Evaluation the Role of Malondialdehyde in Myocardial Infarction Patients

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Abstract

Case control study was carried out in Kirkuk city in the intensive care unit in Kirkuk general hospital from Feb 2020 to May 2020. The study included 90 individuals including sixty myocardial infraction patients and thirty healthy individuals to evaluate the level of Malondialdehyde (MDA) in myocardial infraction patients and healthy controls. All patients were aged between (40-80) years, with a negative family history of heart attack. Blood samples were collected from each patients and controls to evaluate the levels of malondialdehyde by using immunofluorescence technique. The study showed no significant differences between myocardial infraction patients and control groups regarding their age, although 33.33% of MI patients belonged to the age group 60-69 year flowed by 28.33% in the age group 50-59 year. The study displayed that the highest mean of MDA was recorded in MI (104.7±13.0 ng/ml) as compared with the control group (66.7± 22.7 ng/ml), The result was significant (P: < 0.05). **The study concluded that,** The study displayed that the MDA levels were elevated significantly in patients group as compared with the control group and MDA is may be an important cardiovascular parameter, which may be followed before and during the disease.

Keywords: *Malondialdehyde; Myocardial infraction; Oxidative stress.*

Introduction

Myocardial infarction (MI) is heart muscle damage that results from interruption of tissue blood flow caused by occlusion of coronary arteries due to thrombus. It potentially causes permanent damage (myocardial tissue death) unless there is prompt intervention to open up the coronary artery either by percutaneous or surgical methods[(1)]. According to the World Health Organization (WHO), 17.9 million people die each year from cardiovascular diseases (CVDs), an estimated 31% of all deaths worldwide. This implies that CVDs are the first cause of death globally with heart attacks and strokes producing 85% of all CVD deaths[(2)]. The most popular form of coronary heart disease is myocardial infarction and is responsible for over 15% of mortality each year[(3)]. Unlike the other type of acute coronary syndrome, unstable angina, a myocardial infarction occurs when there is cell death, diagnosis of MI is dependent on the sensitivity and specificity of the clinical criteria, electrocardiographic findings, imaging studies and biomarkers (such as cardiac troponins)[(4)]. Oxidative stress plays a crucial role in the development of endothelial dysfunction and is a potent modulator of the inflammatory response, cell growth and differentiation, apoptosis and changes in vascular tone[(5)]. Studies have demonstrated that the excessive activation of lipid peroxidation has a key role in the development of many diseases such as angina and MI. This is because the lipid peroxidation is a chain of reactions providing a continuous supply of free radicals that increase further peroxidation[(6,7)]. Malondialdehyde (MDA) is currently considered to the most widely used representative of oxidative lipid damage[(8)]. The best evidence of lipid peroxidation is the increased formation of malondialdehyde (MDA) which is one of the principal breakdown products by the action of endoperoxidase, and hence the determination of MDA has been widely used in human studies to prove the involvement of lipid

peroxidation in various diseases. A number of studies reported the elevated level of serum MDA in heart diseases, indicating a link between oxidative stress and AMI[9,10]. The study aim of this work was to evaluate the level of Malondialdehyde (MDA) in Myocardial infarction patients and healthy controls.

Patients and methods

Case control study was carried out in Kirkuk city, in the intensive care unit in Kirkuk general hospital from Feb 2020 to May 2020. The study included 90 individuals including sixty myocardial infraction patients and thirty healthy individuals to evaluate the level of Malondialdehyde (MDA) in myocardial infraction patients and healthy controls. The information about patients in this study was retrieved from patient's itself. The myocardial infraction patients were diagnosed by Clinical features, Electrocardiographic (ECG) findings, Elevated values of biochemical markers such as (Cardiac troponin). All patients were aged between (40-80) years. The criteria of exclusion include negative family history of heart attack. The results of the patients groups were compared with healthy individuals nearly comparable age and. About five milliliters of blood were collected from the antecubital vein of patients and controls in plain tubes without any anticoagulant at room temperature for 10-15 minutes and allowed to clot. The tube then were centrifuged (3000 rpm) for 15min. The clear serum was pipetted into clear dry Eppendorf's and stored at (-20^{o}C) until used for the various investigations. The level of malondialdehyde, was measured by using immunofluorescence technique.

Results

The study showed no significant differences between AMI patients and control groups regarding their age, although 33.33% of AMI patients belonged to the age group 60-69 year flowed by 28.33% in the age group 50-59 year, Table 1.

Table 1. : Distribution of AMI Patients and Control Group according to Age

Age groups (years)	MI patients (n:60)		Control group (n:30)		P value
	No.	%	No.	%	
40-49	12	20	9	30	
50-59	17	28.33	11	33.33	**0.35**
60-69	20	33.33	5	16.67	
70-80	11	18.34	6	20	
Mean±SD	58.4±10.8		55.4±10.9		0.22

Serum Malondialdehyde (MDA) Level Comparison Between Patients Group and Control Group.

The study displayed that the highest mean of MDA was recorded in MI (104.7±13.0 ng/ml) as compared with the control group (66.7± 22.7 ng/ml). The result was significant (P: < 0.05), as shown in the Table 2. and Figure 1.

Table 2.: Serum Malondialdehyde Level Comparison Between Patients Group and Control Group.

