

**STUDY OF EFFECT OF PLANT DERIVED ANTIOXIDANTS FLAVONOIDS IN CAD PATIENTS****\*R. Vasudeva**

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**ABSTRACT**

Developing societies are faced with a hostile cardiovascular environment, leading to an increasing epidemic of cardiovascular disease. This has placed a large socio economic burden on countries like India. The present study attempts to explore the role of plant derived antioxidants in reducing the oxidative stress which is largely the cause of CAD. *Terminalia arjuna* is an ancient cardiovascular drug. Its bark extract has significant inotropic and hypolipidemic properties. CAD patients taken from wards of government hospital were administered the extract along with conventional treatment and the effect on ST segment depression in ECG was noted at baseline and 3 monthly follow-up. Electrocardiographic improvement was seen to be highly significant. These results reveal the antiatherogenic potential of flavonoids present in *Terminalia* bark extract. Antioxidants, coronary artery disease, oxidative stress, *Terminalia arjuna*.

**KEYWORDS:** Antioxidants, coronary artery disease, oxidative stress, *Terminalia arjuna*.**INTRODUCTION**

Cardiovascular disease remains the leading cause of death in the world and approximately 80% of all cardiovascular-related deaths occur in LIMIC (low income and middle income countries) and at a younger age in comparison to high-income countries. Developing societies are faced with a hostile cardiovascular environment, characterized by changes in diet, exercise, the effects of tobacco, socioeconomic stressors and economic constraints at both the national and personal level in addition to exposure to potential novel risk factors.<sup>[1]</sup> This epidemic has the potential to place a large social and economic burden on developing countries, where CVD tends to strike those in their prime working years.<sup>[2]</sup> Growing evidence indicates that chronic and acute overproduction of reactive oxygen species (ROS) under pathophysiologic conditions is integral in the development of cardiovascular diseases (CVD).<sup>[3]</sup> Reactive oxygen species (ROS) formation and signaling are of major importance and regulate a number of processes in physiological conditions.<sup>[4]</sup> Usefulness and antioxidant vitamins in cardiovascular disease has been studied.<sup>[5]</sup> *Terminalia arjuna* is the source of an ancient cardiovascular preparation. Experimental studies have revealed its bark exerting significant inotropic and hypotensive effect, increasing coronary artery flow and protecting myocardium against ischemic damage. It has also been detected to have mild diuretic, antithrombotic, prostaglandin E2 enhancing and hypolipidaemic activity.<sup>[6]</sup> The crude bark of *Terminalia arjuna* augments endogenous antioxidant compounds of rat

heart and also prevents oxidative stress associated with IRI of the heart.<sup>[7]</sup>

**MATERIALS AND METHODS**

The present study comprised of 100 known cases of CAD in any of its forms (angina of effort, acute coronary insufficiency and myocardial infarction) taken from medical wards of government hospital, in the age group of 32 to 80 years including both males and females. They were selected on the basis of following criteria:

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

They were divided into following two groups.

Group I: an experimental group comprising 80 subjects.

Group II: a control group comprising 20 subjects.

Group I patients were given antioxidants extracted from *Terminalia arjuna* bark as alcoholic extract and provided in capsule form by Miracle Herbs.

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

The subjects continued with conventional pharmacological treatment for CAD during course of the study.

At baseline, at the end of three months, six months and the end of study, i.e. nine months, ECG changes, i.e. ST

segment depression and no. of leads showing ST segment depression using 12-lead cardiart 108T/MK-VI, BPL.

Statistical analysis was done using paired 't' test and p value was determined. The mean, standard deviation and p value of the parameters were tabulated. It was observed whether the change in parameters was significant or not.

## RESULTS

The subjects were assessed for the parameters at baseline and at the end of study that is nine months follow up. Statistical analysis of data obtained was done. The dropout rate for experimental group was 13.75% and for the control group was 10%.

Maximum ST segment change as well as the number of leads showing the change in ECG was noted as shown in Tables 1, 2 and 3.

At nine months, highly significant decrease was seen in ST segment depression as well as no. of leads showing depression in the experimental group (Table 1)

The changes in control group were not significant. (Table 2).

At 9 months when the values for the two groups were compared, the decrease in the values for the experimental group was found to be significant ( $p < 0.05$ ) (Table 3)

**TABLE 1: COMPARISON OF ECG CHANGES IN EXPERIMENTAL GROUP AT BASELINE AND AFTER 9 MONTHS OF ADMINISTRATION OF FLAVONOIDS**

Parameter	Baseline		9 months follow-up		p-value
	Mean	SD	Mean	SD	
ECG Maximum ST segment change	-2.21	0.89	-1.12	1.12	<0.001 **
No. of leads showing ST change	4.81	1.92	3.10	2.60	<0.001 **

\*Significant

\*\*Highly significant

Table 1 shows the comparison of parameters in experimental group at the baseline and at nine months after the administration of flavonoids.

**TABLE 2: COMPARISON OF ECG CHANGES IN CONTROL GROUP AT BASELINE AND AFTER 9 MONTHS**

Parameter	Baseline		9 months follow-up		p-value
	Mean	SD	Mean	SD	
ECG Maximum ST segment change	-1.97	0.75	-1.84	1.02	> 0.05
No. of leads showing ST change	5.00	1.97	4.72	2.35	>0.05

\*Significant

\*\*Highly significant

Table 2 shows the comparison of parameters in control group at the baseline and at nine months follow up.

**TABLE 3: COMPARISON OF ECG CHANGES IN EXPERIMENTAL AND CONTROL GROUP AFTER 9 MONTHS FOLLOW UP**

Parameter	Experimental		Control		p-value
	Mean	SD	Mean	SD	
ECG Maximum ST segment change	-1.12	1.12	-1.84	1.02	<0.05*
No. of leads showing ST change	3.10	2.60	4.72	2.35	<0.05*

\*Significant

\*\*Highly significant

Table 3 shows the comparison of parameters in experimental group and control group at nine months follow up.

## DISCUSSION

Coronary artery disease is rapidly assuming epidemic proportions among Indians. Early determination of emerging and conventional risk factors is the need of the hour. Adjunct therapy by antioxidants is of value. In the present study, flavonoids from T. arjuna were used to

study their antioxidant and antiatherogenic effects. Electrocardiographic improvement was seen to be highly significant. Bharani et al noted significant improvement in maximal ST depression among other treadmill exercise parameters in angina patients given T. arjuna bark extract.<sup>[8]</sup>

Cardioprotective effect of the alcoholic extract of *Terminalia arjuna* bark in an in vivo model of myocardial ischemic reperfusion injury was demonstrated by Karthikeyan et al.<sup>[9]</sup>

## CONCLUSION

Administration of flavonoids present in *Terminalia arjuna* bark extract led to highly significant improvement in ECG of CAD patients and hence better prognosis.

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