SHORT-TERM EFFECT OF GARLIC EXTRACT ON PATIENTS WITH DYSLIPIDEMIA

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ABSTRACT

Dyslipidemia is a metabolic abnormality leading to a persistent increase in the plasma concentration of cholesterol and triglycerides. Dyslipidemia is known to promote atherosclerosis. It is a complex disease and is a major risk factor for adverse cardiovascular events. Allium sativum commonly known as garlic has been found to have several medicinal value including, lipid-lowering property, blood pressure decreasing, anti-diabetic, anti-cancer and anti-oxidant activity. It was a double-blind, two-parallel-group, prospective interventional clinical trial. Total no of 112 patients were enrolled in the study and divided into two equal groups (56 in each group) viz; Group 1 (Lasuna TM) and Group 2 (placebo). Lipid profile was measured at day 0 and 90. Independent–sample't' test was applied to find out the significant difference between the two groups, P-value being 0.05. The mean difference Total Serum Cholesterol, Serum Triglyceride, Serum LDL Cholesterol and Serum VLDL cholesterol on day 0 was nonsignificant with p being 0.539, 0.811, 0.230, 0.770 and 0.811 and on 90th day was significantly lower in group taking garlic with p being 0.001, 0.014, 0.003 and 0.008 respectively whereas Serum HDL cholesterol on 90th day was significantly higher in group taking garlic with p being 0.001. Garlic, when given as supplement decreases Total Serum Cholesterol, Serum Triglycerides, Serum LDL Cholesterol and Serum VLDL Cholesterol and on the other hand it increases Serum HDL Cholesterol.

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INTRODUCTION

Dyslipidemia is a metabolic abnormality leading to a persistent increase in the plasma concentration of cholesterol and triglycerides. Dyslipidemia is known to promote atherosclerosis.[1] It is a complex disease and is a major risk factor for adverse cardiovascular events. High levels of low-density lipoprotein and low levels of high-density lipoprotein are associated with myocardial infarction (MI) and stroke.[2,3]

Allium sativum, commonly known as Garlic, has been found to have lipid-lowering property since it inhibits HMG-CoA reductase and thus halting lipid oxidation and oxidative modification of LDL cholesterol.[4] Other suggested mechanisms include increased loss of bile salts in feces and mobilization of tissue lipids into circulation, as garlic has a profound effect on postprandial hyperlipidemia.[5] Together garlic also poses vasodilatory effect on the pulmonary vascular bed.[6] It also has cardio-protective effect i.e. Garlic inhibits ADP-induced platelet aggregation and increases plasma fibrinolytic activity which results in dissolution of clot and thrombi, thus preventing cardiovascular disorders and lowering the risk of MI and sudden coronary death.[7,8] Garlic also has potential to decrease blood pressure in Hypertensive patients.[9]

Blood pressure reducing properties of garlic are related with the hydrogen sulphide production and allicin content liberated from alliin and the enzyme alliinase which is assumed to possess angiotensin II inhibiting and vasodilating effects.[10,11] The present study was taken up with the purpose of evaluating the effect of garlic on lipid profile of patient with dyslipidemia.

MATERIALS AND METHODS

This double blind, two parallel-group, prospective interventional clinical trial study was conducted in BPKIHS, Dharan, Nepal from may 2017 to may 2018 Ethical approval was taken from Ethical Review Board, BPKIHS. After calculating the sample size, total no. of subjects were 112 (56 in each group). Patient above 30 years who were diagnosed with dyslipidemia and not taking any hypolipidemic drugs were included in the study and patients taking hypolipidemic drugs were excluded from the study. Therefore, 112 patients were enrolled in the study and divided into two groups viz; group 1 (capsule Lasuna) and group 2 (placebo). Each capsule lasuna contained 250 mg of garlic. Lipid profile was measured on day 0 and 90. Data collected from the study was evaluated at Microsoft Excel 2007 and converted into SPSS 11.5 v for statistical analysis. For inferential study, Independent–sample't' test was applied to find out the significant difference between the groups taking lasuna and groups taking placebo. Other related variables were calculated at 95% CI where $p<0.05$.

RESULTS

A total of 112 patients participated in the study, of which 60 were males and 52 were females.

