

Estimation of Monocytes and Platelets CD 36 Expression Levels in Patients with Type 2 Diabetes Mellitus, Sudan

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Abstract

Background: Diabetes mellitus (DM) is a global health concern affects all ages. Over the past few decades diabetes mellitus is a prevalent, potent devastating, medical problem that has an increasing prevalence. CD36 is a multifunctional signaling cellular receptor with different ligands specificity. It is expressed on different cells including macrophages, platelets and monocytes. **Objective:** This a case control study aimed to estimate monocytes/platelets CD36 levels in patients with type 2 diabetes mellitus in the period between 2019 and 2022. **Methodology:** 70 samples collected from type 2 diabetic patients attending Zeenam Specialized center, Khartoum, Sudan. And 30 samples collected from healthy individuals as control group. 5ml of venous blood were collected from the participants, 2.5 ml were put into a labeled EDTA containers; whole blood were collected to measure HbA1C using I chroma; Boditech Med Inc., and monocytes/platelets CD36 expression levels using CYTOMICS FC 590, Beckman coulter at Flow cytometry laboratory, Khartoum, Sudan. Another 2.5 ml were put into labeled sodium fluoride container to measure FBG using Biosystem chemistry analyzer BTS-302. **Results:** This study showed that the levels of FBG, HbA1C and platelets CD36 expression were significantly higher in type 2 diabetic patients compared with control group ($P = 0.000$, $P = 0.001$ and $P = 0.012$) respectively. And there are no statistical significant difference in expression level of monocytes CD36 between cases and control ($P = 0.366$). Also this study found that monocytes CD36 has a statistically significant correlation with fasting blood glucose ($P = 0.009$), and it is not correlated with HbA1C ($P = 0.547$). Platelets CD36 has a statistically significant correlation with fasting blood glucose, HbA1C and monocytes CD36 ($P = 0.000$) (Table 4). **Conclusion:** This study concluded that platelets CD36 expression was significantly higher in type 2 diabetic patients compared with control group. And there are no statistical significant difference in expression level of monocytes CD36 between cases and control. Also it concluded that monocytes CD36 have a statistically significant correlation with fasting blood glucose, and it is not correlated with HbA1C. Platelets

CD36 have a statistically significant correlation with fasting blood glucose, HbA1C and monocytes CD36.

Key words: Monocytes CD36, Platelets CD36, type 2 Diabetes Mellitus, Sudan.

INTRODUCTION

Diabetes mellitus (DM) is a global health concern affects all ages (Kulkarni N *et.al*, 2018). Over the past few decades diabetes mellitus is a prevalent, potent devastating, medical problem that has an increasing prevalence. And in twenty-first century it constitutes a major health challenge (Tomic D *et.al*, 2022). It is estimated that the most common type of diabetes is type 2 diabetes mellitus, which accounting for more than ninety percent of the total number of cases. For people aged from fifty to seventy four years, it is reported as the fifth leading cause of death (Wu Y *et.al*, 2021). The cluster of differentiation 36 (CD36) is an 88-kDa transmembrane glycoprotein (Castelblanco E *et.al*, 2020). It is a multifunctional signaling cellular receptor with different ligands specificity. It is expressed on different cells including macrophages, platelets and monocytes. In macrophages it serves as a scavenger receptor facilitating the uptake of modified lipoproteins and apoptotic cells, and regulates carbohydrates and lipids metabolism, participate mediating the transport of long chain fatty acids and insulin resistance. CD36 has been mediated in a wide range of pathological conditions, such as cardiomyopathy diabetes and atherosclerosis (Zimman A, Podrez E 2010). CD36 has been stated to be related with type 2 diabetes mellitus. Also it is reported that insulin resistance, hyperglycemia and oxidized low density lipoproteins are leading cause of up-regulation of CD36 in macrophages and monocytes (Castelblanco E *et.al*, 2020). And it has been suggested that this would partly illustrate the accelerated foam cells formation and atherosclerosis in T2DM (Bacon S *et.al*, 2013). On platelets surface CD36 is highly expressed and potentiates the activation of platelets (Yang M *et.al*, 2018). In addition it has major role in angiogenesis and cellular adhesion regulations; act as thrombospondin receptor. Regarding dyslipidemia and stimulated oxidative stress; platelet CD36 interacts with small endogenous oxidized phospholipids which in turn lead to pro-thrombotic signaling and enhanced thrombosis (Zimman A, Podrez E 2010).

MATERIALS AND METHODS

Study Design and Participants

Case control study was done in the period between 2019 and 2022. It included 100 samples (70 cases, 30 controls) collected from volunteer patients with type 2 diabetes attending Zeenam Specialized Clinical Center, Khartoum, Sudan. Monocytes/platelets CD36 expression levels were performed on Flow cytometry laboratory, Khartoum, Sudan.

Data Collection and Statistical Analysis

Data was collected using a questionnaire filled by the investigator at the time of sample collection. Collected data was tabulated and analyzed using statistical package for social sciences (SPSS) program version 20, Ann-Whitney test, T test, a crosstabs and correlation were performed.

Ethical Considerations

Ethical approval was obtained from the IRB of the Faculty of Medical Laboratory Science, University of Gezira. All participants signed a standard informed consent.

