Research Article

To study the hypotensive and hypolipidemic effects of garlic in smokers in the North Indian population

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ABSTRACT

Background: Garlic, latin name *Allium Sativum*, belongs to the onion family Alliaceae, have been widely recognized as agents for prevention and treatment of cardiovascular and other metabolic diseases like atherosclerosis, hyperlipidemia, thrombosis, hypertension and diabetes.
Methods: This prospective study conducted on male smokers (n=40) in the department of physiology of Teerthanker Mahaveer Medical College & Research Centre. Selected smokers were further evaluated before and after giving raw fresh garlic weighing about 5-6gm daily for a month.
Sample 1:- Before taking garlic parameters.
Sample 2:- After taking garlic parameters.
After one month all the parameters were analyzed and compared with the baseline parameters.
Results: Garlic has a significant hypotensive effect by lowering DBP, SBP also lowered but it was not statistically significant. Also hypolipidemic effects of garlic were found to be statically significant in cases of triglyceride, HDL & LDL, but changes in cases of cholesterol and VLDL are not statically significant.
Conclusions: Garlic being hypotensive and hypolipidemic in nature as shown in our study, therefore it can be concluded that garlic is beneficial for human beings. Its main beneficial effect for decreasing the lipid levels as well as the blood pressure in smokers.

Keywords: Garlic, Lipid parameters, Hypolipidemic agents, Smokers

INTRODUCTION

Garlic (*Allium sativum* L.) is used as a spice and well known medicinal herb. Most recent research on garlic has used garlic in the form of tablets, flesh, raw, boiled, cooked and dried for certain therapeutic purposes, including lowering blood pressure and improving lipid profile.

Garlic and its preparations have been applied earlier for prevention and treatment of cardiovascular and other metabolic disease like coronary artery disease, hyperlipidemia, thrombosis, hypertension and diabetes.[1]

Smoking is an addiction as well as habit. The relationship between smoking and cardiovascular disease has been known and supported by worldwide studies. Tobacco smokes contain nicotine, the powerfully addictive drug and responsible for the inauspicious effects of smoking. It has been recognized that blood pressure and heart rate increase during smoking.

This rise in blood pressure is due both to an increase in cardiac output and total peripheral vascular resistance. The blood pressure rise appears immediately and occurs before any increase in circulating catecholamines.[2]

Smoking affects your pulse rate by increasing it several times faster. A healthy pulse rate for a resting heart is 60 beats per minute, nicotine from tobacco increases this rate in a smoker's heart up by three or four times. This is mainly because nicotine increases the carbon dioxide levels in the heart, thus forcing the heart to beat faster to generate oxygen; nicotine also constricts blood vessels thus raising the pulse rate of a smoker.

Smoking is considered as a major cardiovascular risk factor.[3] There is a dose-response relationship between the number of cigarettes smoked and cardiovascular morbidity and mortality.[4] The mechanism by which cigarette smoking causes atherosclerosis remains unknown, only cigarette smoking have been ground to change the level of lipoproteins.[5-9] Plasma lipoprotein abnormalities are said to be the major underlying risk factors and may even be essential for the common occurrence of atherosclerotic vascular diseases.[10] Nicotine stimulates sympathetic adrenal system, leading to increased secretion of catecholamine resulting in increased lipolysis and increased concentration of plasma free fatty acids (FFA) which further result in increased secretion of hepatic FFAs and hepatic triglycerides along with VLDL-C in the blood stream.[6]

These changes lead to the atherosclerotic potential of cigarette smoke. Blood of cigarette smokers routinely displays decreased antioxidant capacity and increased oxidized lipids compared to non-smokers.[10] Cigarette smoke contains approximately oxidant molecules per puff that can do damage to lipids, proteins, DNA, sugars, and other bio-molecules.[11] It is becoming more and more apparent that a pro-oxidant/ antioxidant imbalance largely contributes to atherosclerosis processes.[12] It has been postulated that many of the adverse effect of smoking may result from oxidative damage to critical biological substances resulting in an abnormal endothelial function in chronic smokers. Endothelial dysfunction in turn has been proposed to play a pathogenic role in the initiation of vascular disease.[13]