Table 1: Comparison of baseline parameters between two treatment groups at day 0				
Variable	**Group I (garlic) (N=56) (Mean,SD)**	**Group II (placebo) (N=56) (Mean,SD)**	**t-test p-value**	**Remarks**
cholesterol (mg/dl)	209.91 ± 39.98	205.25 ± 40.10	0.53	NS
Triglycerides (mg/dl)	204.05 ± 86.90	199.98 ± 92.50	0.81	NS
LDL (mg/dl)	131.38 ± 31.83	124.09 ± 33.06	0.23	NS
HDL (mg/dl)	44.68 ± 13.40	43.91 ± 14.36	0.77	NS
VLDL (mg/dl)	40.81 ± 17.37	39.99 ± 18.50	0.81	NS

NS=Non Significant

Table 2: Mean Total Serum Cholesterol and Independent-Sample 't'-test :- comparing Serum Cholesterol between two treatment groups at day 0 and 90.				
Group/ Day	**Garlic (mean,SD)**	**Placebo (mean,SD)**	**t-test p-value**	**Remarks**
Chol at day 0 (mg/dl)	209.91 ± 39.98	205.25 ± 40.10	0.05	NS
Chol at day 90 (mg/dl)	160.45 ± 49.49	197.04 ± 49.03	<0.001	Sig

*p-value<0.05 was considered statistically significant.
NS = Non Significant, Sig = Significant, Chol = Cholesterol

Table-1 summarizes the comparison of baseline parameters of both treatment groups which includes serum cholesterol, serum triglyceride, serum high density lipoprotein cholesterol (HDL), serum low density lipoprotein Cholesterol (LDL) and serum very low density lipoprotein cholesterol (VLDL). The mean of serum cholesterol, serum triglyceride, LDL, HDL and VLDL of both treatment groups at Day 0 showed no significant differences, thus concluding that the sample were homogenously selected.

In between-group comparison of mean Total Serum Cholesterol on 90th day by Independent-Sample 't'-test was significant (p<0.001) Table 2. Total Serum Cholesterol has decreased significantly in group treated with garlic.

Serum LDL- Cholesterol

Serum LDL-Cholesterol decreased in both the groups. In between-group comparison of mean Serum LDL-Cholesterol on 90th day by Independent-Sample 't'-test was significant (p=0.003) Table-4. Thus with garlic as add-on therapy, the serum LDL-Cholesterol reduction was highly significant.

Serum HDL-Cholesterol

Serum HDL-Cholesterol has increased in group 1. In between-group comparison of mean Serum HDL-Cholesterol on 90th day by Independent-Sample 't'-test was significant (p=0.001) Table-5. There was highly significant increase in serum HDL-Cholesterol in group taking garlic.

Table 3: Mean Serum Triglyceride and Independent-Sample 't'-test :- comparing Serum Triglyceride between two groups at day 0 and 90				
Group/ Day	Garlic (mean,SD)	Placebo (mean,SD)	t-test / p-value	Remarks
Trig at day 0 (mg/dl)	204.05 ± 86.90	199.98 ± 92.50	0.81	NS
Trig at day 90 (mg/dl)	145.70 ± 68.41	177.30 ± 65.55	0.01	Sig

*p-value<0.05 was considered statistically significant.
NS = Not Significant, Sig = Significant, Trig = Triglyceride

Table 4: Mean Serum LDL-Cholesterol and Independent-Sample 't'-test :- comparing Serum LDL-Cholesterol between two groups at day 0 and 90				
Group	Garlic (mean,SD)	Placebo (mean,SD)	t-test / p-value	Remarks
LDL at Day 0 (mg/dl)	131.38 ± 31.83	124.09 ± 33.06	0.29	NS
LDL at Day 90 (mg/dl)	101.86 ± 34.76	121.77 ± 33.58	0.003	Sig

*p-value<0.05 was considered statistically significant.
NS = Not Significant, Sig = Significant, LDL = Low Density Lipoproteins

Serum Triglyceride

Serum triglyceride has decreased in both treatment groups. In between-group comparison of mean Triglyceride on 90th day by Independent–Sample 't'-test was significant (p=0.014) Table-3. Thus total serum triglyceride reduction with garlic was significant.

Serum VLDL- Cholesterol

Serum VLDL-Cholesterol has decreased in both groups. In between-group comparison of mean Serum VLDL-Cholesterol on 90th day by Independent-Sample 't'-test (Table-6) was significant (p=0.008). Serum VLDL-Cholesterol decreased significantly in group taking garlic.

