Original Research Article

Garlic (*Allium sativum*): A Natural Remedy for Metabolic Syndrome

Yadav Kavita[1], Meena Kishori Lal[2], Choudhary Urmila[3], Sharma Meghshyam[4]

[1, 3, 4]Assistant Professor, Department of Physiology, RNT Medical College, Udaipur, Rajasthan, India
[2]Assistant Professor, Department of Biochemistry, RNT Medical College, Udaipur, Rajasthan, India

*Corresponding author
Dr. Kavita Yadav
Email: kavita2529@gmail.com

Abstract: Garlic (*Allium sativum*) is a bulbous plant is used medicinally with a history of human use over 5000 years. Garlic contains more than 200 chemical compounds like active compounds (allicin, alliin, ajoene) enzyme (allinase, peroxidase and myosinase) carbohydrate (sucrose and glucose) and many essential amino acids and vitamin A, B, C etc. with many trace elements. Metabolic syndrome consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease and Diabetes Mellitus. The major features of the Metabolic Syndrome includes: Central obesity, hyper triglyceridemia, Low HDL cholesterol, Hyperglycemia and Hypertension. The Aim of this study to investigating the effect of this garlic extract on the risk factors in metabolic syndrome patients along with conventional treatment. The subjects were divided into two groups. Group I patients were given conventional treatment only and serve as the control group. Group II patients besides conventional treatment were given Garlic Capsule (250 mg extract of garlic). In results the present study observed that lipid profile &blood sugar improved significantly in study group after garlic therapy for 3 months. The conclusion in this study is Garlic (*Allium sativum*) therapy had good glycemic control, both FBS and HbA$_1$c improved significantly in study group. This therapy also improved lipid profile significantly. Such studies should be further encouraged as medicinal herbs constitute the cornerstone of traditional medicinal practice worldwide.
Keywords: Metabolic Syndrome, Hyper triglyceridemia, Hyperglycemia, *Allium sativum*.

INTRODUCTION

The metabolic syndrome (Syndrome X, Insulin resistance syndrome) consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus (DM) [1]. Metabolic syndrome is also known as metabolic syndrome X, cardio metabolic syndrome, Reaven's syndrome (named for Gerald reaven) and CHAOS (in Australia) [2]. The major features of the metabolic syndrome include Central obesity, Hyperglycemia, and Hypertension [1]. A meta analysis conducted by Zeng *et al.;*clearly illustrated that garlic therapy is more effective if used for a long term with higher baseline total cholesterol level [3, 4].

Garlic is a bulbous perennial herb, Garlic contains at least 33 Sulfur compounds, several enzymes (allinase, peroxidases, myrosinase and other), 17 amino acids and minerals such as selenium [5] According to Ayurvedic Pharmacology:- Properties of *Allium sativum* includes Guna, Rasa, Veerya Vipaka and Karma [6] Garlic medicinal uses include Anti-atherosclerotic, Anticoagulant, Anti- cancer, Antioxidant, Antibiotic, Anti-parasitic, Anti-inflammatory, Antihypertensive and in Glucose control [7, 8, 9,10,11,12].

METHOD

This study has been conducted in Department of Physiology S.P. Medical College, Bikaner. All 100 patients were randomly selected from the Diabetes clinic that is situated in the Diabetes care and Research centre of P.B.M. hospital, Bikaner. Informed consent was obtained from each participant before their recruitment. The subjects were divided into two groups. Group I patients were given conventional treatment only and serve as the control group. Group II patients besides conventional treatment were given Garlic Capsule & serve as the study group.

PROCEDURE

Patient included in the study group were asked to take one garlic capsule twice a day after meal. Each capsule contains 250 mg extract of lasuna. Capsule taken three months regularly, Before starting garlic capsule base line biochemical parameters were taken for every patient i.e. fasting blood sugar, lipid profile and glycosylated haemoglobin. Patients were evaluated after 3 month for these above mentioned parameter. These under control group were evaluated base line and after three months for these above mentioned parameter.

Exclusion criteria: Patients suffering from liver disease, arthritis, renal disease, mal-absorption, asthma, pulmonary tuberculosis, myocardial infarction, heart block disease and any other disease in addition to metabolic syndrome and non- cooperative patients with metabolic syndrome were excluded from the study.

RESULTS
Effect on blood glucose parameter-
        The present study shows the comparison of mean value of fasting blood sugar in study and control group. In study group fasting blood sugar decreased by 22.66% & 10.98% reduction was in control group. HbA_1c is decreased by 15.45% in study group whereas in control group, it is decreased by 3.19%.

