Original Research Article

An observational study of platelet parameters among patients of diabetes mellitus type 2 at Tertiary Care Centre, Udaipur

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Abstract

Introduction: Diabetes Mellitus is a chronic metabolic syndrome principally characterized by persistent hyperglycemia. Fasting blood glucose, postprandial blood glucose, and hemoglobin A1c (HbA1c) are widely used to monitor glycometabolic control in patients with DM. DM is considered as a "prothrombotic state", Larger platelets that contain denser granules are metabolically and enzymatically more active than smaller ones and have higher thrombotic potential. This study was planned to compare platelet parameters in type 2 diabetic patients and healthy controls. **Methodology**: This observational study was conducted on patients attending the Medicine and Endocrine OPD of Maharana Bhupal Government hospital during July 2017 to June 2018. Total of 100 subjects with 70 diabetic (type 2) patients attending the diabetic clinic and 30 non diabetics (control group) were selected for study. **Result**: Mean age of participants were 59.26±12.27 years. Out of 100 participants, 69% had HbA1C more than or equal to 6.5 while 31% had HbA1C less than 6.5. Association of MPV, PDW, HbA1c with complication was found to be statistically significant (p value<0.05) and correlation of HbA1C with MPV and PDW was also statistically significant (p value<0.05). **Conclusion**: MPV and PDW can be useful as prognostic marker of cardio-vascular complication in diabetics. Both MPV and PDW might be used as a simple and cost – effective laboratory test in the follow up of DM along with HbA1c and thereby help to reduce the morbidity and mortality.

Introduction

Diabetes Mellitus is a global pandemic disease. It is a chronic metabolic syndrome principally characterized by persistent hyperglycemia. Impaired fasting glucose is probably a frequent glycemic disorder in the general population and is considered as a pre-diabetic state[1]. The world prevalence of diabetes among adults (aged 20–79 years) was approximately 6.4%, affecting 285 million adults in 2010 and is predicted to rise to 7.7%, affecting 439 million adults by 2030[2]. In India more than 62 million diabetic individual are currently diagnosed with the disease[3]. Fasting blood glucose, postprandial blood glucose, and hemoglobin A1c (HbA1c) are widely used to monitor glycometabolic control in patients with DM[4]. The development of long-term complications has a closerelationship with endothelial dysfunction mainly caused by poorglycemic control, and is the leading cause of death and poor qualityof life in this group of individuals[2]. Several studies have highlighted the participation of platelets as one of the coagulation system elements involved in the genesis of these events.DM is considered as a "prothrombotic state", Larger platelets that contain denser granules are metabolically and enzymatically more active than smaller ones and have higher thrombotic potential[4]. The changes in mean platelet volume (MPV) and platelet distribution width (PDW) reflect the state of thrombogenesis, therefore MPV and PDW can be considered as predictive markers for vascular complications of diabetes mellitus[6]. The higher values of MPV, PDW and P-LCR indicates that they serve as better risk indicator of initial vascular complications in diabetes mellitus patients and can be used as a simple and cost effective tool to assess vascular events[7].

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Analysing the platelet parameters can act as an alarm for diagnosing and progression of complications of diabetes mellitus[8].
This study was planned to compare platelet parameters in type 2 diabetic patients and healthy controls.

Methodology

This observational study was conducted on patients attending the Medicine and Endocrine OPD of Maharana Bhupal Government hospital and thereafter referred to Haematology section of Pathology Department, RNT Medical College, Udaipur (Rajasthan). This study included total of 100 subjects with 70 diabetic (type 2) patients attending the diabetic clinic and 30 non diabetics (control group). Out of 70 diabetic patients, 15 were with complications while 55 were DM with any macrovascular (including coronary artery disease and peripheral vascular disease) or microvascular complication (including nephropathy, neuropathy and retinopathy. The study was conducted over a period of one year from July 2017 to June 2018. For study group, non insulin-dependent DM (type2) patients on treatment who gave consent attending the diabetic clinic were included in the study. For study group, male patients with Hb <13gm% and female patients with Hb <12gm%, similarly subjects with leucopenia or leucocytosis, thrombocytopenia or thrombocytosis, hypertriglyceridemia, hypercreatininemia, human immunodeficiency virus (HIV) infection, hepatitis B and C, systemic lupus erythematosus, any hematological disorder, any diagnosed malignancy as well as smokers and pregnant women, and patients who are taking anti-platelet drugs such as aspirin and clopidogrel or on insulin were excluded from the study. For control group, persons with coronary artery diseases were excluded from the study. The demographic information and clinical details of the patients were recorded including duration of diabetes, family history of diabetes, hypertension, drug history, special reference to any complications or comorbidities.Data were entered and analysed in excel sheet of Microsoft. Qualitative data will be expressed in the

form of percentages & proportions. Quantitative data will be expressed in the form of mean and standard deviation.

