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Original Research Article

Comparisons of platelet indices and angiographic findings in diabetic and non diabetics presenting with acute coronary syndrome

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Abstract

Introduction: Platelets with larger volume have more activity compared to smaller ones, patient with higher platelet indices have more atherogenic potential and risk for acute coronary syndromes
Aim: To compare Platelet indices, RBS, RFT, Lipid profiles, Coronary angiography and other parameters in Diabetic and non-diabetic individuals who presented with ACS.
Materials and methods: A prospective study with total 100 patients among that 50 were diabetics and 50 were non diabetic individuals admitted to ICCU KIMS Hubli were included. Patients with anaemia, Bleeding diathesis and malignancies were excluded from the study. All the patients underwent complete clinical examination and RBS, Platelet indices, coronary angiography and other routine parameters, were estimated and the results were analysed using SPSS 20 version.
Results: Platelet indices were significantly higher in diabetic individuals compared to non-diabetics and TVD and DVD are more common in diabetics as compared to non-diabetics who were presented with ACS.
Conclusion: In our study we concluded that platelet indices are higher in DM. Coronary artery disease is severe in diabetic patients compared to non-diabetic patients presenting with ACS.
Keywords: Mean platelet volume (MPV), Platelet Distribution Width (PDW), Tripple vessel disease (TVD), Double vessel disease (DVD), Coronary Artery Disease (CAD) and ACS (Acute coronary syndrome), Diabetes mellitus (DM).

1. Introduction

Type 2 diabetes mellitus (T2DM) is a serious public health problem, considering its epidemic prevalence levels and high morbidity and mortality rate [1]. This type of diabetes that results from resistance to insulin action associated with a relative deficiency of this hormone has an insidious development and is often diagnosed due to the presence of micro vascular or macro vascular complications[2].

Platelet indices include MPV, PDW and Platecrit, Mean platelet volume (MPV) is a machine-calculated measurement of the average size of platelets found in blood. High MPV associates with a variety of established risk factors, cardio and cerebrovascular disorders prone to arterial and venous thrombosis. A typical range of platelet volumes is 8.1±0.6 fL (femtolitre), equivalent to spheres 2.65 to 2.9 µm in diameter [3-4].

The PDW indicates the platelet distribution width measured at 20% relative height of the total height of the curve. An increased PDW is an indication for an isocytosis of platelets. Standard PDW ranges 11.9±1.8 [3-4]

The platicrit indicates total percentage of platelet in along with other cell lineages measures 0.19±0.1 [4]. Platelet activation plays a central role in the transformation of atherosclerotic cardiovascular disease (CVD) into its potentially major adverse clinical events, such as ischemic stroke and myocardial infarction (MI) [5-7], Increased platelet activation may also represent the net patho-physiological effects of a number of CVD risk factors, such as smoking and raised cholesterol, thus representing a broad marker of CVD risk [8]. Platelets play a key role in the development and progression of cardiovascular disease, with increased aggregation and activation occurring in patients with chronic stable angina and acute coronary

syndrome (ACS)[9]. Circulating platelets are heterogeneous with respect to their size, density and reactivity. It is generally accepted that large platelets are metabolically and enzymatically more active than small ones [10,11]. It has been postulated that large platelets may be an indicator of platelet activation, and thus be related to the extent and also clinical presentation of coronary artery disease (CAD)[12]. The degree of platelet activation may be assessed by platelet indices such as platelet count, mean platelet volume (MPV) and platelet distribution width (PDW). It is also unclear whether these parameters can be considered risk factors for CAD.

Myocardial infarction (MI) is one of the major consequences of thrombotic lesion in coronary artery disease (CAD). Early diagnosis of MI still needs research despite the considerable advancement in the diagnostic parameters [13]. Platelets play a key role in the development and progression of atherosclerosis and its complications, including MI.[14,15]

Platelet size and its function are interrelated and it has been shown that larger platelets are more reactive than normal platelets. Consequently, larger and hyperactive platelets play a key role in all the consequences of acute thrombotic event in the body [16].

Activated large size platelets not only secrete thromboxane A2 and ADP but also directly bind to the circulating fibrinogen, via platelet glycoprotein (GP) IIb/IIIa (integrin). The platelet–fibrinogen– platelet integration initiates the process of platelet aggregation and thus, leads to coronary thrombus formation. These findings suggested that in larger platelets,

MPV may be useful marker in patients with acute coronary syndrome (ACS)[17].