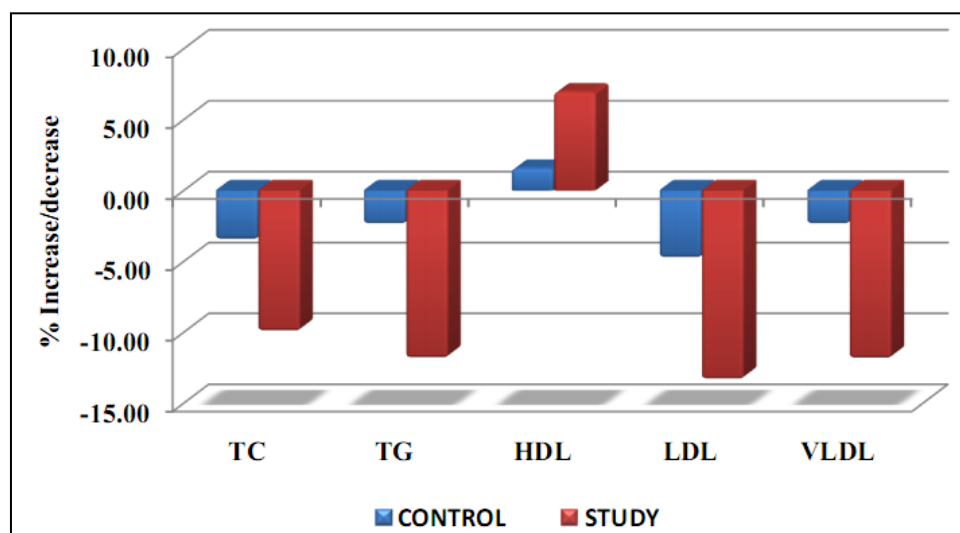**Effect on lipid profile parameter-**
        Mean value of total cholesterol decreased by 9.97% in study group whereas in control group, it is decreased by 3.50%. Mean value of serum triglyceride decreased by 11.86% in study group whereas in control group, it decreased by 2.41%. Mean value of HDL cholesterol increased 6.96% in study group whereas in control group, it increased by 1.58%. Mean value of LDL cholesterol decreased by 15.36% in study group whereas in control group it decreased by 4.80%.Mean value of VLDL cholesterol decreased by 11.89% in study group whereas in control group, it decreased by 2.41%.
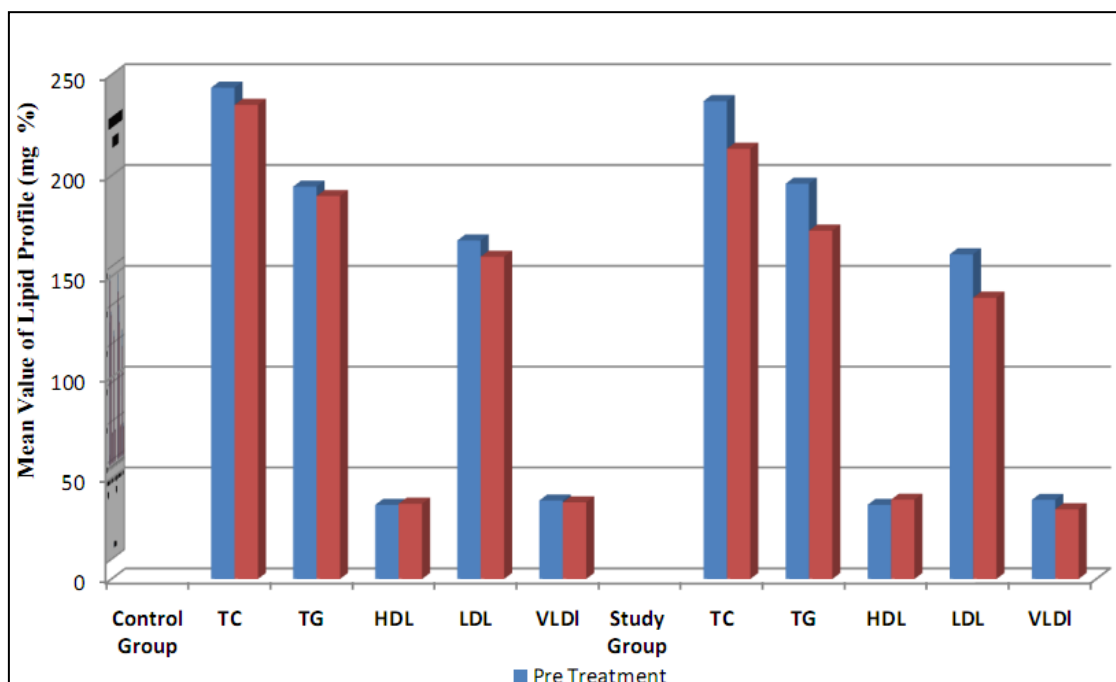
Fig-1: Comparison of lipid profile in control and study group

Table-1: Effect of garlic therapy on biochemical parameters in study group

		Base line		Post treatment		
		Mean	**SD**	**Mean**	**SD**	**p value**
Glycaemic control	**FBS**	222.84	69.41	172.34	45.77	<0.001
	HbA$_1$C	9.25	1.62	7.82	1.46	<0.02
Lipid profile	**TC**	236.93	32.27	213.31	25.87	<0.001
	TG	195.96	48.78	172.171	47.95	<0.001
	HDL	36.76	4.06	39.32	3.21	<0.02
	LDL	160.97	29.11	139.46	23.03	<0.001
	VLDL	39.19	9.75	34.53	9.6	<0.02

