Some Hematological and Biochemical Changes in A Cute Myocardial Infarction (MI) in Babylon Government

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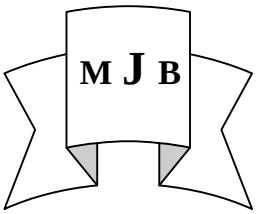

Abstract

This study was carried on thirty five subjects (18 patients, and 17 healthy subjects as controls). Their ages ranged from 40 – 60 years. The patients were diagnosed by specialist physicians by positive troponin I tests, typical chest pain and changes in ECG. This work was performed in coronary care unite (CCU) ward of Marjan Teaching Hospital, during period from March to September 2010. The Age, weight, height, WBC count, differential leukocyte count, ESR, Lipid profile laboratory analysis, Serum total protein, serum albumin, serum globulin, Serum copper, serum zinc and serum potassium ion level were measured in all subjects.

The results of present study revealed that WBC count, ESR, the differential leukocyte count (e.g. neutroplil cells) in patients increased significantly ($P < 0.01$) ($P < 0.05$) ($P < 0.01$) respectively comparison to controls. While, the differential leukocyte count of lymphocyte revealed to decrease significantly ($P < 0.05$) in patients. Serum triglyceride, serum total cholesterol, serum VLDL and LDL increased significantly ($P < 0.05$) ($p < 0.05$) ($P < 0.05$) ($P < 0.05$) respectively, while, serum HDL decreased significantly ($P < 0.01$) in patients comparison to controls. serum globulin, copper and potassium ion showed significant increase ($P < 0. 0.01$) ($P < 0.05$) ($P < 0.01$) respectively in patients comparison to controls. While, serum albumin, and serum zinc revealed significant decrease ($P < 0.05$) ($P < 0.01$) respectively in patients comparison to controls.

ألخلاصه

شملت الدراسة خمسه وثلاثون شخصا (ثمانية عشر مريضا و سبعه عشر شخصا سليما) أعمارهم تراوحت ما بين 40 – 60 سنه. المرضى شخصوا من قبل أطباء اختصاص بواسطة الفحص الايجابي لتحليل التروبونين I ، الم الصدر النموذجي و التغيرات في التخطيط الكهربائي للقلب . أنجز هذا البحث في ردهة الإنعاش في مستشفى مرجان التعليمي خلال الفترة من آذار إلى أيلول 2010.

العمر، الطول ،عدد الكريات البيضاء ونسبها المئوية، سرعة ترسب الخلايا الدموية ، التحليل ألمختبري للصور الدهنية ، البروتينات في مصل الدم ، مستوى الزنك و النحاس و البوتاسيوم في مصل الدم قيست لجميع الأشخاص.

نتائج البحث أشارت إلى زيادة معنوية مقدارها $P < 0.01$ / $P < 0.05$ / $P < 0.01$ على التوالي في عدد الكريات البيضاء وسرعة ترسب الخلايا الحمراء والخلايا البيضاء العدلية على التوالي لدى المرضى مقارنة بالأصحاء. بينما أشارت إلى نقص معنوي مقداره $P < 0.05$ في عدد الكريات البيضاء اللمفية لدى المرضى مقارنة بالأشخاص السليمين. مستوى الكولسترول الكلي، الشحوم الثلاثية، البروتينات الدهنية قليلة الكثافة جدا، والبروتينات الدهنية قليلة الكثافة ازدادت بشكل معنوي مقداره $P < 0.05$ $P < 0.05$ / $P < 0.05$ / $P < 0.05$على التوالي لدى المرضى مقارنة بالأشخاص السليمين. بينما مستوى البروتينات الدهنية عالية الكثافة أظهرت تناقصا معنويا مقدارة ($P < 0.01$). مستوى الكلوبولين ، النحاس و البوتاسيوم اظهر زيادة معنوية مقدارها $P < 0.01$ / $P < 0.05$ / $P < 0. 0.01$ على التوالي لدى المرضى مقارنة بالأشخاص السليمين. بينما مستوى الالبومين و الزنك في مصل الدم اظهر تناقصا هاما مقداره $P < 0.01$ / $P < 0.05$ على التوالي لدى المرضى مقارنة بالأشخاص الأصحاء.

