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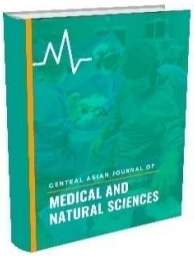

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Evaluating of Some Biochemical and Immunological Parameters in Patients with Myocardial Infarction

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Key words: Acute myocardial infarction; Interleukin-18; Interleukin IL-1α.

Abstract: The aim of the study was to evaluate some biochemical (CRP , Albumin)and immunological parameters in patients with myocardial infarction Myocardial infarction (MI) is a major cause of death and disability worldwide A heart attack, also known as myocardial infarction, occurs when blood flow to a section of the heart is cut off, resulting in the death of heart cells. This usually happens when a coronary artery becomes blocked due to the rupture of a vulnerable plaque made up of cholesterol, fatty acids, and white blood cells.

The study took place in the cardiac resuscitation unit at Al-Zahra Teaching Hospital and Al- Karama Teaching Hospital in Wasit Governorate from November 2022 to January 2023. Its objective was to examine the significance of physiological, immunological indicators, and inflammatory biomarkers for accurately diagnosing, assessing risk, and predicting the future outcomes of patients with acute myocardial infarction.

The study included 100 patients with acute myocardial infarction, including 71 men aged30- 70 years, and 29 women aged 33-75 years. And 50 samples from the control, 28 samples from men and 22 samples from women, and they were divided into three age groups. The first group is 30-45 years old, the second group is 46-60 years old, and the third group is 61-75 years old. Taking into account the risk factors for acute myocardial infarction, which include Sex, age, high blood pressure, diabetes, smoking, and dyslexia. Lipid lipids through a questionnaire.

This study also indicated, significant increase in the value of C-reactive protein and decrease in albumin levels. The current study on the study of interleukins (interleukin 18 and interleukin alpha 1) revealed a significant increase in the concentrations of these interleukins at $p \leq 0.05$.

Conclusions: In patients with AMI, The plasma level of IL-18, IL-1α and CRP is a major independent inflammatory predictor. Also, a decrease in albumin levels is an important indicator in predicting myocardial infarction.

Introduction

Cardiovascular disease is the primary reason for global deaths, with approximately 16.7 million fatalities occurring annually (WHO, 2003). Myocardial infarction, commonly known as a heart attack, is a significant contributor to these deaths and disabilities on a global scale. It happens when the blood flow to a section of the heart is disrupted, causing the death of heart cells. This disruption is usually caused by a blockage in a coronary artery,resulting from the rupture of a vulnerable plaque made up of unstable accumulations of lipids (such as cholesterol and fatty acids) and white blood cells (specifically macrophages) present in the artery wall. (Thygesen and etal,2007).

Blockage results from plaques made of fats and cholesterol. The accumulation of this plaque is known as coronary artery disease. The accumulation of plaque is a process and also can produce chest pain symptom known as angina pectoris. A myocardial infarction occurs when a plaque rupture suddenly and it causes a rapid accumulation of clotting factors at the rupture site which leads a sudden obstruction of blood flow in the coronary artery. Sudden obstructionprevents blood reaching the heart muscle. The heart muscles start to die if there is no vital supply of oxygen-rich blood. The longer the obstruction persists, the greater the amount of heart muscle dies (Eriksson and etal,2010) .

Typical indicators of an Acute MI include pain in the chest, weakness, excessive perspiration, queasiness, throwing up, and irregular heartbeat. Additionally, there is a possibility of losing consciousness and fainting. Acute MI arises when the blood flow to the coronary arteries is unexpectedly obstructed, and it requires immediate attention as it is a severe medical emergency. (Osulal and etal, 2002).

The MI was fully described for the first time by Swedish physician Malmsten and pathologist

J. von Duben. In 1896, the term MI was introduced by a young French physician named Rene Marie. The term MI was described and accepted in the USA in 1912, and in England a few years later. AMI has a high incidence and is the primary cause of death in the elderly. According to the World Health Organization (WHO) in 2011, 14 million people die from AMI every year worldwide

Aim of the study study of some biochemical and immunological parameters and theirrelationship to myocardial infarction.

Material and Methods:

The present work included a case control study for a group of (150) samples: (100) patient samples, (50) control control samples. The study was conducted from care unit at AL-Zahraa teaching hospital and AL-Karama Teaching Hospital from" november 2022 - february 2023", with age ranged between (30 to 75 Year). The study included 100 patients with acute myocardial infarction, including 71 men aged30-70 years, and 29 women aged 33-75 years. And 50 samples from the control, 28 samples from men and 22 samples from women, and they were divided into three age groups.

