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Original Research Article

Study of Antioxidant Activity Marker and Oxidative Stress Marker in Myocardial Infarction Patients with Admitted to Intensive Care Unit

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Abstract

Introduction: The death or necrosis of myocardial cells characterizes acute myocardial infarction (MI). Myocardial ischemia or acute coronary syndromes are diagnosed toward the end of the spectrum. MI can strike at any age, although it is more common as people get older. The actual incidence of atherosclerosis is determined by preexisting risk factors.

Material Method: The research was conducted department of medicine and Biochemistry. Carefully designed to provide a random sampling of patient samples that accurately reflect the current state of MI. Patients admitted to this hospital provided samples for this study.

Result: Mean level of MDA, peroxynitrite and Vitamin C in study group and control group .a significant higher (0.512±0.025) in serum MDA concentration was observed in MI patient as compared to the control group (0.12±0.4) with $p < 0.001$. The study also shows a significant higher (0.19±0.018) in the concentration of peroxynitrite in serum of MI patient as compared to control group (0.07±0.001) with $P < 0.001$. The result also shows a significant lower (14.2±1.3) in serum of patient with control group (31.09±1.12) with $P < 0.001$.

Conclusion: The importance of assessing serum MDA, peroxynitrite, and vitamin C levels as a diagnostic and predictive tool for myocardial infraction patients is reflected by the imbalance of MDA, peroxynitrite, and vitamin C activity in myocardial infarction patients**.**

Keyword: MDA, Peroxynitrite, Antioxidant Activity, Oxidative Stress

Introduction

Acute myocardial infarction (AMI) is caused by a reduction or full cessation of blood supply to a portion of the heart, resulting in heart muscle destruction. A blood clot in the epicardial artery, which supplies that region of the heart muscle, is the most prevalent cause. It is now widely understood that, depending on how the illness is defined, not all AMI cases necessitate a blood clot. Blood

supply is required to meet the oxygen needs of all living tissues, including heart tissue.[1]

The death rate from AMI is on the rise all around the world, and the risk of death is particularly high in the first few hours after the commencement of the illness. The term "biomarker" refers to a "characteristic that is assessed and analyzed as an indicator of biological processes or pharmacologic reactions to a therapeutic intervention." The identification and study of multiple biomarkers can help improve current diagnostic methods for AMI patients.[2]

Antioxidants are currently being studied for their possible involvement in suppressing atherosclerosis and, as a result, reducing some of the most serious clinical consequences of atherosclerosis, such as myocardial infarction. Antioxidants have been found in a-tocopherol and many carotenoids.[3]

In vivo tissue damage caused by auto-oxidation of oxygen-exposed lipids leads to inflammatory disorders and atherosclerosis. Excessive lipid peroxidation has been linked to the development of several illnesses, including angina and AMI, according to study. This is because lipid peroxidation is a series of events that result in a steady supply of free radicals, allowing each oxidation to continue.[4, 5]

MDA levels are used to determine the extent of polyunsaturated fatty acid degradation. As a result, MDA, a unique end product of lipid peroxidation, is frequently employed as one of the primary indications of oxidative damage in AMI patients' bodies.[6]

MDA determination has been widely used in human studies to demonstrate the role of lipid peroxidation in various diseases. Increased production of malondialdehyde (MDA), one of the main products of endo-peroxidase degradation, is excellent evidence of lipid peroxidation, and MDA determination has been widely used in human studies to demonstrate the role of lipid peroxidation in various diseases. Several investigations have found high levels of serum MDA in persons with heart disease, establishing a relationship between oxidative stress and AMI.[7, 8]

Excessive H2O2 production destroys lipids, proteins, and DNA, leading to necrosis and cell death. The excess production of H_2O_2 damages lipids, proteins, and DNA, causing cell death by necrosis. This inactivation of antioxidants is extremely harmful to CAT-free mitochondria, and excessive production of H2O2 damages lipids, proteins, and DNA, resulting in cell death by necrosis. Heart disease has been linked to oxidative stress in mitochondria.[9]

Nitric oxide (NO) is a free radical that has been associated with neurodegeneration mutations in a number of conditions, Overproduction is linked to diseases like Parkinson's disease, multiple sclerosis, stroke, and other psychiatric problems (e.g., schizophrenia, mania, and anxiety).[10]

Material Method:

The study was carried out in the department of medicine at this medical college and hospital. Carefully designed to provide a random sampling of patient samples that accurately reflect the current state of MI. Patients admitted to this hospital provided samples for this study. Individual participants or close relatives of those who were included in the study gave informed consent after receiving ethical approval from the Institutional Ethics Committee.