Introduction

Myocardial infarction (MI) is almost always due to the formation of occlusive thrombus at the site of rupture or erosion of an athermanous plaque in a coronary artery. The leucocytosis is usual, reaching peak on the first day. The erythrocyte sedimentation rate (ESR) become raised and may remain so far several days. Echocardiography is a very

useful technique for assessing left and right ventricular function and for detecting complication such as thrombus, cardiac ventricular septal defect, mitral regurgitation and pericardial effusion [**1**].

The chest pain is the most common symptom of acute myocardial infarction and is often described as a sensation of tightness, pressure, or squeezing. Pain radiate most often to the left arm, lower jaw, neck, right arm, back and epigastrium, where it may mimic heart burn. [2] Clinically, a myocardial infarction can be further subclassified into a ST elevation MI (STEMI) versus a non-ST elevation MI (non-STMI) based on ECG changes.[3]

Electrocardiography (ECG) may show acute changes with elevation in the ST segment and T wave inversion. Within 1 or 2 days of infarction deeping of Q wave occurs, ST and T wave change will disappear over time. The Q wave changes remain and can be used to detect a past infarction. Systemic signs of inflammation occur; including fever, increasing leukocytes and increasing erythrocyte sedimentation rate (ESR) begin about 24 hours after infarction and continue for up to 2 weeks [4]. The American College of cardiology and the European Society of Cardiology have redefined MI as a typical rise in cardiac troponin I with at least one of the following: ischemic symptoms, development of pathological Q waves on the ECG, ischemic ECG changes (ST depression or elevation) [1].

The important risk factors are previous cardiovascular disease, older age, tobacco smoking, high blood levels of certain lipids (triglycerides, low-density lipoprotein) and low level of high density lipoprotein (HDL), diabetes, high blood pressure, obesity, chronic kidney disease, heart failure, excessive alcohol consumption, and chronic high stress level. [5][6] Among the diagnostic tests available to detect heart muscle damage are an electrocardiogram (ECG), chest x-ray, and various blood tests. The most often used marker is the troponin levels. [7] Elevated white blood cell count play important role in the vascular injury and atherogenesis, the development of an atherosclerotic plaque rupture, and thrombosis. [8]

The zinc was recognized 46 years ago. Zinc deficiency resulting in growth retardation, hypogonadism, and immune dysfunction.[9] Zinc is typically the second most abundant after iron and it is the only metal which appears in all enzyme classes.[10] There is 2 – 4 gm of zinc distributed through out the human body.[11] Anxiety, stress, anger and other personality factors are implicated in the relationship of psychosocial issues to cardiovascular disease.[12] Smoking is associated with lowered antioxidant status in MI.[13] Low density lipoprotein (LDL) oxidation in the arterial intima plays a pivotal role in an atherogenesis. Under physiological conditions, several mechanisms protect LDL against oxidation, including hydrolysis of oxidation products by high density lipoprotein (HDL) associated enzymes. Some of these protective mechanisms are less effective under acute phase conditions. [14]

Aim of study

To detect the some hematological changes (ESR, WBC count, differential count,) and biochemical changes (lipid profile, serum protein, serum zinc, copper and potassium).

Materials and Methods

Subjects

The present study was conducted at cardiac care unit in Marjan Teaching Hospital / Hilla in cooperation with department of physiology/ Babylon College of Medicine during period from March 2010 to September 2010. The subjects were recruited from inpatient CCU ward. A history and physical examination were obtained and laboratory tests were performed in all subjects. The patients were diagnosed as acute myocardial infarction by positive rapid troponin I test with typical ischemic chest pain and with electrocardiograph evidence of ST segment elevation. The study was conducted on thirty

five subjects (24 men and 11 women). They were divided into two groups. The group 1 included 18 patients, their mean ages were 53 ± 7.3 years (12 men and 6 women). The group 2 includes 17 control subjects (normal individuals) (12 men and 5 women), their mean ages 50 ± 5.6 years. They had no history of obesity, hypertension (HT), diabetes mellitus (DM), cardiac diseases, smoking or alcohol drinking.

