Impact of Adhesion Molecules as a Predictive Marker for Cardiovascular Disease

Huda Jaber Waheed [1], Inam S. Aref [1], Muthanna A. Majid[2], Nawras K. Fadhil [1]

[1]College of pharmacy, Mustansiriyah University, Baghdad, Iraq.
Mustansiriyah University, Baghdad, Iraq.

Abstract

Cardiovascular disease in diabetes mellitus is an important complications for disease. The mortiality of cardiovascular is five times more in that of an age-matched non-diabetic population. Cell adhesion molecules have been evalute in the initiation and prograssion of atherosclerosis. **Methods:** (50) diabetic patients (T2DM) were enrolled in the study, and (33) healthy subjects insert in the study as control groups. Serum ICAM-1, insulin hormone, hs-CRP , lipid profile and FPG were masured. Results**:** there were a significant diffrance in ICAM-1 in patients when compared to control (324.08 ± 15.22 vs. 262.27 ± 22.94 ng/ml, P<0.01). The mean of insulin hormone were (28.93 ± 1.24 vs. 14.67 ± 3.79 , P<0.001) for T2DM patients and (160 ± 26 mg/dl) for control and there were a significant difference between them (p< 0.05). **Conclusion:** Serum ICAM-1 levels were significantly increase in diabetic patients and strongly related to early detection for CVD.

1- Introduction

Diabetes is a group of disorders that affect the patient and most importantly high glucose (1). However, yet the mechanism of lesion which caused by hyperglycemia is unknown and unclear. Although they lead to many complications such as cardiovascular, retinopathy and nephropathy(2). In fact, cardiovascular complication consider as the major cause of death around the world (3). Cardiovascular disease as an important complication for DM usually association with the chronic inflammatory and its deposit reaching to atherosclerosis (4). Cell adhesion molecules are glycoproteins and act as important part in the cell wall the major function is that the cell adhesion with other the endothelial surface(5). Cell adhesion molecules are facilitate the binding of leucocytes to the endothelial cell to inflammation site, and their subsequent steps that lead to accumulation in arterial walls (6). Circulating adhesion molecules levels (including VCAM-1) are strongly related to increase the risk of cardiovascular disease and parameters and higher levels have been detected in atherosclerotic lesions and in patients with CVD, ischemic stroke and coronary artery disease (7). Intercellular Adhesion Molecule 1 (ICAM-1) is protein located in cell mambran and considare as a part from the immunoglobulin superfamily and has several biological function (8) . Early studies recorded that the cell adhesion molecules levels are association with the risk of CVD. Other studies suggest that reported positive and independent associations between CVD outcomes and circulating levels of VCAM-1 . In fact , the relation between ICAM-1 with CVD is unclear as previous studies have mostly reported null associations between VCAM-1 and CVD (9). The aim of this study is that to evaluate ICAM-1 levels , Insulin, hs-CRP , Lipid profile and FBS in diabetic patients and assess the usefull of using in early detection for diabetic complecations.

Material and Methods:

Patients:

50 diabetic patients (T2DM) were enrolled in the study. Patients were selected from National Diabetic Center at al-Mustansiriyah University with age range (48.7±5.3 years) and BMI (28.4±3.62 kg/cm2). Patients were already receiving anti-diabetic medications. Full information was taken from patients by questioner including; history of the disease, duration of disease, smoking and medications. For comparison (33) healthy volunteers were insert in the study. Anthropometric measurements and blood pressure for both groups were recorded. Serum ICAM-1 levels were measured by immune-assay technique (Ray-Bio tech, USA). Both insulin levels and high sensitive C-reactive protein levels were masured by ELISA and the kits supplied by (MediTech Germany.). Lipid profile (total cholesterol, TG and HDL-C) and plasma glucose also measured.

Statistical analysis:

The Statistical Analysis System- SAS (2012) program was applied to find the difference for parameters between the patients and control group by find P value by depending that $P<0.01$ meant there was a high significant difference and $P<0.05$ meant there was a significant difference . Mean and stander division SD also calculated.

Results:

The basic body charecterstics are show in table (1). Exoressed as Mean±SE.

Parameters (mean ± SD)	Controls (n = 33)	Patients (n = 50)	P.value
Age (Years)	45.13±4.28	46.57±5.56	0.81
BMI (Kg/cm2)	27.24±2.96	28.4±3.62	0.19
Gender: Male/Female no.	17/16	26/24	
Family history:Yes/No	-	27/23	-
Diabetic pharmacotherapy:			
Metformen		21(42%)	
Glyburide		14(28%)	
Combenation		15(30%)	
Duration of disease (year)		3.42±2.43	-

Current study recorded that there were a significant diffrance in ICAM-1 in patients when compare to control (324.08 ± 15.22 vs. 262.27 ± 22.94 ng/ml, $P<0.01$). The mean of insulin hormone were (28.93 ± 1.24 vs. 14.67 ± 3.79 , $P<0.001$) for T2DM patients for control and there were a significant difference between them as shown in table (2). There was a significant elevation in hs-CRP levels when compare between patients and control group as shown in table (2). The mean of FBG also significantly elevated in patients when compared to control group.

Table (2): Clinical charecterstics.

