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Research Article

ROLE OF FLAVONOIDS IN ISCHAEMIC HEART DISEASE AS AN ADJUNCT

Vasudeva Ruchita[1], Sharma Navdeep[2]
[1]Associate Professor, Dept. of Physiology, Dasmesh Institute of Research and Dental Sciences, Faridkot, Punjab, India
[2]Lecturer, Dept. of Physiology, Dasmesh Institute of Research and Dental Sciences, Faridkot, Punjab, India
*Corresponding Author Email: ruchitavasudeva6@hotmail.com
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ABSTRACT
Ischemic heart disease is a leading cause of morbidity and mortality. This work was undertaken with the purpose to study the effect of flavonoids in 80 patients out of a total of 100 confirmed IHD cases taken for the study. Flavonoids were given as an adjunct along with other medication for IHD. 20 patients were not given flavonoids and served as controls. The patients were selected from the wards and O.P.D. of Dept. of Medicine of Guru Nanak Dev Hospital / Government Medical College, Amritsar, India on the basis of clinical, laboratory and electrocardiographic findings. The patients' Total serum cholesterol, S. HDL-C, S. LDL-C and S. Triglyceride were evaluated at the commencement of the study and after six months. Results were recorded and statistically analyzed. It was seen that S. cholesterol showed a definite decrease in the patients taking flavonoids and this decrease was found to be statistically significant (p value < 0.05) Also other parameters showed improvement. S. LDL-C decreased, whereas S. HDL-C increased in the patients taking flavonoids. However, the change in these parameters did not show statistical significance. Cholesterol is a major culprit in oxidative damage to coronary vessel endothelium. Hence it was concluded that this study indicates that flavonoids serve as a useful adjunct in IHD. However, to confirm their positive role in other parameters, a longer follow-up is deemed desirable.
Keywords: Ischaemic heart disease, Flavonoids, *Terminalia*, serum cholesterol

INTRODUCTION

Ischaemic heart disease is the leading cause of death all over the world. It is no longer limited to the advanced countries. In fact, developing countries are poise for twin pronged "epidemics" of communicable and non communicable diseases, especially ischaemic heart disease[1]. Atherosclerosis, which is a reaction to chronic or repeated endothelial cell injury, is the cause of acute coronary syndromes (unstable angina and acute myocardial infarction). Slowing the progression of CAD in its initial stages might be the most effective tool not only to change the natural course of atherosclerotic vascular disease but also to prevent life-threatening complications[2]. Treatments that lower lipoproteins like LDL-C generally have reduced the rate of fatal and non-fatal cardiac events. The free radical oxidation of LDL especially is a matter that needs close examination as oxidized LDL is injurious to both the endothelium and smooth muscle *in vitro* and is found in the lesions of atherosclerosis. Antioxidants such as flavonoids are scavengers of free radicals and prevent oxidative damage. Flavonoids are polyphenolic compounds and a part of human diet. *In vitro* flavonoids inhibit oxidation of LDL. Flavonoids such as arjunone, arjunolone and luteolin are found in Indian cardiotonic plant *Terminalia arjuna.* Its stem, bark and leaves possess glycosides, large quantities of flavonoids, tannins and minerals. Flavonoids have been found to possess antioxidant, anti-inflammatory and lipid lowering effects whereas glycosides are cardiotonic, therefore making *Terminalia arjuna* distinctive amongst currently used medicinal plants[3]. Dietary modification either as a primary treatment or along with other medication has been important in the management of coronary heart disease, the aim being to lower the lipid levels in the body. A 2 % reduction in the incidence of CHD has been reported for every 1 % fall in the serum cholesterol levels[4].

MATERIAL 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 OPD and medical wards of Guru Nanak Dev Hospital / Government Medical College, Amritsar, India. Due permission was taken for the study which was conducted under the supervision of the then H.O.D. The patients were selected on basis of the following criteria:

- Clinical diagnosis of IHD.
- Laboratory findings like high CPK-MB, SGOT, SGPT levels
- ECG changes characteristic of IHD.

These patients were divided into following two groups.
Group I: An experimental group comprising 80 subjects.
Group II: A control group comprising 20 subjects.
The experimental group was given a course of flavonoids 200 mg, twice a day in form of capsule for six 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) = 100 mg. The control group was not given any flavonoids. Both groups continued with conventional pharmacological anti-ischaemic treatment during the course of study. At baseline and at the end of study, laboratory investigations were done for following parameters using the listed methods:

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.

