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Research Article

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Effects of Phyto Antioxidants on the course of Coronary Artery disease

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ABSTRACT

Coronary artery disease is a major cause of mortality in modern times. Lifestyle changes due to urbanization have predisposed to atherosclerosis which is the basic lesion in CAD. Antioxidants can affect progression and regression of atherosclerosis by scavenging free radicals. This study has attempted to unravel the effects of plant antioxidants on the course of CAD. For the purpose of this study the antioxidants used were flavonoids derived from Terminalia plant. One hundred known patients of heart disease were taken out of which 80 were given antioxidants regularly. Twenty patients served as controls. At the end of nine months of follow up, all the patients were evaluated for laboratory findings which included S. Cholesterol, S. Triglycerides, S. HDL-C and S. LDL-C. In addition, any improvement or deterioration in dyspnoea, pain chest and total daily nitrate intake was also noted before and after the follow up for both the groups. It was found that the change in the parameters was significant for the experimental group. S. Cholesterol and S. LDL-C decreased while S. HDL-C increased. In addition, improvement in the NYHA class of dyspnoea and pain chest was noted in the patients receiving flavonoids. Thus, it is concluded that flavonoids obtained from Terminalia definitely affect the course of CAD favourably taken as an additional agent.

***Key words**: Coronary artery disease, phyto antioxidants, dyspnoea, Terminalia.*

INTRODUCTION

Coronary artery disease is the cause of 25-30 percent deaths in most industrialized countries. The WHO has drawn attention to the fact that coronary heart disease is our modern 'epidemic' i.e. a disease that affects populations, not an unavoidable attribute of aging. Coronary heart disease may manifest itself in many presentations:

a) Angina pectoris of effort
b) Myocardial infarction
c) Irregularities of the heart
d) Cardiac failure
e) Sudden death

(Park, 2000)[1]

There is now reason to believe that as well as becoming more severe, under some circumstances, atheromatous plaque may regress. This has been achieved by drugs which lower LDL cholesterol and triglyceride and increase HDL cholesterol. (Souhami Moxham, 1990)[2].

The oxidative modification hypothesis of atherosclerosis predicts that low-density lipoprotein (LDL) oxidation is an early event in atherosclerosis and that oxidized LDL contributes to atherogenesis (Stocker and Keaney Jr. 2004)[3] It seems that the vascular endothelium is particularly sensitive to

oxidative stress, and this is one of the mechanisms that results in widespread endothelial dysfunction in most cardiovascular diseases. Many aspects of endothelial function can be disrupted by oxidative stress, and thus prevention of oxidative stress can protect against or reverse cardiovascular pathologies. (Wadsworth, 2008)[4]

Several flavonoids compounds have been shown to have antioxidant properties in vitro, inhibiting the oxidation of low density lipoproteins and reducing thrombotic tendencies by inhibiting platelet aggregation (Knekt, 1996)[5] . T. Arjuna tree bark contains very high amount of flavonoids: quercetin, kaempferol, luteolin and pellargonidin. The total flavonoids content was estimated as 5.7 $\pm$ 0.5 gm/100g tree bark. It has been found that T. arjuna bark extract decreased total and LDL cholesterol as well as triglycerides and increased HDL cholesterol levels in rabbits in whom hyperlipidemia was experimentally induced. (Pathak et al, 1990)[6]

MATERIALS AND METHODS

The material for the present study comprised of 100 cases of ischemic heart disease in any of its forms (angina of effort, acute coronary insufficiency and myocardial infarction) taken from government hospital OPD and medical wards. The patients were selected on basis of clinical findings, laboratory finding like raised enzyme levels like CPK-MB, SGOT, SGPT levels and ECG findings.

They were divided into experimental group comprising 80 subjects and control group comprising 20 subjects. The experimental group was given a course of Flavonoids twice a day in form of capsule for nine months. These flavonoids extracted from Terminalia arjuna tree bark as alcoholic extract were provided in capsule form by Miracle Herbs.