Table 5: Mean Serum HDL-Cholesterol and Independent-Sample 't'-test :- comparing Serum HDL-Cholesterol between two treatment groups on day 0 and 90.				
Group	Garlic (mean, SD)	Placebo (mean, SD)	t-test / p-value	Remarks
HDL at Day 0 mg/dl	44.68 ± 13.40	43.91 ± 14.36	0.77	NS
HDL at Day 90 mg/dl	51.98 ± 11.36	44.64 ± 11.82	0.001	Sig

*p-value<0.05 was considered statistically significant.
NS = Not Significant, Sig = Significant, HDL = High Density Lipoproteins

Table 6: Mean Serum VLDL-Cholesterol and Independent-Sample 't'-test:- comparing Serum VLDL-Cholesterol between two groups on day 0 and 90				
Group	Garlic + allopathic drug	Placebo + allopathic drug	t-test, p-value	Remarks
VLDL at Day 0 (mg/dl)	40.81 ± 17.37	39.99 ± 18.50	0.81	NS
VLDL at Day 90 (mg/dl)	29.13 ± 13.68	36.31 ± 14.38	0.008	Sig

*p-value<0.05 was considered statistically significant.
NS = Not Significant, Sig = Significant, VLDL = Very Low Density Lipoproteins

DISCUSSION

The present study was conducted to evaluate the effect of *Allium sativum* (garlic) capsules on the lipid profile. In our study, garlic capsule produced significant reduction of lipid profile by the end of 90 days.

It has been proposed that Garlic has shown to inhibit HMG-Co A reductase, which is involved in cholesterol synthesis and exhibit anti-oxidative properties.[12] Aged garlic extract also inhibits lipid oxidation and oxidative modification of LDL-cholesterol, thus lowering the level of circulating LDL-cholesterol.[4] In our study, the reduction of total serum cholesterol, serum LDL-cholesterol, serum triglyceride, serum VLDL-cholesterol and increase in serum HDL-cholesterol were significant (p<0.05). This study thus suggested that garlic capsule improved dyslipidemia as compared to those taking placebo.

Many studies and researches have been done to see the lipid lowering effects of garlic. Observations done by Yei *et al*.[13] suggested that hydrophilic and hydrophobic compounds of garlic are inhibitory to cholesterol synthesis. Animal studies, however, have shown that garlic supplementation in the diet depressed the hepatic activities of lipogenic and cholesterogenic enzymes such as malic enzyme, fatty acid synthase, glucose-6 phosphate dehydrogenase[14] and 3-hydroxy-3-methyl-glutaryl-CoA (HMG-CoA) reductase.[15] Aged Garlic Extract (AGE) has been shown to inhibit lipid peroxidation, reducing ischemic/ reperfusion damage and inhibiting oxidative modification of LDL, thus protecting endothelial cells from the injury by the oxidized molecules, which contributes to atherosclerosis.[10]

Sobenin *et al*.[16] in their double-blinded placebo-controlled randomized study in 42 men aged 35-70 with mild hypercholesterolemia, observed a significant decrease in total cholesterol, triglycerides and LDL-cholesterol, and a significant increase in HDL-cholesterol with garlic powder tablets, Allicor (600 mg daily). This result is in concordance with those of the present study.

Chhatwal *et al*.[17] in their open labelled prospective comparative study, where 60 patients of type 2 diabetics with obesity were enrolled and divided into two groups showed more pronounced fall in total CHL, TG, LDL and an increase in HDL in patients treated with Garlic when given along with Metformin.

Various meta-analysis have been reported to determine the impact of garlic on lipid parameters. In a meta-analysis done by Reid *et al*.[18] in 2013 included 39 primary trials of the effect of garlic preparations on total cholesterol, LDL, HDL, VLDL, and triglycerides. The finding suggested Garlic preparations were highly tolerable in all trials and were associated with minimal side effects, and thus might be considered as an alternative option with a higher safety profile than conventional cholesterol-lowering medications in patients with slightly elevated cholesterol.[19] AGE also inhibits lipid oxidation and oxidative modification of LDL-cholesterol, thus lowering the level of circulating LDL-cholesterol.[4] Some studies have also demonstrated that AGE antagonized LXR α expression in the liver while provoke LXR α expression in the intestine and thus reverse expression of LXR α which leads to reduction of triglyceride and cholesterol.[20] Garlic tablet too on the other hand can reduce the total cholesterol (TC), LDL-cholesterol and increase the HDL-cholesterol thus providing beneficial effect on lipid profile in hyperlipidemic patient.[21]

In conclusion, this study showed the short-term (90 day) effect of garlic oral supplementation in lipid profile of patient. Garlic (250mg) thus lowers serum cholesterol, triglyceride, LDL-Cholesterol and VLDL-Cholesterol level whereas it increases HDL-Cholesterol significantly.

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