Groups	No.	Mean ± SE			
		ICAM-1 (ng/ml)	Insulin (IJU/mL)	hs-CRP (g/dl)	FBG (mg/dl)
DM Patients	50	324.08 ± 15.22 A	28.93 ± 1.24 A	3.36 ± 0.74 A	148.5± 13.7 A
Control	33	262.27 ± 22.94 B	14.67 ± 3.79 B	1.16 ± 0.11 B	84.47 ± 1.32 B
LSD value	---	2.178 **	2.593 **	0.607 **	6.590 **
P-value	---	0.01	0.001	0.01	0.0001

** ($P<0.05$): significant., A,B: Duncan letters, A is given to the highest significant value.
LSD: Least significant difference

Disscusion:

The present study was designed to assess the adhesion molcules (ICAM-1) in diabetic patients and to evaluate there association with cardiovascular diseases. In this study. Serum ICAM-1 signefecantly increase in diabetic patients group.These results in agreemant with other results which recorded that serum ICAM-1 levels and signefecantly correlated with both FPG and Hba1c (10). This finding gives a clear picture of the importance of assessing the ICAM-1 levels and the likelihood of its association with the prevalence of diabetic complications, giving it a significant potential for determining the probability of these complications(11). Nelson et al. suggested that the levels of plasma
ICAM-1 and other adhesion molecules are increased in patients with type 1 diabetes(12).
High sensitive C-reactive protein increase signefecantly in T2DM patients group as comparesion with healthy subjects. Usually, Inflammatory cells do not stick to the cell wall because of the balance between pro- and anti-inflammatory molecules. In contrast, in diabetic patients, increase the glucose are non-enzymatically joined with the chains terminal from lysine end in proteins, which is satuation by any glycosylation end products are resulting, and in cused of oxidative stress, adhesion molecules are secreted in higher levels on the wall of activat endothelial cells(13). Serum hs-CRP levels considare as a good indicator for inflammation and act as major compenant from acut phase reactant, Several studies have recorded that inflammation is correlated with insulin resistance that takes place in the diabetis pathogenesis and CVD (14). Environmental factors such as infections, overnutrition, and decrease in the physical activity are contribute serum hs-CRP levels. On the other hand, increase in glucose levels may stimulate inflammatory process and this may induce the progression of DM (13).
Conclusion: According to the current study serum ICAM-1 levels can be considar as apredactive marker for CVD.

References:

1.   Chiang, JL; Kirkman, MS; Laffel, LMB; Peters, AL . "Type 1 Diabetes Through the Life Span: A Position Statement of the American Diabetes Association". Diabetes Care. 2014; 37 (7): 2034–54.
2.   Petzold A, Solimena M, Knoch KP (October 2015). "Mechanisms of Beta Cell Dysfunction Associated With Viral Infection". Current Diabetes Reports (Review); 2015. 15 (10): 73.
3.   Kuo SJ, Wang FS, Wang CJ, Ko JY, Chen SH, Siu KK. Effects of Computer Navigation versus Conventional Total Knee Arthroplasty on Endothelial Damage Marker Levels: A Prospective Comparative Study. PLoS One. 2015 May 8;10(5):e0126663.
4. I. Satman, B. Omer, Y. Tutuncu et al., "Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults," European Journal of Epidemiology 2013, vol. 28, no. 2, pp. 169–180.
5.   X. Wang, W. Bao, J. Liu et al., "Inflammatory markers and risk of type 2 diabetes: a systematic review

and meta-analysis," Diabetes Care, vol. 36, no. 1, pp. 166–175, 2013.

6. G.S.Taïwe V.Kuete. Management of Inflammatory and Nociceptive Disorders in Africa. Medicinal Spices and Vegetables. 2017; 3(4): 73-92.

7. S. Ilhan, Y. Tutuncu, S. Gedik et al., "Phenotypes and biochemical characteristics of new diabetes patients diagnosed based upon different criteria: HbA1c recognises people at a more advanced diabetic stage," Diabetes, vol. 62, supplement 1, abstract A277, pp. S121–S122, 2013.

8. Xiao X, Mruk DD, Cheng CY (2013). "Intercellular adhesion molecules (ICAMs) and spermatogenesis". Human Reproduction Update. 19 (2): 167–86.

9. de Almeida-Pititto B1, Ribeiro-Filho FF2, Bittencourt MS3, Lotufo PA3, Bensenor I3, Ferreira SR1. Usefulness of circulating E-selectin to early detection of the atherosclerotic process in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). Diabetol Metab Syndr. 2016 Mar 3; 8-19.

10. Cezaretto A, Suemoto CK, Bensenor I, Lotufo PA, de Almeida-Pititto B, Ferreira SRG, ELSA Research Group. Association of adiponectin with cognitive function precedes overt diabetes in the Brazilian Longitudinal Study of Adult Health: ELSA..Diabetol Metab Syndr. 2018; 10:54. Epub 2018 Jul 9.

11. Parrinello CM, Hua S, Carnethon MR, Gallo LC, Hudson BI, Goldberg RB, Delamater AM, Kaplan RC, Isasi CR. Associations of hyperglycemia and insulin resistance with biomarkers of endothelial dysfunction in Hispanic/Latino youths: Results from the Hispanic Community Children's Health Study/Study of Latino Youth (SOL Youth). J Diabetes Complications. 2017 May; 31(5):836-842. Epub 2017 Feb 9.

12. Nelson CL, Karschimkus CS, Dragicevic G, et al. Systemic and vascular inflammation is elevated in early IgA and type 1 diabetic nephropathies and relates to vascular disease risk factors and renal function. Nephrol Dial Transplant 2005;20:2420–6.

13. M. Fisher, M. Cushman, V. Knappertz, and G. Howard, "An assessment of the joint associations of aspirin and statin use with C-reactive protein concentration," American Heart Journal, vol. 156, no. 1, pp. 106–111, 2008.

14. E. Rubio-Martín, F. Soriguer, C. Gutiérrez-Repiso et al., "C-reactive protein and incidence of type 2 diabetes in the Pizarra study," European Journal of Clinical Investigation, vol. 43, no. 2, pp. 159–167, 2013.