Result

(Table-1) In our study, most (59%) of the participants were from the age group of 51-70 year, followed by 41-50 year (21%) and least (4%) were from the age group of 31-40 and 71-80 year age group.

Table 1- Socio demographic profile of study subjects

Variable		Number	Percentage
Age (Years)	31-40	4	4
	41-50	21	21
	51-60	30	30
	61-70	29	29
	71-80	12	12
	81-90	4	4
Sex	Male	50	50
	Female	50	50
Diabetic	Yes	70	70
	No	30	30
HbA1C	<6.5	31	31
	≥6.5	69	69

Mean age of participants were 59.26±12.27 years. Proportion of male and female were equal (50%). There were 70% diabetic patients and 30% were non diabetic. Out of 70 diabetic patients, 78.57% participants have complication while only 21.43% were free from complications. Out of 100 participants, 69% had HbA1C more than or equal to 6.5 while 31% had HbA1C less than 6.5.

(Figure-1) out of 100 participants, 55% had complication along with diabetes and 15% had no complications along with diabetes. And 30% were non diabetic.

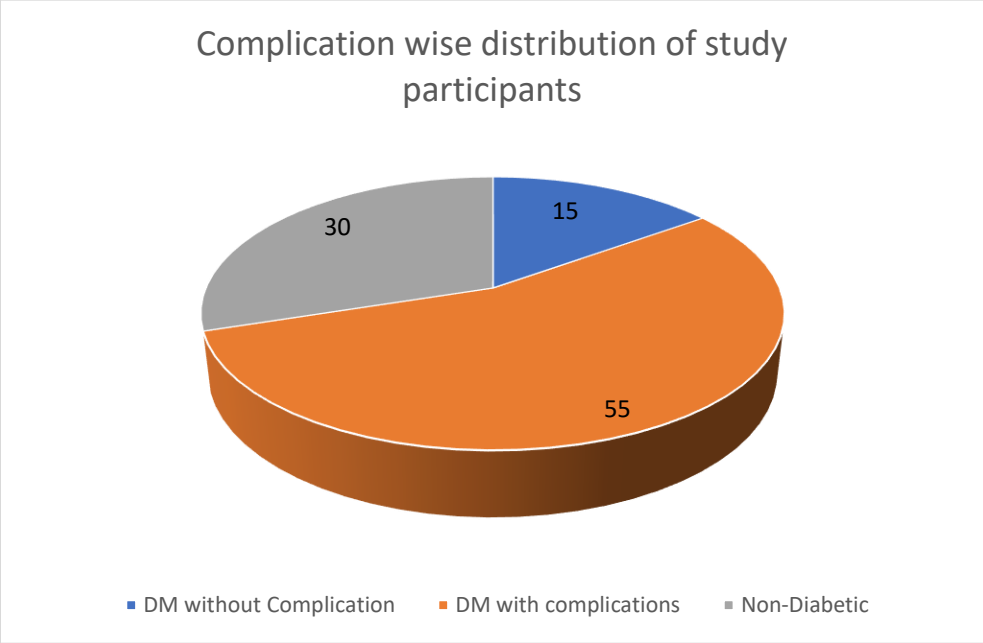

Figure 1- Disease wise distribution of study participants

(Table-2) Correlation of HbA1C with MPV and PDW were found to be significant with pearson's coefficient of 0.767 & 0.338 respectively (p-value <0.05). Correlation of HbA1C with PCT and PC were found to be insignificant (p-value >0.05)

Table 2- Correlation of HbA1C with platelet parameters

Variable	Pearson's correlation coefficient	p value
PCT(%)	0.113	0.262
MPV (fl)	0.767	<0.001
PDW(fl)	0.338	0.001
PC (cells/cumm)	-0.011	0.967