RESULTS

The subjects were assessed for the parameters, at baseline and at the end of the study. Statistical analysis of the data obtained was done. The dropout rate for experimental group was 13.75 % and for control group was 10 %. The comparison of baseline and follow up mean values of the parameters for the experimental group showed decrease in serum cholesterol and serum LDL-C and increase in HDL and triglycerides. However, these changes were not significant (p value > 0.05) as shown in Table 1.

Table 1: Comparison of Parameters in Experimental Group at Baseline and After 6 Months of Administration of Flavonoids

S. No.	Parameter	Baseline		6 months follow up		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	220.14	25.81	213.03	25.69	> 0.05
2.	HDL-C	41.84	5.99	42.63	5.80	> 0.05
3.	LDL-C	144.19	28.03	135.55	27.63	> 0.05
4.	S. Triglyceride	170.57	36.73	174.23	37.55	> 0.05

The comparison of mean values of the parameters for the control group at baseline and at follow up also showed no significant increase or decrease as shown in Table 2

Table 2: Comparison of Parameters in Control Group at Baseline and After 6 Months

S. No.	Parameter	Baseline		6 months follow up		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	219.99	35.27	228.22	30.83	> 0.05
2.	HDL-C	41.03	6.27	40.29	6.19	> 0.05
3.	LDL-C	142.92	34.02	149.60	29.25	> 0.05
4.	S. Triglyceride	180.20	42.36	191.67	40.82	> 0.05

At six months follow-up, the mean values of serum cholesterol for the experimental group were significantly decreased ($p<0.05$) when compared with the control group as shown in Table 3.

Table 3: Comparison of Parameters in Experimental and Control Group at 6 Months Follow Up

S. No.	Parameter	Experimental		Control		p-value
		Mean	SD	Mean	SD	
1.	S. Cholesterol	213.03	35.27	228.22	30.83	< 0.05*
2.	HDL-C	42.63	6.27	40.29	6.19	> 0.05
3.	LDL-C	135.55	34.02	149.60	29.25	> 0.05
4.	S. Triglyceride	174.23	42.36	191.67	40.82	> 0.05

*Significant

When compared for the experimental and control group, increase in mean values of serum HDL-C could be seen. However, this increase was non-significant.

When compared for the experimental and control group, decrease in mean values of serum LDL-C could be seen. However, this decrease was also non-significant.

At six months follow up the mean values of serum triglyceride for the experimental group showed decrease when compared with controls. However, this decrease was non-significant.

Thus, only serum cholesterol showed a significant reduction in the experimental group as compared to the control group.

DISCUSSION

In the history of medicine, no other disease has equalled the medical, social, financial and emotional impact of ischemic heart disease. Prematurity and severity are the hallmarks of IHD in Indians. *Terminalia arjuna* when used as cardiotonic has shown a reduction in levels of lipids. The lipid lowering action of the bark powder of *Terminalia arjuna* has been studied in triton and cholesterol fed rats. Serum lipids were found to be lowered by *Terminalia arjuna* (100 mg / kg, b.w.) in triton induced hyperlipaemia.[5] With above facts in mind the present study was proposed and results have been quite encouraging. The role of Flavonoids as an adjunct has been studied through this trail. There was significant reduction in S. cholesterol in the experimental group as compared to controls on six months follow up. In case of the other parameters, LDL-C is reduced and S. triglyceride is increased but these changes are not statistically significant. S. HDL-C is increased but again not significantly. This seems to suggest that a longer follow up / higher concentration of flavonoids is needed to evaluate the results of *Terminalia* in affecting other parameters. The antioxidant and hypocholesterolemic effects of *Terminalia arjuna* bark powder were studied in a randomized placebo-controlled trail[6]. There was significant decrease in S. cholesterol in patients receiving 500 mg *Terminalia arjuna* bark powder daily for 30 days. Our study is in accordance with above mentioned studies.

CONCLUSION

Administration of flavonoids present in *Terminalia arjuna* bark extract led to improvement in serum cholesterol in IHD patients. The results reveal the antiatherogenic and hypolipidaemic potential of flavonoids present in *Terminalia arjuna* tree bark extract.

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