1.1 Objective

The aim of this study is to evaluate the platelet indices, coronary angiography and various other parameters in patients with T2DM and nondiabetic, in order to demonstrate a potential correlation between these parameters.

Type of study is a Prospective study. Patients admitting to ICCU KIMS, HUBLI diagnosed as Acute Coronary Syndrome selected. The study included 100 patients admitting to ICCU KIMS Hubli who diagnosed as ACUTE CORONORY SYNDROME and divided into 50 diabetic patients (cases) and 50 non diabetics (controls). Patients selected based on who met inclusion/exclusion criteria.

2. Methods

Informed consent was taken from all patients. Venous blood samples would be drawn at the time of admission before initiation of treatment. Estimation of platelet count, MPV, PDW and platicrit will be performed in all patients(by Haemogram) all blood samples would be processed within 30 minutes of blood collection using an autoanalyser before giving antiplatelet drugs.

Clinical history will include age, sex, history of risk factors; past history of diabetes, hypertension and smokingClinical examination will include vitals, general examination and systemic examination including detailed examination of CVS.

2.1 Statistical Analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and SD. **ANOVA (Analysis of Variance) or Kruskal Wallis test** was the test of significance to identify the mean difference between more than two groups for quantitative and qualitative data respectively.

Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs such as bar diagram, Pie diagram.

p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software: MS Excel**,** SPSS version 22 **(**IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

3. Results

Table 1: Profile of subject's comparison between diabetics and non diabetics

		Diabetic		Non diabetic		P value
		Count	%	Count	%	
Age (years)	<40	4	8.0%	13	26.0%	0.03*
	41 to 50	9	18.0%	12	24.0%	
	51 to 60	15	30.0%	15	30.0%	
	61 to 70	19	38.0%	7	14.0%	
	>70	3	6.0%	3	6.0%	
Sex	Female	23	46.0%	16	32.0%	0.151
	Male	27	54.0%	34	68.0%	
HTN	No	26	52.0%	37	74.0%	0.023*
	Yes	24	48.0%	13	26.0%	
Smoker	No	35	70.0%	36	72.0%	0.826
	Yes	15	30.0%	14	28.0%	
Alcohol	No	38	76.0%	38	76.0%	1.000
	Yes	12	24.0%	12	24.0%	
ECG	NSTEMI	4	8.0%	5	10.0%	0.004*
	STEMI	40	80.0%	25	50.0%	
	USA	6	12.0%	20	40.0%	

Among Diabetics, majority were in the age group b/w 61 to 70 years (38%), 54% were males, 48% had HTN, 30% were smokers, 24% were alcoholics,, maximum patients had STEMI(80%), majority were IWMI (38%) and it was clinically significant.

Among non diabetics, majority were in the age group b/w 51 to 60 years (30%), 68% were males, 26% had HTN, 28% were smokers, 24% were alcoholics, on ECG 50% had STEMI, and 40% had Unstable angina and it was clinically significant.

There was significant difference in Age distribution, HTN, ECG findings and CD findings between diabetics and non diabetics.

Table 2: Profile of subject's comparison between diabetics and non diabetics

	Diabetics		Non diabetics		P value
	Mean	SD	Mean	SD	
Urea	29.86	13.18	25.36	9.00	0.049*
CREAT	0.98	0.32	1.01	0.28	0.667
TCH	216.86	69.42	203.58	55.86	0.295
TGS	160.82	62.98	161.62	60.50	0.948
HDLC	52.02	23.93	50.00	17.00	0.628
LDLC	84.20	29.79	88.16	25.90	0.480
TP	2.57	0.88	2.36	0.92	0.251
EF%	47.94	8.21	51.10	9.06	0.071

Mean Urea among diabetics was more 29.86±13.18 mg/dl as compared to non diabetics that was 25.36±9.00 mg/dl. There was significant difference in mean Urea between two groups.

Total cholesterol level was more in diabetics 216.86 mg/dl as compared to non diabetics that was 203.58 mg/dl.

Ejection fraction was low in diabetic patients (47.94%) as compared to non diabetics (51.10%).

There was no significant difference in mean Creatinine, TCH, TGS, HDLC, LDLC, HB, TP and Ejection fraction between two groups.

