenesis can be interrupted for improving therapeutic approach and prognosis. Identifying the risk factors and causes of hypertension is essential to categorize into idiopathic and secondary hypertension. Garlic used since ancient time has drawn attention for deeper research towards its contribution to various health benefits. Its vital component allicin has played key role in beneficial effects of garlic.

**Index Terms-** hypertension, atherosclerosis, angiotensin converting enzyme, allicin , alliin.

## I. INTRODUCTION

5 years old male presented with history of indigestion since 3 months. More troublesome after having oily food stuff, fried items. Patient is a known case of type 2 diabetes mellitus since 8 years and hypertensive since 5 years. On treatment with T. Glimy 1 mg OD and T. Metformin SR 500 mg BD. T. Telmisartan 40mg OD and T. Amlodipine 2.5mg OD , T. Atorvastatin 20 mg HS , T. Aspirin 75mgHS .

Patient was examined thoroughly, basal BP measuring 158/92 mmHg and Per abdomen examination revealed tenderness in right hypochondriac region and epigastric region. Advised to undergo following biochemical investigations with respective test result as follows

FBS: 132 mg%

PPBS: 186 mg%

LIPID PROFILE: Total cholesterol – 248 mg%

Triglycerides – 228mg%

LDL Cholesterol – 112mg%

HDL cholesterol- 40mg%

S. Creatinine 1.0 mg%

Blood urea level: 32 mg%

Urine routine: NAD

Liver function tests:

Serum bilirubin total: 0.9 mg%

Direct: 0.3 mg%

Indirect 0.4 mg%

Total protein 7.0g%

Serum albumin 3.5g%

Serum globulin 1.8g%

SGOT levels: 48 IU/mL (normal range 12-38U/Lt)

SGPT levels: 55 IU/mL (normal range 7-41 U/Lt)

After the evaluation of biochemical investigations, the patient was advised to undergo ultrasound examination of

abdomen and pelvis, which revealed Grade 2 fatty liver, other solid organs didn't depict any abnormality.

Patient was advised to consume to garlic, to get the essentials of allicin from it. The concentration of allicin to be consumed would be mg, and dandelion along with milk thistle post dinner for 6 weeks. Intermittent basal blood pressure reading after 15 days of prophylactic remedy showed 148/90 mmHg. This is bound to take serial reading on three different days at 8 am on empty stomach without tea/ coffee intake, thus avoiding effects of caffeine, phytates and tannates on blood pressure. Basal reading on all three days showed systolic BP 146-150 mmHg and diastolic reading 86-90 mmHg. Hence his antihypertensive medications were changed to Telmisartan 40 mg once daily skipping T. amlodipine with regular follow up. At the end of one month blood pressure reading with similar consecutive reading on three different days revealed systolic BP ranging between 138-144 mmHg and diastolic BP ranging between 82mmHg to 88mmHg, once again the dosage of antihypertensive medication was reduced to 20mg of telmisartan. At the end of 6 weeks, the biochemical investigations were repeated with more focused review on lipid profile. Astonishing results were received with following values

LIPID PROFILE: Total cholesterol – 202 mg%

Triglycerides – 153mg%

LDL Cholesterol – 92mg%

HDL cholesterol- 42mg%

The patient was made to discontinue T. Aspirin, T. Telmisartan and T. Atorvastatin and continued to consume garlic essentials.

## II. GARLIC ESSENTIALS: A BOON TO HEALTHY HEART

Being one of the most important organs in the body the heart is one of those organs that works non-stop. It circulates oxygen in the body and takes away the toxins produced, without which all other organs would shut down leading to death.

Atherosclerosis (in common term called as thickening and blocking of arteries) remains the major cause of death and premature disability in developed & developing countries. Current predictions estimate that year 2020 cardiovascular diseases, notably atherosclerosis, will become the leading global cause of total disease burden. Atherosclerosis of the coronary arteries commonly causes myocardial infarction and angina pectoris. Atherosclerosis of arteries supplying the central nervous system frequently provokes strokes and transient cerebral ischemia. In the peripheral circulation, atherosclerosis causes

intermittent claudication and gangrene, and jeopardizes limb viability.

It is the narrowing or occlusion of the arteries by plaque, which consists of cholesterol, platelets, monocyte/macrophages, calcium, aggregating proteins, and other substances. Morbidity of atherosclerosis-induced coronary heart disease (CHD) gradually elevates annually due to the improvement of life standard and the change of lifestyle in recent years. However, the mechanism of the onset and development of atherosclerotic lesions are not completely understood until now. Many complicated factors, its interaction and interrelated biological processes contribute to atherosclerosis. Among these, high plasma levels of low-density lipoprotein (LDL), especially its oxidized form (ox-LDL), and activation of the renin-angiotensin system (RAS) are considered to be the key influencing factor of the generation and development of atherosclerosis.