MDA(ng/ml)					
Group	**Mean**	**SD**	**Max**	**Min**	**P value**
AMI Patients Group	104.7	13.0	143.79	83.145	< 0.05
Control Group	66.7	22.7	100.918	18.87	

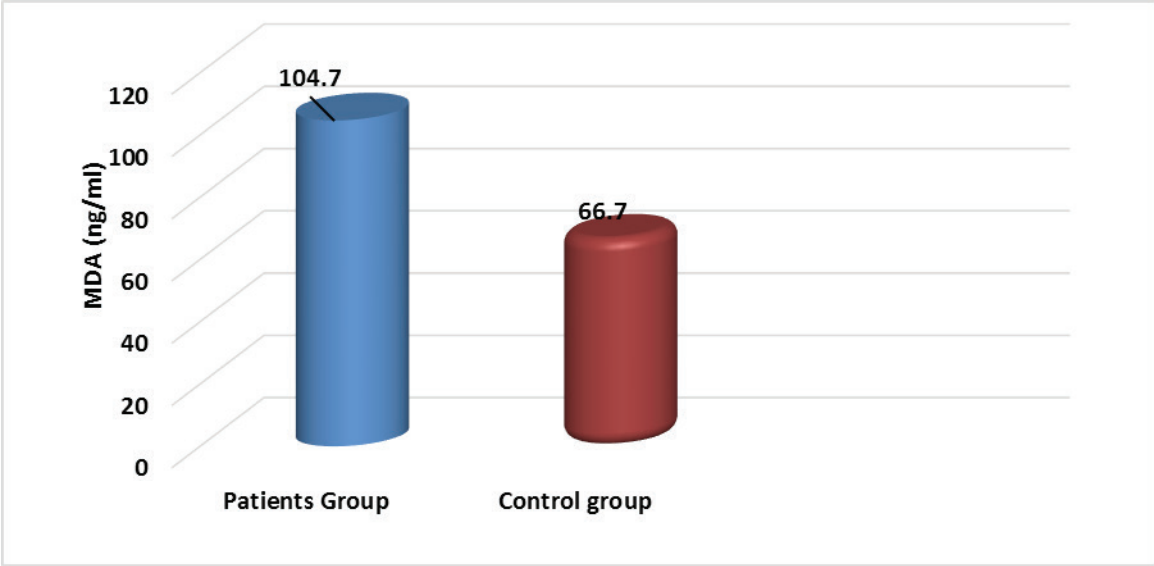

Figure 1. : Serum Malondialdehyde Level Comparison Between Patients Group and Control Group in (ng/ml).

Discussion

The study showed no significant differences between AMI patients and control groups regarding their age, although 33.33% of AMI patients belonged to the age group 60-69 year flowed by 28.33% in the age group 50-59 year. In agreement with these finding, previous research has found that older age is associated with a higher prevalence of AMI presentation[11]. The elderly with acute myocardial infarction (AMI) have been reported to present with more atypical symptoms[12,13]. AMI is associated with significantly higher mortality in the elderly compared with the young, yet the elderly are treated less aggressively than the young[14]. Another study found that, elderly patients, those 65 years of age and older, represent 13% of them yet account for half of hospital admissions for acute myocardial infarction (AMI) and 80% of AMI deaths[15]. Despite the greater risk of AMI among older patients and the increasing size of this population, the relationship between age, clinical presentation and outcome of AMI in elderly patients is incompletely understood. Many prior observational studies and clinical trials have classified elderly patients as a single population, not specifically evaluating differences in older subgroups, particularly those 75 years of age and older[16-17]. In the elderly, numerous disorders often coexist. Ischemic heart disease, hypertension, diabetes mellitus, chronic obstructive pulmonary disease, chronic renal failure, digestive system disorders, as well as, joint and bone disorders occur more often in this group of patients. The coexistence of several diseases may cause the clinical picture of acute coronary syndrome to be uncharacteristic[18,19]. The study displayed that the highest mean of MDA was recorded in MI (104.7±13.0

ng/ml) as compared with the control group (66.7± 22.7 ng/ml). The result was significant (P: < 0.05), as shown in the Table (2.) and Figure (1.). In agreement with this finding, Yin *et al* [11] found that, circulation MDA was significantly increased in patients with acute myocardial infarction as compared with healthy individuals. Majid [12] Showed that, patients with acute myocardial infarction have a significant increase in serum MDA comparing with healthy persons. Additionally, Lopes-Virella *et al* [13] stated that, levels of circulated MDA showed a significant increase in MI patients when compared with normal persons. Several studies also indicated significant increase in MDA levels in AMI patients as compared to controls[14-16]. Another study on 22 AMI patients and 15 controls has found serum MDA levels significantly elevated[20]. While in AMI patients a significant increase in serum MDA was observed in the days following the acute event, reaching a maximum 6-8 days later, when 90% of the patients had values higher than the upper normal limit of the control group[17]. Another study showed that, the levels of thiobarbituric acid reactive substances (TBARS, predictor of MDA) were significantly increased and total antioxidant status was significantly decreased in AMI[18]. Moreover, Bagatini *et al* [19] have demonstrated a significant increase in MDA levels and a decrease in nonenzymatic antioxidants such as vitamin C and vitamin E levels in 40 AMI patients when compared with the same number of normal subjects. The significantly higher level of MDA in patients with unstable angina and myocardial infarction than in the control group were attributed to significantly higher level of serum cholesterol, high blood pressure, smoking and increased BMI in patients[21]. Oxidative stress has been regarded as one of the most important contributors to the progression of atherosclerosis[13]. MDA levels increased following by oxygen free radicals accumulation, which leaded to lipid peroxidation in cell membranes, acute cardiac injury, mitochondrial function impairment and reduced myocardial systolic function, and eventually induced AMI[12,19].

Conclusions

The study displayed that the MDA levels were elevated significantly in patients group as compared with the control group and MDA is may be an important cardiovascular parameter, which may be followed before and during the disease.

Ethical Clearance: None

Source of Funding: Self.

Conflict of Interest: None

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