Table 3: Profile of RBS comparison between diabetics and non diabetics

	Diabetics		Nondiabetics		P value
	Mean	SD	Mean	SD	
RBS	179.78	63.88	117.86	54.49	<0.001*

Mean RBS among diabetics was 179.78±63.88 mg/dl and in non-diabetics was 117.86±54.49 mg/dl. There was significant difference in mean RBS between two groups.

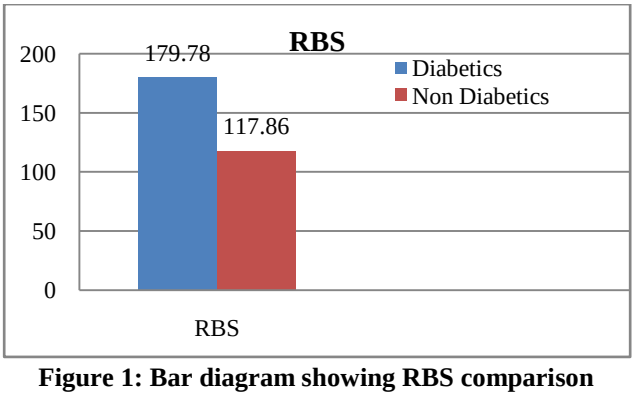

Figure 1: Bar diagram showing RBS comparison between Diabetics and non diabetics

Table 3: Profile of Platelet indices comparison between diabetics and non diabetics

	Diabetics		Nondiabetics		P value
	Mean	SD	Mean	SD	
PDW	13.94	2.97	12.16	1.52	<0.001*
MPV	11.46	2.30	10.27	1.09	0.001*
Plateletcrit	0.33	0.16	0.25	0.12	0.013*

Mean PDW among diabetics was 13.94±2.97 and in non diabetics was 12.16±1.52. There was significant difference in mean PDW between two groups and it was statistically significant.

Mean MPV among diabetics was 11.46±2.30 and in non diabetics was 10.27±1.09. There was significant difference in mean MPV between two groups and it was statistically significant.

Mean Plateletcrit among diabetics was 0.33±0.16 and in non diabetics was 0.25±0.12. There was significant difference in mean Plateletcrit between two groups and it is statistically significant.

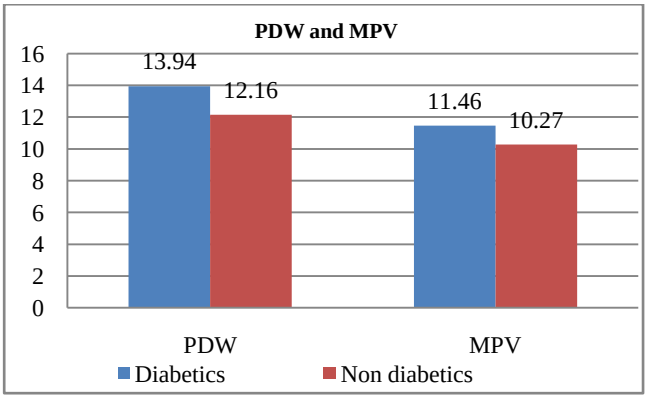

Figure 2: Bar diagram showing platelet indices comparison between Diabetics and non diabetes

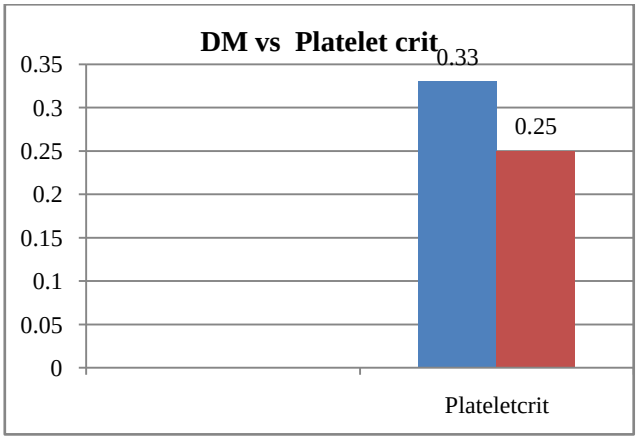

Table 4: Comparison of CAG findings between diabetics and non diabetics

		Diabetes Mellitus			
		Present		Absent	
		Count	%	Count	%
CAG	SVD	17	34.0%	28	56.0%
	DVD	16	32.0%	2	4.0%
	TVD	15	30.0%	2	4.0%
	Normal	2	4.0%	17	34.0%
	ICAD	0	0.0%	1	2.0%

$\chi 2 = 36.36$, df = 4, p <0.001*

Diabetics 34% had SVD, 32% DVD and 30% TVD whereas non diabetics 56% SVD, 2% DVD and 2% TVD hence it shows there is severe CAD in diabetics and it is statistically significant.