Sample size: A total of 200 patients were screened with age ranging from 35 to 75 years. Divided in two group

- Study group: myocardial infarction100 patient
- Control group: healthy subject (no history of heart disease) 100 patients.

Inclusion criteria	Exclusion criteria
Recent AMI patients admitted to the intensive care unit (both genders) with a ST ST at least 2 mm in two or more consecutive sources of electrocardiography were included.	Patients with a previous history of chronic angina or AMI. Family history of heart and cerebrovascular diseases. In thrombolytic treatment, as well as inability to obtain informed consent were not included.

Sample collection:

Blood samples were taken via venipuncture. The blood was quickly transferred to a polystyrene tube, submerged in 37° C for 10 minutes, then centrifuged at 3000 rpm for 10 minutes. The separated serum was kept in the refrigerator for later testing.

Biochemical analysis:

• Serum MDA was measured in the form of thiobarbituric acid (TBA).

• Serum peroxynitrite levels are limited by spectrophotometric method.

• Serum Vitamin C level was photometrically determined in the form of 2,4-dinitrophenyl hydrazine.

Statistical Analysis:

The information is presented as a mean (standard deviation). SPSS version 17.0 for Windows was used to conduct the statistical analysis (SPSS Inc, Chicago). The mean and standard deviation were calculated. Because the probability value was less than 0.05 ($p<0.05$), it was considered statistically significant.

Result:

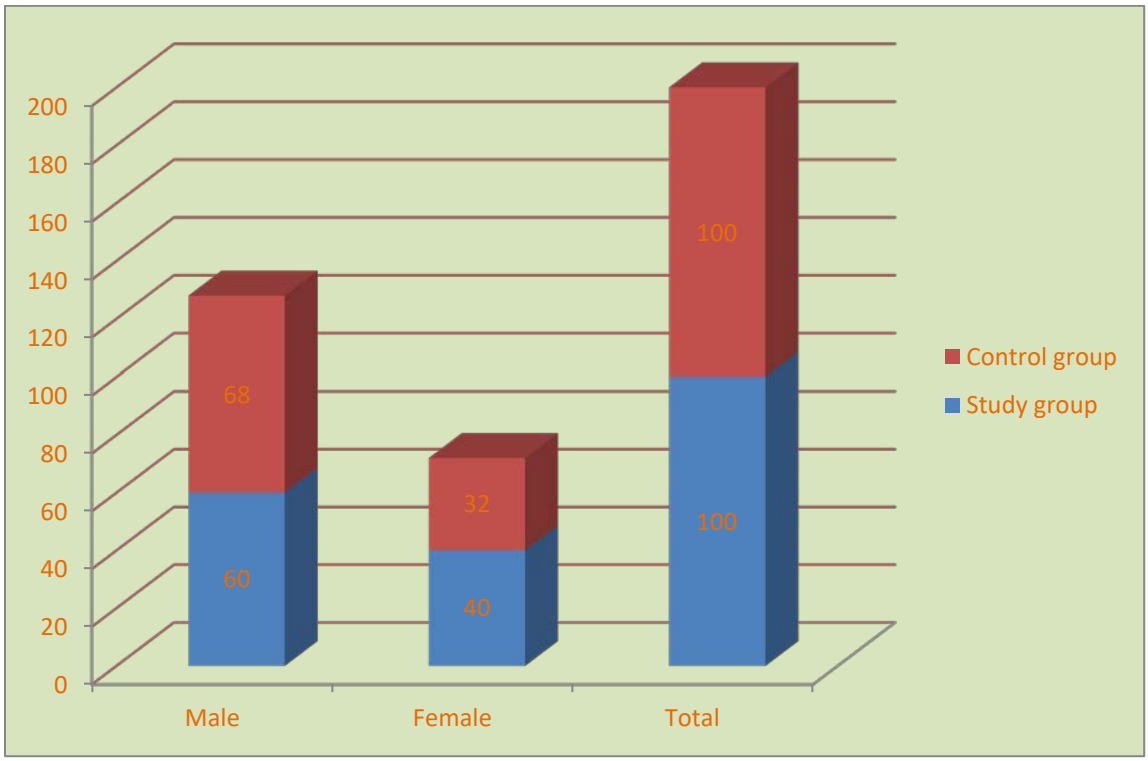

Figure 1: Gender wise comparison study group and control group.

Graph no 01 show the sex wise comparison in study group 60 male patients and 40 female patients. Control group 68 male patients and 32 female patients, total 200 subjects.

Table no 01: mean level of MDA, peroxynitrite and vitamin C in serum of patient with myocardial infarction and control group.

PARAMETER	STUDY GROUP (MI patient) MEAN±SD	Control group MEAN±SD	P- value
MDA(µmol/L)	0.512±0.025	0.12±0.4	P <0.0001
PEROXYNITRITE (µmol/L)	0.19±0.018	0.07±0.001	P <0.0001
VITAMIN C (µmol/L)	14.2±1.3	31.09±1.12	P <0.0001

Table no 01 Mean level of MDA, peroxynitrite and Vitamin C in study group and control group .a significant higher (0.512±0.025) in serum MDA concentration was observed in MI patient as compared to the control group (0.12±0.4)with p < 0.001. The study also shows a significant higher (0.19±0.018) in the concentration of peroxynitrite in serum of MI patient as compared to control group (0.07±0.001) with P < 0.001. The result also shows a significant lower (14.2±1.3) in serum of patient with control group (31.09±1.12) with P < 0.001.

Discussion

Atherosclerosis is the most common cause of MI. Atherosclerosis is a chronic inflammatory disorder that progresses to an acute clinical event such as a heart attack. As a result, inflammation plays a key role in atherosclerosis, despite the fact that inflammation can linger for decades before causing clinical symptoms. Free radicals complicate the biology of tissue injury and inflammation. As a result, antioxidants are important in decreasing inflammation and tissue damage produced by free radicals. [11]

Our study Mean level of MDA, peroxynitrite and Vitamin C in study group and control group .a significant higher (0.512±0.025) in serum MDA concentration was observed in MI patient as compared to the control group (0.12±0.4)with p < 0.001. The study also shows a significant higher (0.19±0.018) in the concentration of peroxynitrite in serum of MI patient as compared to control group (0.07±0.001) with P < 0.001. The result also shows a significant lower (14.2±1.3) in serum of patient with control group (31.09±1.12) with P < 0.001.

MDA levels are used to determine how much damage polyunsaturated fatty acids have suffered. As a result, MDA, which is a distinctive end product of lipid peroxidation, is frequently utilized as one of the key indicators of oxidative damage in AMI patients' bodies. [12]

A higher level of MDA is linked to a decrease in antioxidants and, as a result, different types of scavengers. [13] Elevated MDA levels in the blood can be a biochemical marker of coronary artery disease and risk of AMI. [14]

Vitamin C is the most powerful antioxidant available to aqueous-phase humans. Antioxidants such as Vitamin C eliminate poisons generated by free radicals in the bodily fluids of AMI patients, which explains the current study's low Vitamin C level. In vitro, vitamin C prevents the oxidation of LDL. Ascorbate is a naturally occurring antioxidant that aids in the conversion of tocopheroxyl radical to tocopherol. Vitamin C is involved in a variety of biological processes, including electron transfer and the breakdown of reactive oxygen species (ROS), as well as the regeneration of Vitamin E from the tocopheroxyl radical. [15-18]

Conclusion:

The importance of assessing serum MDA, peroxynitrite, and vitamin C levels as a diagnostic and predictive tool for myocardial infraction patients is reflected by the imbalance of MDA, peroxynitrite, and vitamin C activity in myocardial infarction patients.

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