The first group is 30-45 years old, the second group is 46-60 years old, and the third group is 61-75 years old. Patients presented with chest pain, ECG and Echo findings of myocardial ischemia. Risk factor for MI were evaluated (Age, Sex, HT, DM, Smoking and hyperlipidemia). CRP and and Interleukin 18, Interleukin-1α

Blood sample:

6 ml of venous blood samples were withdrawn in a tube containing gel and clot activator forcheck the level of CRP and and Interleukin 18, Interleukin-1α

Determination of serum CRP, Human IL-18:

The Sandwich-ELISA principle is utilized in this ELISA kit.(Elabscience).

Determination of serum Albumin:

Assay procedure

We take three Test Tubes, put in the first Tube 1000 of blank, and put in the second tube 1000of blank and 10 of standard, and put in the third tube 1000 of blank and 10 of the sample.

1. Add 1000 µL from Reagent to 10 µL from sample.
2. Mix and Incubate for 1 minute at 30 cº.
3. Measure absorbance of standard and sample against the reagent blank

This Test Total protein and Albumin was done by spectrophotometaer method device depending on Colorimetric method by passing of different wavelength and recording absorbing of light by sample, standard and blank then we calculate the result by using this calculation

$$Albumin\ Con.\left(\frac{g}{dl}\right) = \frac{\text{Absorbance of sample}}{\text{Absorbance of standard}}$$

Statistical Analysis

The data were analyzed statistically using SPSS vet.25, and the averages were compared using Chi-square under a probability level of 0.05.

Results and Discussion

Table 1: Explains the Effect of Gender and age Group on the IL-18

Sex	Case	Age	IL-18	p-value
Male	**Patient**	**30-45**	975.77	**0.02**
		46-60	930.67	
		61-75	939.96	
	Control	**30-45**	754.02	
		46-60	802.65	
		61-75	740.33	
Female	**Patient**	**30-45**	965.05	**0.02**
		46-60	878.19	
		61-75	863.75	
	Control	**30-45**	784.73	
		46-60	805.64	
		61-75	753.5	

The results of the statistical analysis in Table 1 showed that there were significant differences between the age groups for males, where the highest rate of IL-18 was recorded for infected people in the age group (30-45), where it was recorded (975.77), compared to control people, where it was recorded (754.02)

The age group (61-75) also recorded the second highest rate, reaching (939.96), compared to control people, which reached (740.33)

While the lowest rate was observed in the age group (46-60) for infected males, where it reached (930.67), compared to control people, where it reached (802.65)

The results of the statistical analysis in Table 3.20 showed that there were significant differences between the age groups for males, where the highest rate of IL-18 was recordedfor infected people in the age group (30-45), where the second highest rate was recorded, reaching (965.05), compared to control people, where it reached (784.73)

The age group (46-60) for infected females was recorded at (878.19) compared to control people, which was recorded at (805.64)

While the lowest rate was observed in the age group (61-75) for infected females, where it reached (863.75) compared to control people(753.5).

Table 2: Explains the Effect of Gender and age Group on the IL-1α

Sex	Case	Age	IL-1α	p-value
Male	**Patient**	**30-45**	67.92	**0.03**
		46-60	66.53	
		61-75	79.61	
	Control	**30-45**	31.66	
		46-60	28.99	
		61-75	14.4	
Female	**Patient**	**30-45**	69.67	**0.02**
		46-60	47.86	
		61-75	33.84	
	Control	**30-45**	15.89	
		46-60	42.03	
		61-75	31.45	

The results of the statistical analysis in Table 2 showed that there were significant differences between the age groups for males, where the highest rate of IL-1α was recorded for infected people in the age group (61-75), where it was recorded (79.61), compared to control people, where it was recorded (14.4)

The age group (30-45) also recorded the second highest rate, reaching (67.92), compared to control people, where it reached (31.66)

While the lowest rate was observed in the age group (46-60) for infected males, where it reached (66.53), compared to control people, where it reached (28.99)

The results of the statistical analysis in Table 3.21 showed that there were significant differences between the age groups for females, where the highest rate of IL-1α was recorded for infected people in the age group (30-45), where it was recorded (69.67), compared to control people, where it was recorded (15.89)

The age group (46-60) also recorded the second highest rate, reaching (47.86), compared to control people, where it reached (42.03)

While the lowest rate was observed in the age group (61-75) for infected females, where it reached (33.84), compared to control people, where it reached (31.45).