Each capsule contains: Flavonoids (arjunone, arjunolone, luteolin) = 100mg

The control group was not given any Flavonoids. Both groups continued with conventional treatment during the course of study. At baseline and at the end of study, laboratory investigations were done for following parameters:

1. Total serum cholesterol – enzymatic determination
2. Serum high density lipoprotein cholesterol – sodium phosphotungstate/chloride method.
3. Serum low density lipoprotein cholesterol – Freiedwald method.
4. Serum triglycerides – colorimetric method using Hantzsch reaction.

The study was conducted with approval and under supervision of the Professor and Head of the dept. of Medicine of the government hospital.

RESULTS

The subjects were assessed for the parameters, at baseline and at the end of the study, a period of nine months. Statistical analysis of the data obtained was done. The dropout rate for experimental group was 13.75% and for control group was 10%. Evaluation of statistical significance was done for the baseline and follow up findings of the experimental and the control group respectively and also between the follow up findings of the two groups.

Table I shows the comparison of parameters in the experimental group at the baseline and 9 months after the administration of flavonoids. It is seen that the decrease in S. cholesterol is significant. The increase in HDL-C and S. triglyceride is non- significant. The decline in LDL-C is also significant in this group.

Table I COMPARISON OF PARAMETERS IN EXPERIMENTAL GROUP AT BASELINE AND AFTER 9 MONTHS OF ADMINSTRATION OF FLAVONOIDS

Sr. No.	Parameter	Baseline		9 months follow up		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	220.14	25.81	207.10	25.31	<0.05*
2.	HDL-C	41.84	5.99	43.33	5.83	>0.05
3.	LDL-C	144.19	28.03	128.42	26.78	<0.01*
4.	S. Triglyceride	170.57	36.73	176.76	38.74	>0.05

**significant*

***highly significant*

Table II shows the comparison of parameters in the control group at the baseline and 9 months.

S, cholesterol, S LDL-C, S. triglyceride all show increase while S. HDL- C shows decrease. However, all changes are non-significant.

Table II COMPARISON OF PARAMETERS IN CONTROL GROUP AT BASELINE AND AFTER 9 MONTHS

Sr. No.	Parameter	Baseline		9 months follow up		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	219.99	35.27	231.72	34.21	>0.05
2.	HDL-C	41.03	6.27	39.98	6.04	>0.05
3.	LDL-C	142.92	34.02	152.33	32.57	>0.05
4.	S. Triglyceride	180.20	42.36	197.06	41.32	>0.05

**significant*

***highly significant*

Table III shows the comparison of parameters in the experimental and control groups at nine months follow up.

It is seen that there is a significant decrease in S. cholesterol and S. LDL-C in the experimental group as compared to the control group while a significant increase in HDL-C in the experimental group as compared to the control group is also seen. S. triglyceride shows a decrease in the experimental group as compared to the control group but it is non-significant.

Table III COMPARISON OF PARAMETERS IN EXPERIMENTAL AND CONTROL GROUP AT 9 MONTHS FOLLOW UP

Sr. No.	Parameter	Experimental		Control		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	207.10	25.31	231.72	34.21	<0.01*
2.	HDL-C	43.33	5.83	39.98	6.04	<0.05*
3.	LDL-C	128.42	26.78	152.33	32.57	<0.01*
4.	S. Triglyceride	176.76	38.74	197.06	41.32	>0.05

**significant*

***highly significant*

Table IV shows the comparison of percentage change from baseline to 9 months in experimental and control groups.

When comparing the percentage change in S.cholesterol and LDL-C in the two groups, the decrease in the experimental group as compared to the controls was found to be highly significant. (p value <0.001)

Comparing the percentage change in HDL-C from baseline to 9 months in the experimental and control groups, it is found that it showed highly significant increase for the experimental group as compared to the control group.

In case of S. triglyceride values, the percentage change in both the groups indicated increase from the baseline. However, this increase was significantly more (p value <0.01) in the control group.

