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Study the Levels of Galectin-1 in Sera Samples of Patients Undergone to Elective PCI

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Abstract
Background and aims: Coronary Heart Disease is a pathological disorder marked by the deposition of atherosclerotic plaque in the epicardial arteries, whether obstructive or non-obstructive.Percutaeonus Coronary Interventionis a non-operative procedure used to treat stenosis of the coronary arteries of the heart seen in patients with coronary artery disease.In the early stages of Acute Myocardial Infarction (AMI) *in vivo*, cultured cardiomyocytes upregulate and secrete Gal-1 in response to hypoxia and proinflammatory cytokines.The aim of this study is to determine the concentration of galectin-1 in patients undergoing PCI.
Materials and Methods: The current work 90 cases were collected to participate. These cases were divided into two groups, the first included 52 patientswith Myocardial Infection who underwent to elective percutaeonus coronary intervention, while the second involved 38 healthy individuals were enrolled in the present work as a control group.Sandwich-ELISA method was applied to assess human Galectin-1 concentration in the sera samples of patients and control groups.
Results : When the amount of galectin-1 was tested in the sera samples of the study participants, it was found to be higher in the healthy community. When the two research groups were compared together, a highly significant difference ($p<0.05$) was observed.the effect of gender on the levels of serum Gal-1, the statistical Analysis of Variance (ANOVA) was applied to compare the recorded results in the study samples after classification the participants in the two groups according to their gender.The current study showed that there was a significant, statistically significant increase ($p=0.000$) of Gal-1 in sera samples of males undergone to elective PCI compared with healthy males, as well as the same result was observed when comparing the levels of Gal-1 in patient female samples with those in the control group ($p=0.000$) .While there are no statistically significant differences when comparing the two sexes within the group
Key words: Elective PCI, MI, CVD.

Introduction

Coronary Heart Disease (CHD) is a pathological disorder marked by the deposition of atherosclerotic plaque in the epicardial arteries, whether obstructive or non-obstructive. This mechanism can be sped up or slowed down with behavioral changes, pharmacological treatments, and invasive procedures aimed at disease stabilization or regression. A number of clinical presentations arise from the complex nature of the CAD process, which can be easily labeled as either acute coronary syndromes (ACS) or chronic coronary syndromes (CCS)(Neumann *et al*., 2020). In developing countries, CHD is the leading cause of death, associated with stable or unstable angina, myocardial infarction and sudden coronary death. At any age, CHD can affect individuals, but with progressive age, it becomes increasingly more common, tripling in incidence with each decade of life. Males are more likely to be affected than females.CHD typically occurs initially as a heart attack and is

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complicated by heart failure or irregular heartbeat (Li *et al*., 2018). The symptoms of CAD are the result of insufficient heart blood flow caused by coronary artery obstruction (Legarth *et al*., 2020).

Percutaeonus Coronary Intervention(PCI)is a non-operative procedure used to treat stenosis of the coronary arteries of the heart seen in patients with coronary artery disease. The procedure uses coronary catheterization to visualize the blood vessels on X-ray imaging. After accessing the blood stream via the femoral or radial artery, the interventional cardiologist can perform a coronary angioplasty into the obstructed artery by a deflated balloon and inflated to alleviate the narrowing; other devices as stents to hold the blood vessel open.PCI can be adequate for patients with stable coronary artery disease with certain conditions, such as coronary stenosis therapy greater than 70%. The proper use of PCI depends on many factors.While PCI does not prevent drug death or myocardial infarction for these patients, it offers better angina relief.In patients with serious coronary artery disease, such as ST-segment elevation myocardial infarction (STEMI), PCI can minimize deaths, myocardial infarction, and angina when compared with two medications.Medication and/or PCI therapy for patients with non-ST segment elevation myocardial infarction (NSTEMI) or unstable angina depends on the risk assessment of the patient.(amsheeri et al., 2019)

The *LGALS1* gene, which is present on chromosome 22, encodes Galectin-1 (Gal-1), the first and most well-studied prototypical member of the galectin family (q12). It's a 14-kDa non-covalent homodimeric protein with one CRD that preferentially recognizes galactose-1-4-N-acetylglucosamine sequences on N- or O-linked glycans.Gal-1 can be found inside the cell (in the cytoplasm and nucleus), outside the cell, and on the cell surface. Gal-1 is mainly produced by adipose tissue cells, but it is also produced by a number of other cell types. Human/porcine keratinocytes, thymic epithelial cells, fibroblasts, 3T3 cells, T- and B-cells, macrophages, dendritic cells, Langerhans cells, cultured stromal cells of human bone marrow, endothelial cells, and ovary cells are among the cell types involved in Gal 1 secretion and release. On lymphocytes, endothelial cells, and the extracellular matrix (Pasmatzi *et al*., 2020).

