| Print ISSN: 2589-7837 | Online ISSN: 2581-3935 | |

International Journal of Medical Science and Diagnosis Research (IJMSDR)

Available Online at www.ijmsdr.com

NLM (National Library of Medicine ID: 101738824)

Volume 4, Issue 9; September: 2020; Page No. 03-05



Original Research Article

A COMPARATIVE STUDY OF MDA LEVEL AS A MARKER OF OXIDATIVE STRESS IN HYPERTENSIVE PATIENTS AND CONTROLS ¹Mahesh Kumar, ²BK Agrawal, ³Arun Mishra, ⁴Bhagwan Singh Meena

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Conflicts of Interest: Nil

Corresponding author: Bhagwan Singh Meena DOI: https://doi.org/10.32553/ijmsdr.v4i9.669

Background: Hypertension is recognized as most common cardiovascular disorder and a leading cause of morbidity and mortality worldwide. There is abnormal lipid peroxidation which suggested that oxidative stress is important in the pathogenesis of hypertension. This study aims at understanding the role of oxidative stress in hypertension.

Aim of the Work: The objective of this study was to determine the malondialdehyde (MDA) in patients with hypertension and healthy controls.

Subjects and Methods: Whole study population included 250 hypertensive cases and 250 controls. All individuals included in the study were submitted to: Complete history and physical examinations to evaluate exclusion criteria. Serum MDA was estimated by method of Jean et al using trichloroacetic acid and thiobarbituric acid. Mean and standard deviation were calculated for serum MDA. Statistical analysis was done using SPSS no. 20 and Microsoft excel.

Result: There was statistically higher significant increase (p value <0.001) in MDA in hypertensive cases comparison to control groups.

Conclusion: The role of oxidation mediated tissue damage in generation of hypertension in human. Oxidative stress leads hypertension and other disease like atherosclerosis and cardiovascular diseases.

Keywords: Malondialdehyde (MDA), Oxidative stress, Hypertension.

Introduction:

Hypertension is a modern day's epidemic, an increasingly important medical and health issue worldwide. Effects of hypertension are widespread and no organ spared^{1,2}. Hypertension has been recognized as the most common cardiovascular disorder and a leading cause of morbidity and mortality in both developed and developing countries³. Numerous researchers have shown that elevated BP is related lower life expectancy at every age and in both sexes. So, a stringent public health effort is the remedial for the detection, control and prevention of complications of hypertension^{1,4}.

On the basis prevalence according by the World Health Organization report states that considering of any disease, hypertension ranks fourth in the world⁵. New reports refer that nearly 1 billion adults had hypertension in 2000 and this range increase to 1.56 billion through 2025⁶. Hypertension is sharply promoting and leading cause factors of death and disability in developing countries. The heart diseases, stroke and renal problems have caused through hypertension. These pathologies are associated with vascular, functional and structure changes including endothelial dysfunction, altered contractility remodelling. Central to these phenomena is oxidative stress^{7,8}.

Oxidative stress describes the damage that occurs when reactive oxygen species (ROS) overwhelm the antioxidant defenses of the host. Oxidative stress promotes thickening and narrowing of the vascular lumen. Oxidative stress also damage to endothelium and may be impair endothelium dependent vascular relaxation and increases vascular contractile activity. All effects of the vasculature can explain how increase oxidative stress is cause hypertension⁹. Malondialdehyde (MDA) is an aldehyde considered to be the terminal compound and the most important marker for monitoring lipid peroxidation and oxidative damage induced by ROS which is strongly associated with development of serious disease¹⁰.

Aim of the work:

The study was estimated of MDA in hypertensive patients and healthy controls.

Subject and methods:

The present study was carried out 250 persons afflicted with hypertension, and equal number of age and sex matched healthy controls were attending the outpatient department (OPD) of medicine department of Index Medical College and research center, Indore. The study was commenced after obtaining clearance from Institutional Human Ethical Committee. All cases were selected by simple random selection (SRS). Hypertension cases were between the age 20-60 years irrespective of gender and all controls were selected from the neighborhood of cases.

Exclusion Criteria: chronic smoking, Obesity, Diabetes mellitus, Dyslipidemia, Gout, Pregnancy, Recent history of infectious disease. All patients and controls well subjected to the following: Complete history and physical exam to evaluate exclusion criteria. MDA was estimated by method of Jean et al using trichloroacetic acid and thiobarbituric acid¹¹.

Statistical analysis of the results: Data were expressed as Mean \pm SD. For correlation analysis, Pearson's correlation coefficient was calculated. A value of P <0.001 was considered highly significant.

Results:

Statistical analyzes projected that MDA of hypertensive patients found to be significantly increased in Table 1. This was observed that the average (mean \pm standard deviation) MDA concentration was found in the control group was 1.15 \pm 0.26 and in the test group, it was 2.29 \pm 0.38. The vitamin D level was found significantly higher comparison to that in the control group, with a p value of < 0.001.

Table 1: MDA in control group (healthy subjects) and test group (hypertension). All the values are mean ± SD.

	Control group	Test group	P value
MDA (nmol/ml)	1.15±0.26	2.29±0.38	<0.001*

^{*} Highly significant

^{**} Non-significant

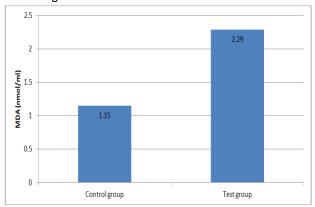


Figure 1: MDA in control group (healthy subjects) and test group (hypertension).

Discussion:

Reactive oxygen species functions as signal transducers in normal physiology, however, their overproduction may result in numerous human health problems. Although the body's own defense mechanism plays a crucial role to control the levels of these free radicals, the levels of antioxidants that counterbalance these oxidative radicals get impaired themselves. The present study was planned to detect lipid peroxidation products, i.e. MDA in hypertension.

In the present study, the lipid peroxidation product like MDA levels has been measured in hypertensive patients. It was found that higher O_2 free radical production, evidenced by increase levels of MDA in hypertensive patients. The present study shows that there is significant difference between hypertensive cases and healthy controls regarding serum MDA (see Table 1).

The finding of increased levels of MDA in this study has been reported ^{12,13,14}. The increased concentration of MDA levels among hypertensive patients could be due to increased oxidative stress in hypertension. There is greater than normal lipid peroxidation and an imbalance in antioxidant status, suggesting that oxidative stress is important in the pathogenesis of hypertension ¹⁴. Rise in MDA could be due to increased generation of ROS due to the excessive oxidative damage generated in the hypertensive patients ¹⁵.

Conclusion:

On the basis of the results of the present study, it may be concluded that hypertension is associated with generation of free radical. Oxidative stress, therefore, has the potential for being used as a marker for hypertension. However, further studies are needed to assess the oxidative stress in hypertension and could have important implications for the management of hypertension.

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