Methods

Complete history (history of hypertension, diabetes mellitus, family history, smoking and previous attack of disease), symptoms and signs of disease, site of patients and ECG, echo, and x-ray were obtained. Five milliliter of venous blood was taken from all subjects after 12 – 14 hours for lipid profile, serum proteins, serum zinc, serum copper, serum potassium, WBC count, differential count, and erythrocyte sedimentation rate. The tests were done during first 3 days of attack. Body mass index (BMI) was calculated from weight and height of patients and controls in kilogram/meter2 [**1**5].

WBC count and differential leucocyte count was mentioned in Dacie and Lewis practical hematology [16].

The method of lipid Profile laboratory analysis: After fasting 12 – 14 hours, a venous fresh blood sample of 3 ml obtained, blood was centrifuged and collected serum was investigated for serum cholesterol, serum triglyceride, and serum HDL by direct method [**1**7]. The VLDL and LDL were calculated by use friedewald formula: VLDL = triglyceride/5. Total cholesterol = HDL +LDL +VLDL. [17] Serum total protein and serum albumin were done according method mentioned by Berne and Lovy. [18] Serum copper was done according method mentioned by Ciuti. [19] Serum zinc was done according method mentioned by Tetsuo. [20] Serum potassium was done according method mentioned by Inouye. [21]

Statistical analysis

All data were expressed as mean ± standard error (SE). The differences were assessed by paired student's test. A value of $p < 0.05$ was considered to be statistically significant [22].

Results

Effect of gender: There was no significant difference in data between male and female patients with comparisons. Therefore, the data of both sexes regarding the acute myocardial infarction were polled together and were considered as one group.

A- The history and physical examination:-

Table 1 The site of patients.

Site	Number of Patients	Percentage
Urban	13	70 %
Rural	5	30 %
Total	18	100%

Table 2 The history of patients.

Type of history	Diabetes mellitus	Hypertension	Previous attack	Family history	Smoking
Number	6	5	1	3	12

Table 3 The signs and symptoms of patients.

Symptoms and signs	Pale	Sweating	Fever	Nausea	Vomiting	Syncope
Number	18	13	12	15	11	8

Table 4 The type of parameters of x- ray and echo in patients

Type of parameter	Normal	Abnormal
X-ray	15	3
Echo	9	9

Table 5 The site of MI by ECG changes in patients.

Type of MI	**Inferior MI**	**Anterolateral MI**
Number	11	7

There is no significant difference ($P > 0.05$) between age of patients (53 ± 7.3 years, n = 18) and age of controls (50 ± 5.6 years, n = 17). Also there is no significant difference ($P > 0.05$) between BMI of patients (26 ± 3 kg/m^2, n = 18) and BMI of controls (26.6 ± 2.2 kg/m^2, n = 17). See figure **(6)**.

Table 6 The parameters of age and BMI.

Parameter	**Patient subjects**	**Control subjects**	**Significant**
Age (years)	53 ± 7.3	50 ± 5.6	P > 0.05
Body mass index (Kg/m^2)	26 ± 3	26.6 ± 2.2	P > 0.05

B- The hematological and biological changes:-

The ESR showed significant increase ($P < 0.05$) in patients group comparison to the controls, and serum copper ($P < 0.05$) as well as serum potassium ($P < 0.01$) in patients when compare with healthy controls (table 7). While serum zinc showed decrease significantly ($P < 0.01$) in patients comparison to healthy controls.

Table 7 The measured parameters of the groups under study; serum ESR, serum potassium, serum zinc and serum copper.

Parameter	**Patient subjects**	**Control subjects**	**Significant**
ESR (mm/hr)	31 ± 12.7	21.9 ± 5.3	P < 0.05
Serum potassium (mmol/L)	4.1 ± 0.3	2.7 ± 0.37	P < 0.01
Serum zinc (mmol/L)	86.6 ± 4.8	96 ± 9.6	P < 0.01
Serum copper (mmol/L)	103 ± 8.6	97 ± 5	P < 0.05

The total serum protein recorded no significant difference ($P > 0.05$) between patients and controls (table 8). While there is significant decrease ($P < 0.05$) between serums albumin of patients in comparison with controls. Where as, the serum globulin showed significant increase ($P < 0.01$) in patients as compared with control (table 8).