We have chosen raw garlic in our field to analyze its hypotensive and hypolipidemic effects in tobacco users. Raw garlic homogenate is essentially same as an aqueous extract of garlic, which has been employed in several scientific fields. Allicin (all 2-propenethiosulfinate or diallyl thiosulfinate) is thought to be the principal bioactive compound present in an aqueous garlic extract or raw garlic homogenate. When garlic is chopped or crushed, allinase enzyme, present in garlic, is activated and acts on alliin (present in intact garlic) to produce allicin.

Lipid profile is a group of tests that include total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides, which are done to know about the patient's risk for heart diseases. It is clear that smoking is bad for health and has severe health issues. It has many side effects and one of its main negative issue is it affects the lipid profile of the body system. The following article discusses on how the lipid profile is affected by smoking and its consequences.

Garlic and garlic extracts are considered to have beneficial effects for the prevention of cardiovascular diseases.[14] Several studies have also shown that garlic contains active hypocholesterolemic and hypoglycemic components, known as diallyl disulfide and dipropyl disulfide.[15]

Garlic has been shown to have several effects in the body. This includes inhibition of platelet aggregation[16], and prevention of fat infiltration of the liver.[17]

METHODS

Subject selection

This prospective study conducted on Male smokers (n=40) in the department of Physiology of Teerthanker Mahaveer Medical College & Research Centre. Selected smokers were further evaluated before and after giving raw fresh garlic weighing about 5-6gm daily for a month.

Sample 1:- Before taking garlic
Sample 2:- After taking garlic

After one month all the parameters were analyzed and compared with the baseline parameters.

The blood sample was withdrawn from a medial cubital vein in a blood container and EDTA (ethylene Di methyl amine tetra acetate) (anticoagulant) was added to prevent of clotting. The study was commenced after approval from the Institutional Ethical Committee.

Following parameters were assessed during the study.

Cardiac parameters

1. Pulse Rate
2. Blood Pressure

Lipid parameters
1. Total Cholesterol (TC) (140-250 mg/dl).
2. High Density Lipoprotein (HDL):
   Adult male: 35.3 – 79.5 mg/dl.
   Adult female: 42.0 – 88.0 mg/dl.
3. Low Density Lipoprotein (LDL)
4. Triglycerides (TG): Normal Fasting Levels:- 25-160 mg/dl.

Statistical Analysis

Results were analyzed by student's 'T' test to compare both the parameters.

The P value represents probability values for testing the simultaneous equality of the means and P values were

considered to be statically significant. The values of all the parameters were presented as geometric means.

Statistical software, namely SPPS10.0 and Systat 8.0 were used for the analysis of the data. Microsoft word and Excel have been used to generate tables.

RESULTS

This prospective study conducted on male smokers (n=40) in the department of Physiology of Teerthanker Mahaveer Medical College & Research Centre.

The cardiac and lipid parameters were analyzed before giving garlic (baseline values) (Sample 1) and after the administration of garlic for a month (Sample 2).

Cardiac parameters (Table 1):

In case of Pulse rate parameter, the mean of sample 1 is 74.97 and the mean of sample 2 is 72.65. The values of Sample 2 are lesser than as compared to sample 1 and the

p value of both samples is 2.44, so it is not statically significant.

In case of SBP (Systolic Blood Pressure) parameter, mean of sample 1 is 120.37 and the mean of sample 2 is 114.30. The value of Sample 2 is lesser than as compared to sample 1 and the p value of both samples is 3.17 so it is not statically significant. Similarly, in case of DBP (Diastolic Blood Pressure), mean of sample 1 (80.37) higher than that of sample 2 (76.62) and a p value of both samples is 0.03 which is below the statically p value, so it is statically significant.