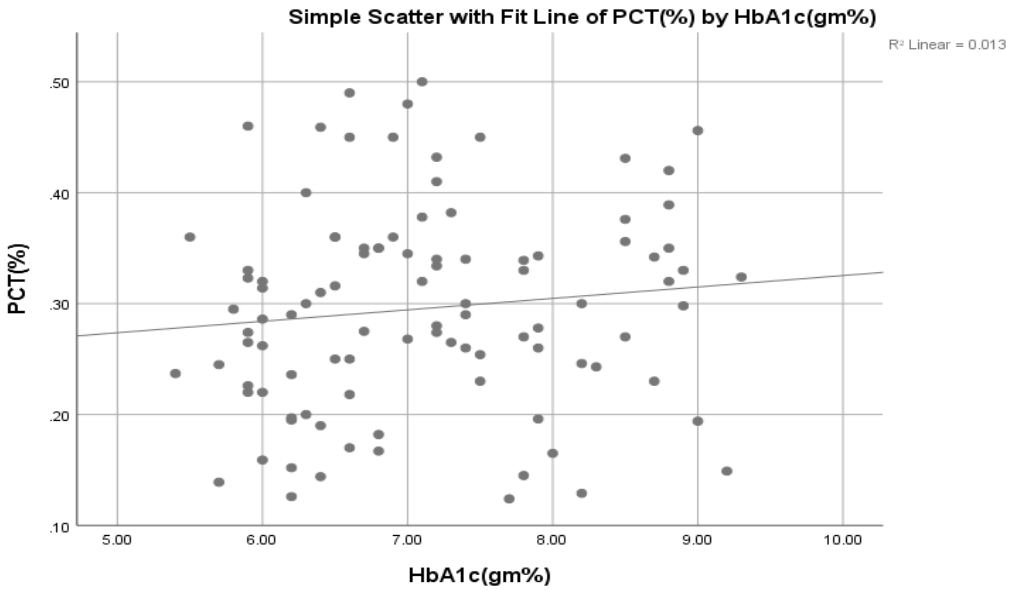

Figure 2- Correlation of HbA1C (gm%) with PCT(%)

(Table-3) In our study, mean PCT among participants with complication was 0.31±0.09 while among without complication it was 0.29±0.1 and association of PCT with complication is found to be insignificant.

Table 3- Association of Platelet indices among study groups

Variable	Diabetic with complications (n=55)	Diabetic without complications (n=15)	Non- diabetic (n=30)	Test of significance
PCT(%)	0.31±0.09	0.29±0.1	0.26±0.09	F=2.839, df=2, p value=0.063
MPV (fl)	13.94±1.37	9.92±1.96	8.53±1.72	F=126.085, df=2, p value<0.001
PDW(fl)	17.25±2.18	14.55±2.44	14.62±2.65	F=15.584, df=2, p value<0.001
PC (cells/cumm)	319.93±104.86	301.87±141.9	295.67±78.55	F=0.578, df=2, p value=0.563
HbA1c(gm%)	7.85±0.73	6.63±0.14	6.02±0.25	F=107.19, df=2, p value<0.001