Table IV SHOWING COMPARISON OF PERCENTAGE CHANGE FROM BASELINE TO 9 MONTHS IN EXPERIMENTAL AND CONTROL GROUPS

Sr. No.	Parameter	%age change experimental Group		%age change control Group		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	-5.92	3.63	5.67	5.53	<0.001**
2.	HDL-C	3.84	5.35	-2.32	6.98	<0.001**
3.	LDL-C	-11.05	5.84	7.47	9.23	<0.001**
4.	S. Triglyceride	3.79	7.60	9.98	4.71	<0.01*

**significant*

***highly significant*

Table V shows comparison of percentage of patients showing improvements/no change/deterioration in parameters of dyspnoea, pain chest and daily nitrate intake in the experimental and control after nine months of study.

On comparison of percentage of patients in the two groups, it was seen that the number of patients improved with respect to dyspnoea, pain chest and daily nitrate intake was highly significant in the experimental group as compared to the control group.

Table V SHOWING COMPARISON OF %AGE OF PATIENTS SHOWING IMPROVEMENT/NO CHANGE/DETERIORATION IN PARAMETERS OF DYSPNOEA, PAIN CHEST AND DAILY NITRATE INTAKE AFTER NINE MONTHS OF STUDY

	Dyspnoea		Pain chest		Daily nitrate intake	
	Experimental	Control	Experimental	Control	Experimental	Control
%age of patients in the category	88.4	88.8	89.8	88.8	100	100
%age improved*	80.3	12.5	79	18.7	75.3	33.3
% age showing no change	14.7	75.0	12.9	50.0	15.9	44.4
%age showing negative change	4.9	12.5	8.0	31.2	8.6	22.2

*p value <0.001 showed highly significant improvement in the experimental group in the above shown parameters

DISCUSSION

The most common cause of mortality in Western culture is coronary artery disease. It is rapidly assuming epidemic proportions in India also. Early determination of emerging and conventional risk factors is the need of the hour. Genetic and environmental factors lead to atherosclerosis, the underlying lesion in CAD and it is known oxidized LDL are atherogenic. (Hertog et al, 1993)[7] Flavonoids are a large group of polyphenolic antioxidants present naturally in vegetables, fruits and beverages such as tea and wine. They are scavengers of free radicals. In the present study, flavonoids from T. arjuna were used to study their antioxidant, hypolipidemic and antiatherogenic effects. Encouraging results have been obtained. Total S. cholesterol and S, LDL-C decreased significantly. There was found to be a significant increase in S. HDL-C. These results established the hypolipidemic property of the phyto antioxidants obtained from Terminalia arjuna. In addition, improvement in the NYHA class of dyspnoea and pain chest was noted. Decreased requirement of nitrates was also observed.

It has been seen that the 50% v/v ethanol T. arjuna bark extract at the dose of 40mg/kg body weight given in rats substantially reduced the plasma total cholesterol, triglycerides and LDL cholesterol while HDL cholesterol increased in experimental group in comparison with hypercholesterolemic animal group. (Patil, Prakash and Maheshwari, 2011)[8].

Hypolipidemic activity of methanolic extract of Terminalia arjuna leaves in hyperlipidemic rats been observed where serum lipids in general were found to be lowered whereas fecal bile excretion was enhanced in cholesterol and cholic acid fed hyperlipidemic rats.(Reddy, Kumar, Bharavi and Venkateswarlu, 2011)[9]

While studying the effects of T.arjuna in congestive heart failure patients, improvement has been noted in dyspnoea among other parameters. (Dwivedi and Jauhari, 1997)[10]

Also, 50% reduction in angina frequency in all cases of stable angina administered T.arjuna bark extract has been noted. (Dwivedi and Agarwal, 1994)[11]

The effect of T, arjuna therapy in stable angina patients was seen to be the reduction in the number of rescue medication (glyceryl trinitrate) needed for the relief of angina symptoms. (Kumar et al, 1999) [12]

CONCLUSION

Our study has yielded results positive to our expectation. Similar conclusions to the cited references have been reached by our studies. The lipid profile of the group administered the phyto antioxidants improved and they also showed symptomatic improvement. Thus, we are able to say that this study reveals the antiatherogenic and hypolipidemic potential of flavonoids present in T.arjuna bark extract.

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