Table 3: Explains the Effect of Gender and age Group on the CRP

Sex	Case	Age	CRP	p-value
Male	**Patient**	**30-45**	14.94	**0.03**
		46-60	18.62	
		61-75	21.79	
	Control	**30-45**	3.69	
		46-60	6.86	
		61-75	7.06	
Female	**Patient**	**30-45**	3.69	**0.05**
		46-60	6.86	
		61-75	7.06	
	Control	**30-45**	3.57	
		46-60	5.54	
		61-75	8.80	

The results of the statistical analysis in Table 3 showed that there were significant differences between the age groups for males, where the highest CRP rate was recorded for affected people in the age group (30-45), where it was recorded (14.94), compared to control people, where it was recorded (3.69)

The age group (46-60) also recorded the second highest rate, reaching (18.62), compared to control people, where it reached (6.86)

While the lowest rate was observed in the age group (61-75) for infected males, where it reached (21.79), compared to control people, where it reached (7.06)

The results of the statistical analysis in Table 3.10 also showed that there were significant differences between the age groups for females, where the highest CRP rate was recorded for affected people in the age group (61-75), where it was recorded (7.06), compared to control people, where it was recorded (8.80)

The age group (46-60) also recorded the second highest rate, reaching (6.86), compared to control people, where it reached (5.54)

While the lowest rate was observed in the age group (30-45) for infected females, where it reached (3.69), compared to control people, where it reached (3.57)

Table 4: Explains the Effect of Gender and age Group on the Albumin

Sex	Case	Age	Albumin	p-value
Male	**Patient**	**30-45**	3.68	**0.06**
		46-60	3.59	
		61-75	3.43	
	Control	**30-45**	3.03	
		46-60	3.44	
		61-75	2.70	
Female	**Patient**	**30-45**	3.32	**0.06**
		46-60	3.26	
		61-75	3.40	
	Control	**30-45**	3.25	
		46-60	3.38	
		61-75	3.30	

The results of the statistical analysis in Table 4 showed that there were no significant differences between the age groups for males and between the infected and control people, where the average albumin for the infected people when active was recorded in the category (30-45), where it was recorded (3.68) compared to the control people, where it was recorded (3.03)

The age group (46-60) also recorded (3.59) compared to control people, which reached (3.44) While the lowest rate was observed in the age group (61-75) for infected males, where itreached (3.43), compared to control people, where it reached (2.70)

The results of the statistical analysis in Table 3.18 showed that there were no significant differences between the age groups of females and between infected and control people, where the average albumin for infected people was recorded in the age group (61-75) for infected females, where it reached (3.30), compared to control people, where it was recorded (3.25)

The age group (30-45) also recorded (3.32) compared to control people, which reached (3.25) While the lowest rate was observed for the age group (46-60), where it was recorded (3.26),compared to control people, where it was (3.38)

Discussion

Relationship between C-reactive protein in Acute Myocardial Infarction

The current study on C-reactive protein concentrations showed a significant increase in the concentrations of this protein, which may be due to an association primarily with a more general inflammatory process, perhaps secondary to cigarette smoking(Green and Harari 1995). Or perhaps there is another reason that may be the result of injury and infection, or as aresult of other signs of inflammation, and an increase in acute phase proteins (Das, 1985).

The level of CRP in the circulation is associated with several risk factors for cardiovascular disease, such as obesity, smoking, blood pressure, triglyceride levels, and cholesterol. There may be another reason for the high CRP concentration in response to the presence of infectious agents that may be associated with sclerosis Arteries, (Fagerberg and etal, 1999) CRP is directly involved in atherosclerosis (Rajtar and etal, 2004(.

This study was consistent with what the researchers indicated (Ajeed A; 2016; AL-giraway A.2015), as was another study that matched the current study, which showed that the level of CRP increases in patients suffering from acute myocardial infarction, which is close to plaqueformation. It may develop into heart failure (Kivimaki and Kawachi, 2013).

There was also agreement with the previous study by Zebras et al which showed that CRP levels are higher after AMI and unstable angina. They also showed that CRP was a strong predictor of long-term mortality due to MI, for patients with ACS (Zebras and etal, 2002). In addition to demonstrating the early effect of CRP on MI, the data also suggest that the association between CRP levels and risk of MI may be stronger in middle-aged men (55 yearsof age) than in those who are older (Tracy and etal, 1997(.

Relationship between serum Albumin in Acute Myocardial Infarction

As for the study on (Serum Albumin), the results of this study showed a, no significant decrease in the concentration of (Albumin). This decrease may be attributed to inflammation, as inflammation plays an important role in the occurrence of hypoalbuminemia, and cardiovascular diseases are directly linked to inflammation (Yang and etal, 2016(.

Another reason may also be the association of low albumin with high oxidative stress and consequent damage to the heart muscle (Taverna and etal, 2013). Thus, the higher mortality rate can be explained

by lower antioxidant activity. Meanwhile, albumin is also one of the negative reactants in the acute phase and is inversely associated with inflammation, which is a marker of the effectiveness of the secondary inflammatory response to STEMI (Cirakoglu andetal, 2020(.

