



*Original Research Article*

## **Study of Antioxidant and Lipid Peroxidation Status in Cardiovascular Diseases**

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### **ABSTRACT**

The present study was undertaken to elucidate peroxidation and protective antioxidant mechanism in cases of cardiovascular diseases. 50 clinically diagnosed cases of cardiovascular diseases (Age group 40-80) irrespective of gender of the rural areas admitted in S.R.T.R. Medical College and Hospital, Ambajogai Result were matched with normal control with same age group irrespective of sex. Malondialdehyde is an index of lipid peroxidation done by Baker and Frank method and antioxidant like vitamin E by dipyrindyl method. Serum MDA level was found to be increased in all cardiovascular patients in comparison with controls. Vitamin E levels were found to be highly significantly decreased in cardiovascular patients. Results revealed that increased tendency of peroxidation of PUFA resulting from reduction in antioxidant availability might favors thrombosis. Depleted vitamin E adversely affects myocardium.

**Key words:** Cardiovascular Disease, Antioxidants, Vitamin E

### **INTRODUCTION**

Nature provided free radicals as a weapon of aggression against invading microbes. Free radicals have been implicated in tissue injury in a variety of diseases. The recognition of organic free

radicals, which might be involved in living system<sup>[1]</sup>

The hepatotoxicity of carbon tetrachloride was the consequences of a free radical reaction that the ideas of free radicals mediated process forming a significant class of reaction in the generation of tissue injury

gained a place in the purview of biochemical pathology.

The most important reaction in free radical biochemistry in aerobic cells are due to oxygen and its derivatives, (superoxide and hydroxyl radical) hydrogen and transition metals. Reactive free radicals formed within cells can oxidize biomolecules and lead to death and tissue injury. [2] Lipid peroxidation can result in membrane disorganization by peroxidation mainly the polyunsaturated fatty acid and also changes in composition. Such changes and lipid peroxidation itself are associated with decrease in membrane fluidity. In human body a large number of free radicals can be formed which can damage various system like cardiovascular, respiratory gastrointestinal, renal and other. In myocardial infarction injury oxygen free radicals play a major role in the pathogenesis of reperfusion injury. [3]

The oxygen free radicals in the reoxygenation phase of injury include the findings of accumulation of lipid peroxidation product. [4] The extent of injury sustained by heart after such a partial reversible ischaemic insult is in part related to damage caused by free radicals particularly at the time of reperfusion. [5]

Among the dietary antioxidant, vitamin E is lipid soluble antioxidant responsible for protective the polyunsaturated fatty acids in membranes against lipid peroxidation. [6] Vitamin E by donating hydrogen atom, has the ability to inhibit generation of free radicals and thereby protect polyunsaturated fatty acids from peroxidation in the membrane and prevent further oxidative damage including lipid peroxidation. [7,8]

Free radical developed widely in mammalian cells but they are precisely controlled by several antioxidant protective mechanism. [9] The antioxidant as hypothesized to help prevent atherosclerosis

by blocking the oxidative modification of low density lipoprotein. [10] The antioxidant may protect against lipoprotein oxidation and in that way inhibit atherosclerosis and its clinical sequelae. [11]

## **MATERIAL AND METHODS**

The present case control study was designed the level of MDA and antioxidant vitamin E. the study was carried out in the department of biochemistry, Swami Ramanand Teerth Rural Medical College Ambajogai. The study group consists of 50 patients with clinical diagnosed as cardiovascular disease and 50 age, sex matched normal healthy controls. The patients were recruited from department of medicine Swami Ramanand Teerth Rural Medical College Ambajogai, between the age group 40-80 years. The patients were diagnosed by the department of medicine on the basis ECG finding show left ventricular failure, depression or elevation of ST segment with or without inversion of T wave, chest X ray look for cardiomegaly heart failure and rib notching in coarctaion, and idea about cardiac enlargement, coronary arteriography, severe chest pain, breathlessness, hyperlipidemia, hypercholestrolemiaetc and severity was confirmed by measuring serum aspartate aminotransferase, creatine kinase(CK) Lactate dehydrogenase level. And the patients having other causes of hypertensive vascular disease myocardial infarction (Past or Present) were excluded from the study.

There were two groups; one was Study group and other Normal Healthy Control.

The blood samples were collected by venipuncture with all asptic precaution in plain bulb and allowed to clot. After one hour serum was separated by centrifugation at 2500 rpm for 5 min. The serum was free from hemolysis and turbidity. All the

analysis of biochemical parameter was performed on the same day. The serum was used for measurement of MDA and index of lipid peroxidation by method Beuge & Aust. Vitamin E was assayed by Baker and Frank as index of antioxidant mechanism in the body. The results were statistically evaluated by using 'Z' test.

## RESULT

In the present study the level of MDA and antioxidant were determined and expressed as Mean±S.D. The mean age of

the Study group was 53.22±7.96 yrs. And that of Control group was 52.92±6.17. There was no significant difference found between mean age of the Study and Control group.