Lipid parameters (Table 2):

In case of Cholesterol, values of Sample 2 are slightly more as compare to sample 1, whereas in cases of Triglyceride, VLDL, HDL, values of Sample 2 are lesser than as compared to sample 1. But in case of LDL, the values of both the samples are partly equal. The p values of both samples were statically significant only in cases of Triglyceride, HDL & LDL.

Table 1: Showing data set of cardiac parameters.

Parameters		No.	Mean	SD	SE Mean	P value	Statistical significance
Pulse Rate	Sample 1	40	74.97	5.30	0.83	2.44	NO
	Sample 2	40	72.65	4.32	0.68		
SBP	Sample 1	40	120.37	8.72	1.38	3.17	NO
	Sample 2	40	114.30	5.79	0.91		
DBP	Sample 1	40	80.37	8.11	1.28	0.03	YES
	Sample 2	40	76.62	6.34	1.03		

Table 2: Showing data set of lipid parameters.

Parameters		No.	Mean	SD	SE mean	P value	Statistical significance
Cholesterol	Sample 1	40	167.3	16.43	2.59	3.8	NO
	Sample 2	40	166.3	16.64	2.63		
Triglyceride	Sample 1	40	101.14	30.86	4.88	0.01	YES
	Sample 2	40	100.04	29.08	4.59		
VLDL	Sample 1	40	47.37	18.78	2.97	0.15	NO
	Sample 2	40	47.20	18.57	2.93		
HDL	Sample 1	40	50.68	10.16	1.60	0.05	YES
	Sample 2	40	51.77	9.22	1.45		
LDL	Sample 1	40	84.44	9.63	1.52	0.01	YES
	Sample 2	40	83.65	9.66	1.52		

DISCUSSION

In the present study, we have investigated the changes of Cardiac parameters and Lipid profile in smokers before and after giving raw, fresh garlic weighing about 5-6 gm. to the subject for eating daily for a month.

Change in cardiac parameters

In the present work, we have found that garlic have a substantial effect on lowering DBP, SBP also lowered in sample 2 but it is not statistically significant (Table 1). This is in accordance with Leoper and DeBray et al.

recognized the hypotensive effect of garlic, blood pressure reduction was observed in 85% of the patients, the average decline being 12.3 mm Hg systolic (SBP) and 6.5 mm Hg diastolic (DBP) blood pressure, over one-quarter of the subjects experienced a decline in SBP of 20 mm Hg or more.[18] Pektov (1979) has also cited several studies, which indicated that garlic and its extracts exhibit antihypertensive activity.[19]

No substantial alterations were observed in pulse rate and systolic BP, when compared with control.

Change in lipid profile

In this study changes are statistically significant only in cases of triglyceride, HDL & LDL, but in cases of cholesterol and VLDL are not statistically significant. Our findings are in accordance with the study conducted by Al-Numair et al. who observed the effect of garlic extracts on lipid profile. Garlic extract significantly increased (p<0.05) plasma HDL-Cholesterol and decreased plasma TC, LDL-Cholesterol and TG as well as liver TC and TG as compared with the positive control (Group II). No substantial deviation was noted in plasma LDL-Cholesterol, HDL-Cholesterol as well as plasma and liver TG between the rats ingested with high or low dose of garlic extracts[20] (Table 2).

CONCLUSION

Our study shows effect of garlic on cardiac parameters and lipid profile of male smokers. Majority of parameters was found to be lowered after taking garlic as compared to sample 1 taken before giving garlic.

- *Hypotensive effects*: In cardiac parameters, pulse rate and systolic blood pressure lowered, but not statistically significant, but diastolic blood pressure is statistically important.
- *Hypolipidemic effects*: In lipid parameters, only VLDL and HDL is statistically significant and others parameters are not statistically significant.

Thus it can be concluded that garlic have hypotensive as well as hypolipidemic effects and can be beneficial in patients suffering from cardiovascular diseases.

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