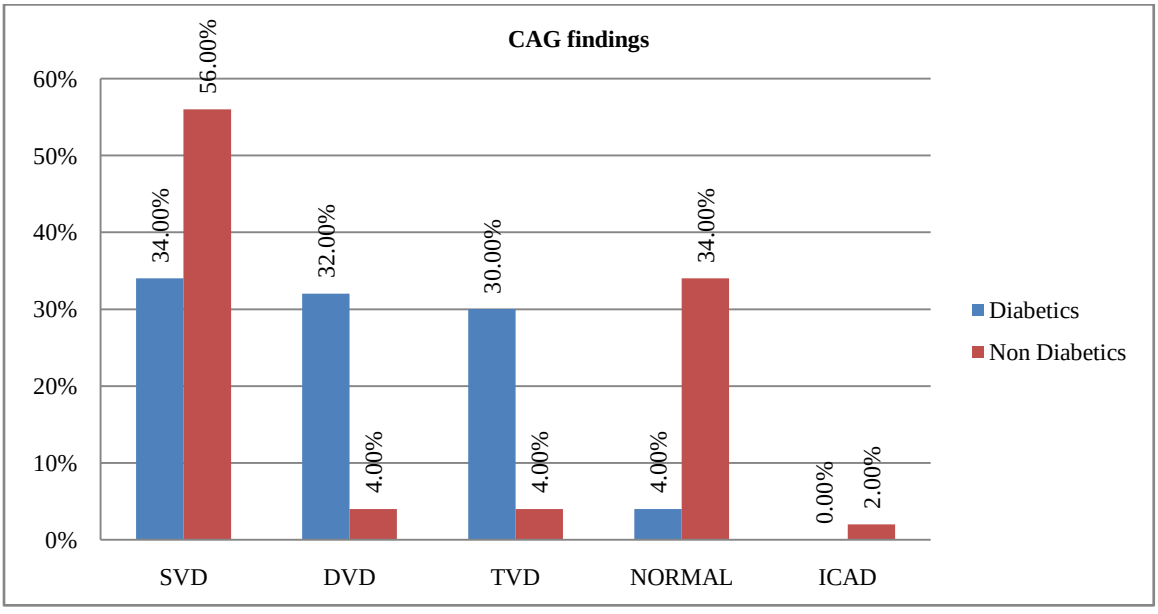

Figure 3: Bar diagram showing Comparison of CAG findings between diabetics and non diabetics

4. Discussion

Plateletindices, including MPV, PDW and platicrit increased in patients with diabetes as compared to non-diabetics who presented with ACS. These findings are similar to other studies like Lippi *et al* [18], Khandedar *et al* [19] and Kilicli-Camur *et al* [20].

It is shown in previous studies that it has good predictive value in assessing severity of CAD [18-22]. The larger one is being more reactive and produces more proinflammatory and prothrombotic mediators leading to coronary related clinical events. MPV is a routine measurement of complete blood count showing the mean of circulating platelet size, and its predictive value concerning clinical assessments in the cardiovascular medicine has been previously reported [23].

In the study there was significant difference in mean PDW, MPV and Platelet crit a with respect to Diabetes. In this study the Platelet indices higher in patients with Diabetis ACS patients (cases) than those in non diabetic ACS patients (control) group. The study also showed that there was significant difference in platelet indices values between them Atherogenecity in terms of severity of coronary occlusion is more in diabetic ACS patients as compared to nondiabetic ACS patients that is TVD and DVD are more common in Diabetic ACS patients as compared to controls. Hence it might be useful diagnostic tool and an additional cost efficient test in predicting severity of CAD and helps in aggressive treatment of patients. Larger platelets are haemostatically more active and hence carry risk for developing coronary thrombosis leading to ACS. Patients with increased MPV could be easily identified during routine haematological analysis. It could play an important role in early detection of acute coronary syndrome (ACS) and be beneficial for early differentiation of DVD and TVD.

5. Conclusion

In our study we concluded that platelet indices are higher and coronary artery disease is severe in patients with diabetics presenting with ACS compared to non diabetic patients presented with ACS.

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