Fig-2: Percentaqge Increase/Decrease in Lipid Profile Parameters in Control and Study Group

DISCUSSION

The present study observed that lipid profile improved significantly in study group after garlic therapy for 3 months. The mechanism of hypocholesterolemic action of garlic extract is due to inhibition of HMG-coA reductase activity, Garlic supplemental enhanced the excretion of natural steroids and bile acids & possibly decreased activity of lipogenic enzyme glucose-6 phosphate dehydrogenase & malic dehydrogenase. The triglyceride lowering effect of garlic appears to be due to inhibit of de-novo fatty acid synthesis [13]. In recent years, garlic has been focus of attention because of its potential role in the prevention of various aspects of cardio vascular disease [14, 15].

Diabetes mellitus the most common endocrine disorder that affect more than 194 million people worldwide. If nothing is done to control this disease, the number will exceed 333 million by 2025 [16]. The hypoglycaemic action of garlic could possibly be due to an increase in pancreatic secretion of insulin from Beta cells, or enhancement of insulin sensitivity [11, 17].

CONCLUSIONS

Metabolic syndrome major features include: - Central obesity, hypertriglyceridemia, low high – density lipoprotein cholesterol, hyperglycemia and hypertension. Garlic (*Allium sativum*) therapy had good glycemic control, both FBS and HbA_1c improved significantly in study group. This therapy also improved lipid profile significantly. So it can be used as an adjunct with diet & medicines in management of metabolic syndrome.

REFERENCES

1. Eckel RH; The metabolic syndrome. In: Harrison's Principles of Internal Medicine. Fauci, Kasper, Hauser, Longo, Jameson, Loscalzo (eds.) 18th Edition, 2012; 2:1992-97.
2. Allen E Gale; consultant physician (Allergy), in his case studies presented at the chronic fatigue syndrome conference in Sydney, Australia 1998; 12:13
3. Zeng T, Guo FF, Zhang CL, Song FY, Zhao XL, Xie KQ; "A meta-analysis of randomized, double-blind, placebo controlled trails for the effects of garlic on serum lipid profile."Journal of the Science of food and Agriculture. 2012; 92(9):1892-1902.
4. Holzgartner H, Schmidt U, Kuhn U; "Comparison of the efficacy and tolerance of a garlic preparation versus bezafibrate. Arzneimittel- Forschung. 1992; 42(12): 1473-1477.
5. Newall CA, Anderson LA, Phillipson JD; Herbal medicines: a guide for health- care professionals. London: Pharmaceutical Press. 1996: 296.
6. Raman R, Gupta A, Pal SS, Ganesan S, Venkatesh K, Kulothungan V *et al.;* Prevalance of metabolic syndrome and its influence on Microvascular complication in Indian population with Type 2 Diabetes Mellitus. Diab Metab Synd. 2010; 2: 67.
7. Benavides GA, Squadrito GL. Mills RW, Patel HD, Isbell TS, Patel RP *et al.;* "Hydrogen sulphide mediates the vaso activity of garlic." Proceeding of the National Academy of Sciences of the United State of America. 2007; 104(46): 17977-17982.
8. Rahman K, Billington D; Dietary supplementation with aged garlic extract inhibits ADP-induced platelets aggregation in humans. Journal of Nutrition. 2000; 130(11): 2662-2665.

9. Milner JA; Preclinical perspectives on garlic and Cancer. Nutr. 2006; 136(3): 8275-8315.
10. Harris JC, Cottrell SL, Plummer S, Lloyd D; Antimicrobial properties of Alum sativum. Applied Microbiology and Biotechnology. 2001; 57: 282-286.
11. Mathew PT, Augusti KT; Studies on the effect of allicin (diallyl Disulfide-oxide) on alloxan diabetes. Hypoglycaemic action and enhancement of serum insulin effect and glycogen synthesis. Indian J Biochem Biophys. 1973; 10: 209-212.
12. Borek C; Antioxidant health effects of aged garlic extract. J Nutr. 2001; 131(3):1010-50.
13. Yeh YY, Lin RIS, Yeh S; Garlic reduces cholesterol in hypocholesterolemic men maintaining habitual diets. In Food Factors for Cancer Prevention. Springer- Verlag. 1996; 226-230.
14. Bakhsh R, Chughtai MI; Influence of garlic on serum cholesterol, serum triglycerides, serum total lipids and serum glucose in human subjects. Die Nahrung. 1984; 28(2):159-163.
15. Madder FH; Treatment of hyperlipidaemia with garlic-powder tablets. Evidence from the German association of general practitioners multicentric placebo-controlled double-blind study. Arzneimittel- Forschung. 1990; 40(10): 1111-1116.
16. Diabetes Atlas, Second Edition. Belgium: International Diabetes Federation (IDF), 2003.
17. Augusti KT, Sheela CG; Antiperoxide effect of S-allyl cysteine Sulfoxide a insulin secretagogue in diabetic rats. Experientia.1996; 52:115-120.