Growth of atherosclerotic plaques probably doesn't occur in a smooth, linear fashion, but rather discontinuously, with periods of quiescence punctuated by periods of rapid evolution. After generally prolonged 'silent' period, atherosclerosis can manifest clinically. The clinical expressions of atherosclerosis may be chronic, as in effort induced *angina pectoris* or of predictable and reproducible intermittent *claudication*. Alternatively, a dramatic acute clinical event, such as myocardial infarction, a *stroke*, or *sudden cardiac death* may first herald the presence of atherosclerosis.

MAJOR RISK FACTORS : <sup>1</sup>

1	Cigarette smoking
2	Hypertension (BP >140/90mmHg)
3	Low HDL cholesterol (<40mmHg)
4	Diabetes mellitus
5	Family history of premature coronary heart disease (CHD) CHD IN MALE FIRST –DEGREE RELATIVE < 55years CHD IN FEMALE FIRST –DEGREE RELATIVE < 65years
6	Lifestyle risk factors Obesity ( BMI > 30Kg/m <sup>2</sup> ) Physical inactivity Atherogenic diet
7	Age ( men > 45years, women >55years)

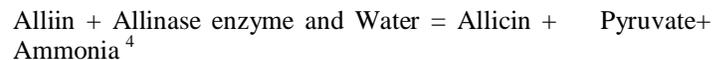
SCIENTIFIC ROLE OF GARLIC IN MAINTAINING HEALTHY HEART:

Garlic (*Allium sativum*) is originated from central Asia and belongs to Alliaceae family. It is used as a flavoring agent. In Egyptian codex 3500 years old document notifies that garlic was used in the treatment of heart disorders, tumors, worm and snake

bites etc. Majority of the garlic is composed by water around 65% followed by fructose, sulphur, zinc, selenium and moderate amounts of Vitamin A, low levels of calcium, magnesium, iron, manganese.

Alliin is an organosulphur compound, obtained from garlic. The aroma of garlic when freshly crushed is because of the content alliin released by the action of the enzyme alliinase on the substrate alliin. Alliin is an oily based yellowish liquid, which gives garlic its unique colour. Its biological activity can be attributed to both its antioxidant activity and its reaction with thiol containing proteins. The content of garlic by whole weight to its concentration of bioactive compound is 1:0.001 . Alliinase has a very short half life. Alliinase is irreversibly deactivated below pH 3; as such, alliin is generally not produced in the body from the consumption of fresh or powdered garlic. Alliin is unstable , breaking down into inactive components at 23<sup>0</sup> C, thus cooking destroys the bioactive component of garlic. Alliin exhibits lipid lowering, blood thinner, increases local circulation and platelet inhibitor action thus preventing aggregation and clot formation.<sup>3</sup>

III. MODE OF ACTION ALLICIN:



The biological activity of alliin extracted from fresh garlic is thought to be related to a combination of factors:

1. Antioxidant activity

*Potent antioxidant with relevance to LDL oxidation and reduces peroxides accumulation in endothelial cells. As oxidized LDL cholesterol is known to bind to specific receptors and stimulate the activation of numerous pro-inflammatory changes in the vascular wall.* <sup>5</sup>

2. Enzymes are also protein , and contain SH (sulphydryl) group for their biochemical interaction. Alliin attacks the SH groups of protein interfering with their function. Cholesterol is synthesized in the liver with the help of rate limiting enzyme HMG(beta-hydroxy-beta-methylglutaryl) Co A reductase. Organosulphur content of alliin reduces the enzyme forming internal disulphide bond and inactivation of thiol (-SH) group of enzymes like multienzyme complex of fatty acid synthesis. Thus contributing to lipid lowering action . <sup>6</sup>

Garlic, in an amount approximating one-half to one clove per day (600-900 mg), has been shown to decrease total serum cholesterol levels by about 9%

3. Because of its organic nature, alliin rapidly penetrates into the cell. <sup>6</sup>

HYPERTENSION AND ITS STAGES : <sup>1</sup>

CATEGORY	SYSTOLIC BP (mmHg)	DIASTOLIC BP (mmHg)
Normal	< 120 and	< 80
Pre hypertension	120-139 or	80-89
Hypertension stage I	140-159 or	90-99

Hypertension stage II	≥160 or	≥100
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#### IV. ROLE OF GARLIC IN PREVENTION AND TREATMENT OF HYPERTENSION