This study was consistent with findings in previous studies 4-6, where studies showed that a low level of serum albumin was associated with a higher risk of death resulting from cardiovascular diseases. Another study also showed that a low level of serum albumin is associated with a higher risk of myocardial infarction and deaths from coronary heart disease and stroke. 10-12 Inflammation is linked to the occurrence of cardiovascular diseases and deaths, and serum albumin levels decrease by approximately 20 percent during the inflammatory process(Gabay and etal,1999). Yang et al (2016) showed a strong association between low serum albumin levels and the occurrence of first or recurrent myocardial infarction, after adjusting for traditional risk factors. (Yang and etal, 2016(.

Our finding has been supported by several previous studies. A large population-based study reported that low serum albumin level was strongly associated with the occurrence of myocardial infarction. The Framingham Offspring Study reported that serum albumin was an independent predictor of first myocardial infarction. Some studies have shown that low serum albumin independently predicts incident heart failure (Filippatos and etal, 2011) (Arques and etal, 2011).

Relationship between IL-18 IL-1α in Acute Myocardial Infarction

As for the study on interleukin 18, the significant increase recorded in the results of this study on interleukin 18 may be attributed to damage to the heart muscle and its death, as IL-18 stimulates IFN-ã gene expression in activated T cells and macrophages (Maisel and etal,1998). and also induces programmed cell death. In activated T cells that express Fas. On the other hand, apoptosis is the main form of post-infarction myocardial damage, as the expression of Fas is enhanced in ischemic myocytes. (Kajstura and eral,1996) Therefore, increases in serum IL-18 concentrations may induce myocyte apoptosis, leading to persistent myocardial damage in acute MI.

The results of interleukin 18 concentration were consistent with what the researchers indicated The role of serum levels of IL18 in the CVD risk has been being discussed (Bartekova et al. 2018; Liu et al. 2009). Some researchers reported that increased IL18 concentration is associated with extension of intima-media thickness in the carotid artery (Yamagami et al2005). Moreover, adult men with coronary events were characterized by significantly increased baseline serum blood level of IL18 compared to control donors. Additionally, IL-18 has been found to be independently predictive of future coronary events in both coronary disease and control subjects(Tiret and etal,2005 ; Blankenberg and etal

,2003). Although 1 previous small study dem-onstrated that IL-18 was markedly increased and correlated with myocardial injury in patients following AMI(Seta and etal,2000). There were also other studies that were not identical to this study.the international project MONICA in control middle-aged people reported no connection between the IL18 concentration and CVD risk (Thompson and etal, 2007). The same results were obtained in the recent Mendelian randomization stud, (Yuan and etal, 2020).

there was no association between IL-18 level and the risk of myocardial infarction. Inflammation is an important factor for the development of atherosclerosis, coronary plaques, and plaque rupture(Libby,2014 ;Libby,2012,Libby,2006).

The significant increase in IL-1α concentration recorded in the study may be explained by the fact that after myocardial death, the inflammatory and immune environment may play crucial roles in plaque rupture. It is known that macrophages and T cells are important components ofatherosclerotic lesions, which can generate and release cytokines that play important roles in ACS. Various inflammatory

markers and cytokines are associated with atherosclerosis. A number of pro-inflammatory cytokines, including IL-1, are expressed in human atherosclerotic plaques. These cytokines, alone or in combination, contribute to the local inflammatory response and may have a significant impact on plaque formation and progression (Dubey and etal, 2008).

This study on IL-1α was consistent with previous studies, where patients with AMI show elevated levels of IL-1α in serum, which indicates a systemic inflammatory response (Libby and etal, 2002; Biasucci and etal, 1996(.study also matches another study (Biswas and etal. 2010; Wang and etal. 2004), where the high level of IL-1α concentrations in AMI patients reported a similar increase in these cytokines. IL-1α has a wide range of target cells including cardiac myocytes and vascular smooth muscle cells, suggesting a role for this cytokine in myocarditis (Sharman and Das, 1997(.This current study is identical to another study (Kalfin and etal, 1993), which showed that the concentration of (IL-1α) increased significantly during and after myocardial injury, which showed an increase in levels of (IL-1α) in AMI patients.

In contrast to the present findings, Heinisch etal did not find elevated IL-1α levels, but did observe elevated IL-β in AMI patients (Heinisch and etal, 2005).

Conclusions: In patients with AMI, The plasma level of IL-18, IL-1α and CRP is a major independent inflammatory predictor. Also, a decrease in albumin levels is an important indicator in predicting myocardial infarction

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