The most important biological properties and actions of this galectin include involvement in morphogenesis, angiogenesis, regulation of the cell cycle, proliferation and immune response, cell-cell and cell-matrix adhesion, apoptosis, inflammation, tumor invasion and metastasis, regulation of the innate and the adaptive immune response, promotion of the subsidence of autoimmune inflammation and suppression of allergeninduced inflammation and antibacterial immune response, contribution to the induction of B-cells' regulatory function and to the escape of tumor cells from immune surveillance, involvement in tumoral angiogenesis, hypoxia and metastasis, and the mechanisms of microglial modulation, polarization, and remyelination(Pasmatzi *et al*., 2019)

In the early stages of Acute Myocardial Infarction (AMI) *in vivo*, cultured cardiomyocytes upregulate and secrete Gal-1 in response to hypoxia and proinflammatory cytokines. Enhanced Gal-1 expression later in the course of AMI could influence the resolution of cardiac inflammation and restore homeostasis, while early upregulation of Gal-1 can serve as a homeostatic safeguard mechanism to prevent a dysregulated inflammatory response that could otherwise promote adverse remodeling. Gal-1 was found to be upregulated 7 days after a non-reperfused AMI, and this was linked to a peak in infiltrating dendritic cells, lymphocytes, and macrophages. Gal-1 promotes the differentiation of tolerogenic dendritic cells and

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M2-type macrophages, both of which play protective roles in AMI, so Gal-1-glycan interactions could help these cells perform reparative functions(Seropian *et al*., 2018).

Gal-1 induces apoptosis of CD8 and Th1 and Th17 lymphocytes within the T-cell compartment, encouraging a transition toward a Th2-dominant cytokine profile. This effect is significant in cardiovascular diseases since upregulation of Th1 and Th17 cytokines is a common finding in patients with acute coronary syndromes and is related to poor remodeling after an AMI. Safe patients with Th2 dominant responses, on the other hand, may be protected from cardiovascular disease. (Seropian *et al*., 2018)

Materials and Methods

During six months period (from the beginning of September 2020 to the end of February 2021) 90 cases were collected to participate in the current work. These cases were divided into two groups, the first included 52 patients (28-78 years) with Myocardial Infection (MI) who underwent to Elective Percutaeonus Coronary Intervention (PCI), while the second involved 38 healthy individuals (28-62 years) were enrolled in the present work as a control group.

The samplesof enrolled patients were collected from The Nasiriya Heart Center in Al-Hussein Teaching Hospital, Thi-Qar Governorate, Iraq. Initial diagnosis was performed by specialist physicians and through several of clinical and laboratory exams specialist for MI patients. The full information about the current study patients were provided through oral interviews with patients and in cooperation with the supervising physicians.

Sandwich-ELISA method was applied to assess human Galectin-1 concentration in the sera samples of patients and control groups.

Results and Discussion

When the levels of galectin-1 were estimated in the sera samples of the participants in the current study, the results recorded a significant ($p < 0.05$) decrease in the levels of galectin-1 in the samples of the patients who underwent to elective PCI compared to those in the control group, as shown in Table 1.

Table1: Levels (Mean±S.D.) of Galectin-1 (pg/mL) in The Sera of The Study Individuals

Subjects (n)	Galectin-1(pg/mL) Mean ± S.D.	Galectine-1(pg/mL) Min-Max	p-value
Patients 52	9.290±1.154	6.38-10.95	0.027
Controls 38	12.690±1.797	10.17-18.73	

The Mean Difference is Significant at 0.05 Level

In order to investigate the effect of gender on the levels of serum Gal-1, the statistical Analysis of Variance (ANOVA) was applied to compare the recorded results in the study samples after classification the participants in the two groups according to their gender. The present study found a statistically significant increase ($p=0.000$) of Gal-1 in sera samples of males undergone to elective PCI compared with their peers in the control group, this finding was consistent with what was observed when comparing the levels of Gal-1 in patient female samples with those in the

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control group (p=0.000). Moreover, the present study found that were no-significant gender differences within the same group, as shown in Table 2.

Table 2: Levels (Mean±S.D.) of Galectin-1 (pg/mL) in Sera of The Different Study Groups

Groups (n)	Gender (n)	Gal-1(pg/mL) Mean ± S.D.	Gal-1(pg/mL)Min.-Max. Range	p-value
Patients 52	Male 34	9.414 ±1.041	6.38-10.77 4.39	0.383 For 1 vs 2 0.000 For 1 vs 3 0.345 For 3 vs 4 0.000 For 2 vs 4
	Female 18	9.035±1.355	6.40-10.95 4.55	
Controls 38	Male 28	12.555±1.942	10.17-18.73 8.56	
	Female 10	13.066±1.319	11.16-14.87 3.71	

1: Elective PCI Male Patients, 2: Elective PCI Female Patients, 3:Healthy Male Control, and 4: Healthy Female Control. The Mean Difference is Significant at 0.05 Level

Galectin-1 is the first galectin to be identified, belongs to β-galactoside bound lectins that are expressed in a wide range of cells and tissues. It acts as an anti-inflammatory mediator that suppresses innate and adaptive immunity (Seropian *et al*., 2018). Gal-1 is a fatty substance found in subcutaneous fatty tissue that was discovered recently. Body fat and Gal-1 have a positive relationship. It lowers gene expression when the body lose weight and raises it when the body gian weight . Gal-1 levels are highest in obese people, according to studies (Acar *et al*., 2017**,** (Fryk et al., 2019). In patients undergoing CAG, regardless of diabetes, the amount of circulating serum galectin-1 is an independent prognostic marker for subsequent renal function decline. These results add to the increasing body of evidence that galectin-1 plays a role in the pathogenesis of renal dysfunction in CAD patients(Kuo *et al*., 2020)

Gal-1 is a prognostic marker for coronary artery disease(CAD)that is independent. Elevated serum Gal-1 levels may indicate the compensation of chronic vascular inflammation in patients with CAD, as Gal-1 has protective effects against acute myocardial infarction MI. In comparison to the strong evidence for MI, there is very little and conflicting evidence that galectin-1 reduces inflammation in healthy CAD(Chou *et al*., 2020) .

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