

# Study of Oxidative Stress in Patients with Hypertension

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## Research Article

**Abstract:** **Background:** Hypertension is correlated with the incidence of atherosclerosis. Hence, present work was undertaken to investigate the association of Blood pressure and lipid peroxidation in hypertensive patients. **Objective:** To study the levels of serum MDA as a marker of oxidative stress in patients of hypertension. **Methods:** In this cross sectional study 30 normotensive and 30 hypertensive subjects were included. The potential participants were subjected to selection protocol consisting of clinical history, physical examination and appropriate test. All subjects underwent blood pressure measurement and markers of oxidative stress were estimated in serum. **Results:** There was a significant increase ( $p=0.0001$ ) in the SBP, DBP in Nonhypertensive Controls. The MDA level was significantly increased ( $p=0.05$ ) in hypertensive patients. **Conclusion:** Present study showed strong association of oxidative stress with high blood pressure and there was positive correlation between marker of oxidative stress and systolic and diastolic blood pressure.

**Keywords:** Oxidative Stress, Hypertension.

## Introduction

Hypertension is an important worldwide public health challenge because it is one of the most common chronic conditions. It is a major risk factor for cardiovascular disease and it remains an important cause of coronary heart disease, cerebrovascular disease, peripheral artery disease and heart failure<sup>1</sup>. Increased vascular oxidative stress could be involved in the pathogenesis of hypertension<sup>2,3</sup>, a major risk factor for cardiovascular disease mortality. Oxidative stress occurs when there is an imbalance between the generation of reactive oxygen species (ROS) and the antioxidant defense systems so that the latter become overwhelmed<sup>4</sup>. Hypertension is associated with increased vascular oxidative stress; however, there is still a debate whether oxidative stress is a cause or a result of hypertension. Animal studies have generally supported the hypothesis that, increased blood pressure is associated with increased oxidative stress; however, human studies have been inconsistent. Oxidative stress promotes vascular smooth muscle cell proliferation and hypertrophy and collagen deposition, leading to thickening of the vascular media and

narrowing of the vascular lumen. In addition, increased oxidative stress may damage the endothelium and impair the endothelium-dependent vascular relaxation and increases vascular contractile activity. All these effects on the vasculature may explain how increased oxidative stress can cause endothelial dysfunction. Treatment with antioxidant supplements have failed to show any consistent benefit<sup>5</sup>. This study aimed to measure the MDA levels as a marker of oxidative stress in hypertensive patients.

## Material and Methods

The study was carried out in Department of Biochemistry in MGM Medical College and Hospital Aurangabad. The Protocol of the study was submitted to the institutional Ethical Committee and Permission for study was obtained.

### Study groups

30 patients of hypertension between (age group 20-60 years), referred by various hospitals to the MGM Medical College, Aurangabad. 30 normal individuals (age and sex matched) belonging to the same socioeconomic status will be selected as control.

### Exclusion criteria

Following patients will be excluded from the study: patients with STDs, patients with cardiac diseases, patients with renal diseases, patients with hepatic diseases, patients with myocardial infarction, patients with gout and arthritis

### Blood sampling

The blood samples (3-5ml fresh blood) will be drawn and collected in a clean, disposable plastic tube from anterior cubital vein under aseptic condition for MDA assay.

### Determination of serum Malondialdehyde concentration

MDA levels will be measured as per thiobarbituric Acid (TBA) method described by Nourooz-Zadeh *et al* (1995)<sup>8</sup>.

### Statistical analysis

The results obtained will be statistically analysed using student t-test and one way ANOVA.

## Results

On the basis of blood pressure levels following groups were made according to JNC-VII classification<sup>9</sup> as shown in table.1. Data obtained in our study revealed that, the MDA level was significantly increased ( $p < 0.05$ ) in hypertensive patients as compared to Nonhypertensive Controls. Clinical characteristics and serum level of markers of oxidative stress in normotensive and hypertensive groups are shown in Table-2. MDA level was significantly increased in hypertensive group when compared with normotensive group as shown in table 2.

**Table 1:** Groups of cases and control on the basis of blood pressure (mm hg)

Group	Systolic blood pressure (mm hg)	Diastolic blood pressure (mm hg)
Normotensive (control)	<120	<80
Hypertensive (cases)	$\geq 140$	$\geq 90$

**Table 2:** Clinical characteristics and serum level of marker of oxidative stress in Normotensive and Hypertensive group

	Normotensive (N=30)	Hypertensive (N=30)
Age(year)	39.72 $\pm$ 9.04	51.04 $\pm$ 3.27
Male	16	20
Female	14	10
Height (cm)	155.72 $\pm$ 6.23	158.44 $\pm$ 6.11
Weight (kg)	60.04 $\pm$ 8.28	64.56 $\pm$ 6.10
bmi (kg/m <sup>2</sup> )	22.35 $\pm$ 2.73	23.58 $\pm$ 1.61
Systolic BP (mm hg)	112.32 $\pm$ 2.38	156.32 $\pm$ 10.81
Diastolic BP (mm hg)	74.04 $\pm$ 2.12	104.20 $\pm$ 9.86
MDA (nmol/ml)	1.22 $\pm$ 0.02	1.36 $\pm$ 0.09*

Data presented are mean $\pm$ SD. \* $p < 0.05$  is statistically significant

## Discussion

Nwanjo, H. U. *et al.* 2007, observed that there was significantly higher level of plasma lipid peroxides in hypertensive patients when compared with control groups<sup>6</sup>. Aymelek *et al.*, 2012, observed that there was increased MDA levels both in dipper and non-dipper hypertensives as compared to normal control groups<sup>1</sup>. Our study demonstrated increase in MDA level in hypertensive group when compared with normotensive group. Thus oxidative stress promotes vascular smooth cell proliferation and hypertrophy and collagen deposition leading to thickening of vascular media and narrowing of vascular lumen. Oxygen radicals may also induce endothelial permeability with extravasation of plasma protein and macromolecules and recruitment of inflammatory proteins and cells, which could further impair endothelial function and aggravate vascular damage.<sup>12</sup> All these effects on vasculature may explain how oxidative stress can cause hypertension. Ahmad A *et*

*al.* 2013, observed that MDA level was significantly increased in hypertensive group when compared with normotensive group but there was no significant difference in MDA level between prehypertensive and normotensive group. MDA level was significantly increased in hypertensive group as compared to prehypertensive group.<sup>7</sup>

## Conclusion

In conclusion oxidative stress is associated with hypertension; however, it is unclear whether reactive oxygen species initiate the development of hypertension, or if they are a consequence of the vascular damage observed in hypertension. The major limitation of our study was the small sample size. Financial constraints were the main cause of choosing a small sample size. Multi centric studies with larger numbers of subjects are required to extrapolate these results to the general population.

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