Methods

5ml of venous blood were collected from the participants by using a sterile needle and syringe. 2.5 ml were put into a labeled EDTA containers; whole blood were used for measurement of HbA1C and monocytes/platelets CD36 expression levels. Another 2.5 ml were put into labeled sodium fluoride container to measure fasting blood glucose.

Fasting blood sugar (FBG) was measured using Biosystem chemistry analyzer BTS-302; Serial No: 801010336, EU. HbA1C was measured using I chroma; Serial No: PFR10F181359, Boditech Med Inc. Chuncheon, Korea. Expression level of monocytes/platelets CD36 was measured using CYTOMICs FC 590, Beckman coulter.

RESULTS

This case control study was carried out on 70 patients with type 2 diabetes (cases) and 30 apparently healthy individuals (control group) with both sex. 27 (38.6%) were male and 43 (61.4%) were female (Table 1). 51 (72.1%) of them were uncontrolled diabetes and 19 (27.1%) were controlled diabetes depending on HbA1C level (Table 2). According to disease duration patients were distributed into three groups; 1 – 10 years (45.7%), 11 – 15 years (25.7 %) and more than 15 years (28.6 %) (Table 2).

The result of this study showed that the levels of FBG, HbA1C and platelets CD36 expression were significantly higher in type 2 diabetic patients compared with control group. And there are no statistical significant difference in expression level of monocytes CD36 between cases and control (Table 3). Also this study revealed that monocyte CD36 has a statistically significant correlation with fasting blood glucose, and it is not correlated with HbA1C. Platelet CD36 has a statistically significant correlation with fasting blood glucose, HbA1C and monocytes CD36 (Table 4).

Table 1: Frequency of patients according to gender

	Frequency	Percent
Male	27	38.6
Female	43	61.4
Total	70	100

Table 2: Distribution of patients according to HbA1C and disease duration

		Frequency	%
HbA1C	Control	19	27.1
	Uncontrolled	51	72.9
	Total	70	100
Disease duration	1 - 10	32	45.7
	11 - 15	18	25.7
	> 15	20	28.6
	Total	70	100

Table 3: Compared FBG, HbA1C, monocytes/platelets CD36 between cases and control

		N	Mean	STD	P. Value
FBG	Case	70	163.23	52.583	0.000
	Control	30	92.23	32.176	
HbA1C	Case	70	8.39	1.766	0.001
	Control	30	5.73	0.869	
Monocytes CD36	Case	70	43.98	16.66	0.366
	Control	30	45.33	14.81	
Platelets CD36	Case	70	95.63	3.33	0.012
	Control	30	92.57	2.06	

Table 4: The correlation between FBG, HbA1C and monocytes/platelets CD36

		FBG	HbA1C	Monocytes CD36	Platelets CD36%
FBG	Pearson Correlation		0.374**	-0.313**	-0.418**
	Sig. (2-tailed)		0.001	0.009	0.000
	N		70	69	69
HbA1C	Pearson Correlation			-0.074	-0.545**
	Sig. (2-tailed)			0.547	0.000
	N			69	69
Monocytes CD36	Pearson Correlation				0.561**
	Sig. (2-tailed)				0.000
	N				69

Monocytes CD36 has a statistically significant correlation with fasting blood glucose ($P = 0.009$), and it is not correlated with HbA1C ($P = 0.547$). Platelets CD36 has a statistically significant correlation with fasting blood glucose, HbA1C and monocytes CD36 ($P = 0.000$) (Table 4)

DISCUSSION

Diabetes mellitus (DM) is a global health concern affects all ages. Over the past few decades diabetes mellitus is a prevalent, potent devastating, medical problem that has an increasing prevalence. CD36 is a multifunctional signaling cellular receptor with different ligands specificity. It is expressed on different cells including macrophages, platelets and monocytes. This case control study was carried out on 70 patients with type 2 diabetes (cases) and 30 apparently healthy individuals (control group) with both sexes aimed to estimate the monocytes/platelets CD36 expression level in patients with type 2 diabetes mellitus. This study showed that the levels of FBG, HbA1C and platelets CD36 expression were significantly higher in type 2 diabetic patients compared with control group ($P = 0.000$, $P = 0.001$ and $P = 0.012$) respectively. And there are no statistical significant difference in expression level of monocytes CD36 between cases and control ($P = 0.366$). Also this study found that monocytes CD36 has a statistically significant correlation with fasting blood glucose ($P = 0.009$), and it is not correlated with HbA1C ($P = 0.547$). Platelets CD36 has a statistically significant correlation with fasting blood glucose, HbA1C and monocytes CD36 ($P = 0.000$). In a previous study done by

Castelblanco E and et.al, a Flow cytometric method was performed to estimate the expression of CD36 in circulating monocytes from T2D patients and non-diabetic control group. It found that there is no significant difference in the expression of CD36 receptor in monocytes between T2D patients and the non-diabetic subjects (Castelblanco E *et.al*, 2020).

CONCLUSION

This study concluded that the levels of FBG, HbA1C and platelets CD36 expression were significantly higher in type 2 diabetic patients compared with control group. And there are no statistical significant difference in expression level of monocytes CD36 between cases and control.

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Conflict of Interest:

The authors declare no conflicts of interest regarding the publication of this paper.

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