The MDA level was also found to be significantly increased in study group (4.27±0.59 nmol/ml) as compared to the normal healthy controls (2.65±0.39 nmol/ml). Whereas the level antioxidant vitamin E were significantly reduced in study group (0.91±0.25 mg/dl) than the normal healthy control (1.24±0.35 mg/dl). The results are depicted in Table No. 1 and 2:

**Table 1: Level of Serum MDA (nmol/ml) in study group and normal healthy controls.**

Groups	No. of Cases	MDA (nmol/ml)
		(Mean±S.D).
Study Group	50	4.27±0.59*
Controls	50	2.65±0.39

\*p < 0.001 highly significant.

**Table 2 : Level of Vitamin E (mg/dl) in study group and normal healthy controls.**

Groups	No. of Cases	Vitamin E
		(mg/dl) (Mean±S.D).
Study Group	50	0.91±0.25*
Control	50	1.24±0.35

\*p < 0.001 highly significant.

Statistical correlation between MDA & vitamin E level in patient with cardiovascular disease:

Correlation Variable	R value
MDA with Vitamin E	-0.37*

The statistical analysis suggested significant negative correlation between MDA and vitamin E in patients with cardiovascular disease.

## DISCUSSION

Oxygen free radical damage cells by breaking DNA and protein strands and

destroying cell membrane by means of lipid peroxidation. [12]

Study of fifty patients suffering from cardiovascular diseases reveal that a significant rise in serum Malondialdehyde

levels as compared to the controls, but decrease of vitamin E in same patients.

The purpose of present study finds the relation between Malondialdehyde production and alpha tocopherol levels in ischaemic and hypertensive condition. Malondialdehyde, formed by the breakdown of oxidized polyunsaturated fatty acids can be used in clinical studies as marker of the production of free oxygen radical. [13] The increased free radical formation in the body was due to oxidative stress. [14] Severe oxidative stress can cause cell injury and death. One way of imposing oxidative stress is by the action of certain toxins that produce free radicals and deplete antioxidant defense. [15] An unbalanced excess of free oxygen radicals caused by a lack of antioxidants could increase the risk of coronary heart disease in several ways.

The development of atheroma is partly dependent on incorporation of oxidized cholesterol into monocyte and macrophages within the arterial wall there are receptors on monocyte and macrophages which do not recognize native low density lipoproteins(LDL), but do recognize modified and oxidized form of LDL. The susceptibility for oxidation of LDL depend on the stability of the polyunsaturated fatty acids esterified to it, the density of the LDL molecule and antioxidant level. Secondly platelet adhesion, so important change in thrombosis more likely when the antioxidant status is low. [16] Thirdly the arterial endothelium is protected against damage in primates by dietary alpha tocopherol. [17] Fourthly, unopposed free radical attack within the ischaemic myocardium can impair its function and repair.

On the other hand, antioxidants which are present in the body both extracellular and intracellular can protect against oxidative damage to biologic macromolecules. Alpha tocopherol plays an important role in preventing atherogenic

modification of low density lipoprotein. [18, 19]

In the present study lipid peroxidation was determined in terms of MDA which was significantly higher in the study group than the normal healthy controls. We also estimated serum vitamin E levels, which were found significantly decreased in the study group than the normal healthy controls.

Above study showed that there was an inverse correlation between Malondialdehyde levels and vitamin E levels of the patients suffering from cardiovascular disease. MDA levels were significantly increased, where as Alpha Tocopherol levels were decreased as compared to the controls. Thus it can be suggested that decrease serum alpha tocopherol levels is an indicator of defective antioxidant mechanism in patients suffering from cardiovascular diseases.

The similar result were found by Meir J. Stampfer et al [20] who studied that a risk of major coronary disease among women who took vitamin E supplement was about 40 percent lower than the risk in women who did not take these supplement.

From above discussion inference can be made that there is a definite increase in lipid peroxides due to the reactive oxygen species formation during ischaemia. On the other hand defective antioxidant defense mechanism caused by free radicals may cause decrease in serum alpha tocopherol level in various cardiovascular diseases.

## CONCLUSION

In the present study, clinically diagnosed fifty cases of cardiovascular disorders including cases of hypertension, angina pectoris and myocardial infarction were compare with 50 normal healthy control subjects. The result indicate a significant rise MDA levels indicating

increases in lipid peroxidation while serum vitamin E levels showed a significant fall indicating a defective antioxidant mechanism in the various cardiovascular diseases as compared to the controls.

The myocardium may also be adversely affected after period of ischemia if concentration of vitamin E is low. Lipid peroxidation can become autocatalytic, but the chain reaction can be prevented by the action of vitamin E. The incidence of coronary heart disease may benefit from eating diet rich in natural antioxidant particularly vitamin E.

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