Table 8 The measured parameters of serum proteins of groups study.

Parameter	**Patient subjects**	**Control subjects**	**Significant**
Serum Total protein (gm/dl)	6.34 ± 0.4	6.4 ± 0.3	P > 0.05
Serum albumin (gm/dl)	3.3 ± 0.4	3.7 ± 0.3	P < 0.05
Serum globulin (gm/dl)	3.3 ± 0.5	2.6 ± 0.2	P < 0.01

The serum of cholesterol, serum triglyceride, VLDL and LDL significant increase ($P < 0.05$) in patients in comparison to controls. While serum HDL recorded significant decreases ($P < 0.01$) in patients in comparison to controls (table 9).

Table 9 The measured parameters of lipid profile of groups study.

Parameter	Patient subjects	Control subjects	Significant
Serum cholesterol (mg/dl)	199 ± 16.6	177.5 ± 30	0.05 P <
Serum triglyceride (mg/dl)	198 ± 89	141.6 ± 20	P < 0.05
Serum HDL (mg/dl)	37 ± 7.7	51.7 ± 5.7	P < 0.01
Serum VLDL (mg/dl)	40 ± 17.7	28.5 ± 5.8	P < 0.05
Serum LDL (mg/dl)	124 ± 21.3	± 29 98.3	P < 0.05

There is significant increase ($P < 0.01$) in serum of WBC count and neutrophil ($P < 0.01$) in patients comparison to controls (table 10). Where as the lymphocytes showed significant decrease ($P < 0.05$) in patients when compared with controls (table 10).

Table 10 The measured parameters of WBC count and differential count in present study.

Parameter	Patient subjects	Control subjects	Significant
WBC count 10^3cells/cmm	9.5 ± 3.1	6.4 ± 0.3	P < 0.01
Neurophile %	68 % ± 6%	60% ± 1%	P < 0.01
Lymphocyte %	27% ± 5%	32% ± 1%	P < 0.05

Discussion

In this study about 70% of patients lived in urban (table 1) due to life style and chronic stress. The smoking was the most risk factor in history of patients (67%) (table 2). Smoking increases the risk of mortality rate from the effect of coronary heart disease 1.4 to 2.4 fold (even light smoking) and in heavy smoker up to 3.5 fold. [23]. It is not clear how smoking promoter by nicotine, displacement of O2 in the Hb molecule by carbon monoxide, increased platelet adhesion, and raised endothelial permeability, induced by constituents in smoke.[23]

Patients were pale (100%) in table 3 due to stimulation of sympathetic nervous system, 82% of patients complained nausea due to cardiac pain. About 65% of patients had normal x-ray, 35% abnormal, while, half of them had normal echo. About 11 patients had inferior MI, while, seven had anterolateral MI.

Present study showed a significant increase in serum potassium. A little data exist on the relationship between potassium level and infarct size after ST-segment in acute myocardial infarction. In patients with ST elevation MI, higher potassium levels are associated with large infarct size**.** [24] Serum copper showed a significant increase, while serum zinc decreased significantly. Copper increased significantly after the fifth days after the acute myocardial infarction. While zinc decrease significantly to control group from first day with the lowest value being found on the third day after attack. Copper correlate with concentration of both serum protein (albumin and globulin), while zinc bound to albumin only. [25]

This study also showed increase significantly in serum cholesterol, triglyceride, VLDL and LDL in patients comparison to controls, while, HDL decreased significantly. This result was in agreement with other previous studies. [26] [27]

The present study showed that ESR was increase significantly and revealed a significant increase in globulin and decrease

significantly in albumin due to mediate inflammatory response to acute myocardial injury by numerous biochemical mechanisms.[28]

The data of the present study demonstrate that, WBC count and neutrophil increased significantly in patients comparison to controls, while lymphocytes decreased significantly. This study was in agreement with other studies. [29, 30, 31]

Conclusion

1- Smoking is most risk factor; pale and sweating are more common in MI.

2- WBC count, serum k ions, and serum globulin are significantly increased in patients comparison to controls.

3- Serum zinc, and serum HDL, are decrease significantly in patients comparison to controls.

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