- a) Improvements in vasodilatation due to maintenance of healthy endothelium secondary to prevention of accumulation of peroxides and other free radicals in endothelium and LDL oxidation. Protects and restores the elasticity of the arteries.<sup>7</sup>
- b) Inhibition of angiotensin converting enzyme, thus reducing production of angiotensin II which is responsible for salt and water retention and vasoconstriction
- c) Decreasing platelet aggregation
- d) Lipid lowering effects by reducing hepatic cholesterol synthesis and fatty acid synthesis
- e) Prevents lipid peroxidation of oxidized erythrocytes.<sup>7</sup>

#### V. ROLE OF LIPID DISORDERS IN HEART DISEASE

Abnormalities in plasma lipoproteins and derangement in lipid metabolism rank the most firmly established and best understood risk factors for atherosclerosis. Elevated LDL levels promote atherogenesis likely involves oxidative modification. Cholesterol is necessary for the normal body process. It is the vital component of the cell membrane and transports nutrients into the cell and waste products out of the cell. Cholesterol being the component blood lipids: LDL, HDL, VLDL etc. Thus hypercholesterolemia causes metabolic derangement leading to oxidative stress causing LDL oxidation and subsequent subendothelial accumulation forming foam cells. The consistent benefit of LDL lowering by HMG CoA reductase inhibitors (eg. Atorvastatin) observed in risk groups causes salutary effects on lipid profile and direct modulation of plaque biology apart from lipid lowering.<sup>8,9,11</sup>

#### VI. OTHER USES OF GARLIC

It is beneficial in patients with chronic sinusitis, allergic rhinitis, hypertension in late pregnancy (pre-eclampsia), travelers diarrhoea, flu, enlarged prostate (BPH-benign prostatic hyperplasia), building up immunity, prevention and treatment of Colon CA, gastric CA, CA breast, CA prostate, CA lung.<sup>12,13</sup>

#### REFERENCES

- [1] Fauci, Braunwald, Kasper et al. Harrison's 17th edition of internal medicine. Chapter 235, page 1501.
- [2] Yin Lu, Zhuojin He, Xiuying Shen et al. Oxidative Medicine and Cellular Longevity, Hindawi Publishing Corporation, Volume 2012 (2012), Article ID 489690, 6 pages
- [3] Khalid Rahman<sup>3</sup> and Gordon M. Lowe. Garlic and Cardiovascular Disease: A Critical Review. JN the journal of nutrition J. Nutr. March 2006 vol. 136 no. 3 736S-740S.
- [4] Peter Josling. Heart of Garlic: Allicin's Effective Natural Healing Properties: an A-Z of Conditions and Suggested Treatments. Illustrated edition. Natural Health Holdings Limited, 2003
- [5] Hughes BG, Lawson LD. Antimicrobial effects of *Allium sativum* L (garlic), *Allium ampeloprasum* (elephant garlic) and *Allium cepa* L (onion), garlic compounds and commercial garlic supplement products. Phytotherapy Research 1991; 5: 154-8.
- [6] Ellmore G.S., Feldberg R.S., Alliin lyase localization in bundle sheaths of garlic clove (*Allium sativum*), Am. J. Bot. 81(1994) 89-94.
- [7] Todd J. Anderson, Ian T. Meredith, François Charbonneau. Endothelium-Dependent Coronary Vasomotion Relates to the Susceptibility of LDL to Oxidation in Humans. American heart association. Circulation. 1996; 93: 1647-1650 doi: 10.1161/01.CIR.93.9.1647
- [8] Rafael Carmena, Patrick Duriez, Jean-Charles Fruchart. Atherosclerosis: Evolving Vascular Biology and Clinical Implications. Atherogenic Lipoprotein Particles in Atherosclerosis. American heart association. Circulation. 2004; 109: III-2-III-7 doi: 10.1161/01.CIR.0000131511.50734.44.
- [9] Rahmani M, Tabari AK, Niaki MRK, and et al. Effect of dried garlic supplementation on blood lipids in mild and moderate hypercholesterolemic patients. Arch Iran Med 1999;2:19-23
- [10] Jack Challem. Basic health publication. User's guide to garlic. Page 38
- [11] de N, Nelson AB, and Lau BHS. Aged garlic extract and its constituents inhibit Cu<sup>2+</sup>-induced oxidative modification of low density lipoprotein. Planta Med 1997;63:263-264.
- [12] Lian Z, Jun-Ling M, and Wei-Dong L. A randomized multi-intervention trial to inhibit gastric cancer in Shandong (progress report). Chinese Journal of Clinical Oncology 1998;25:338-340.
- [13] Gail M, You WC, Chang YS, and et al. Factorial trial of three interventions to reduce the progression of precancerous gastric lesions in Shandong, China: Design issues and initial data. Controlled Clin Trials 1998;19:352-369.

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