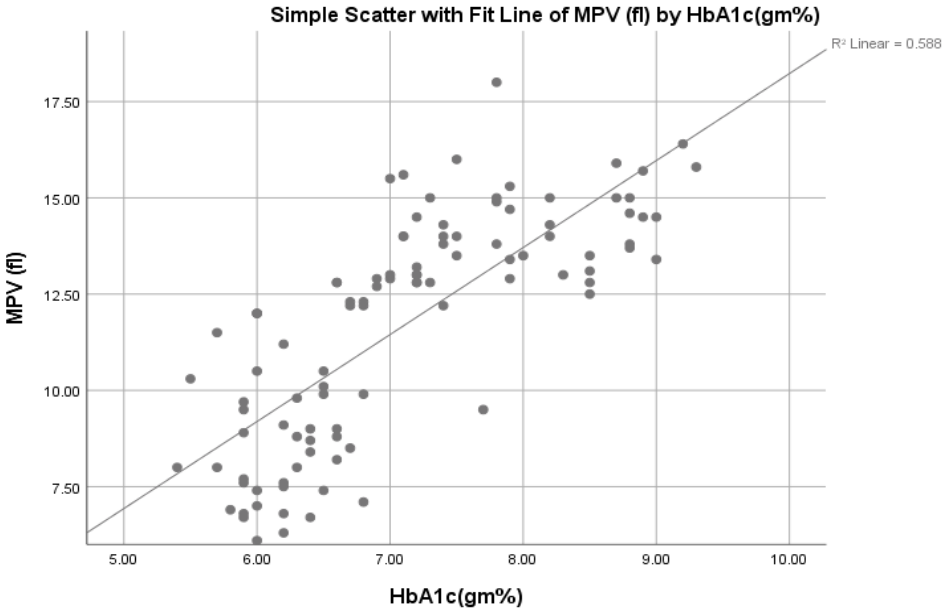

Figure 3- Correlation of HbA1C(gm%) with MPV(fl)

Mean MPV among participants with complication was 13.94±1.37 which is higher than participants without complication (9.92±1.96) and non-diabetic participants (8.53±1.72) and this association was found to be significant (p value<0.05)

Mean PDW among participants with complication was 17.25±2.18 which is higher than participants without complication (14.55±2.44) and non-diabetic participants and this association was found to be significant (p value<0.05)

Association of HbA1C with complication was statistically significant (p value<0.05)

(Table-4) PCT, MPV and PDW was more among the participants with HbA1C more or equal to 6.5 compare to participants with HbA1C less than 6.5. Association of HbA1C with PCT, MPV and PDW was found to be significantly significant (p value<0.05) while association of PC with HbA1C was found to be insignificant (p value>0.05)

Table 4- Association of Platelet indices with HbA1C among study participants

Variable	HbA1C		Test of significance
	<6.5gm% (n=31)	≥6.5gm% (n=69)	
PCT(%)	0.26±0.09	0.31±0.09	t=-2.5, df=98, p value=0.014
MPV (fl)	8.53±1.69	13.14±2.19	t=-10.4, df=98, p value<0.001
PDW(fl)	14.6±2.61	16.71±2.48	t=-3.882, df=98, p value<0.002
PC (cells/cumm)	293.52±78.16	317.32±113.23	t=-1.061, df=98, p value=0.291

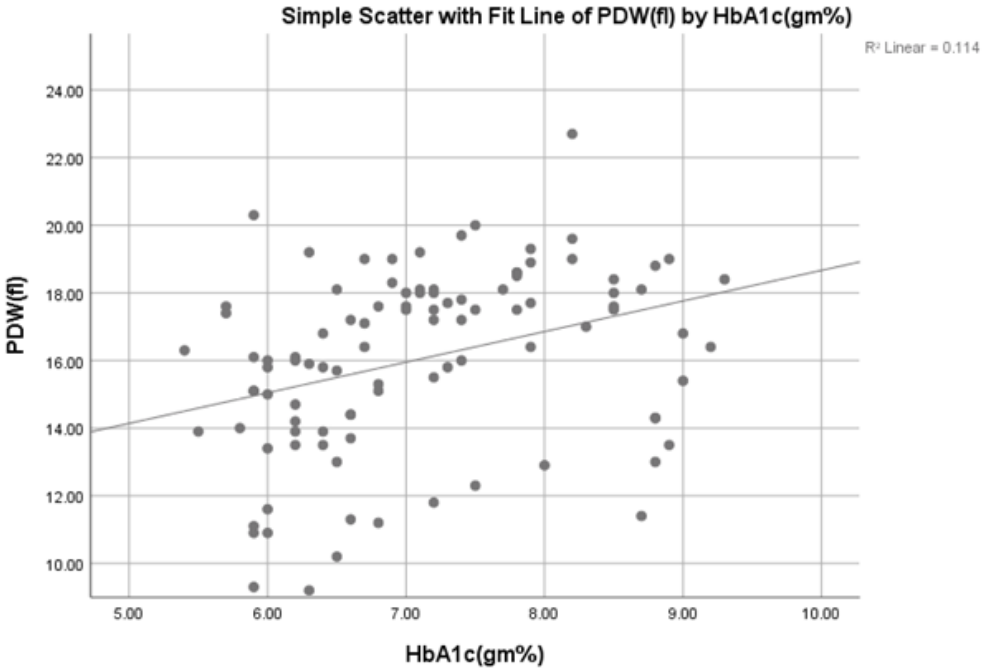

Figure 4- Correlation of HbA1C (gm%) with PDW(fl)

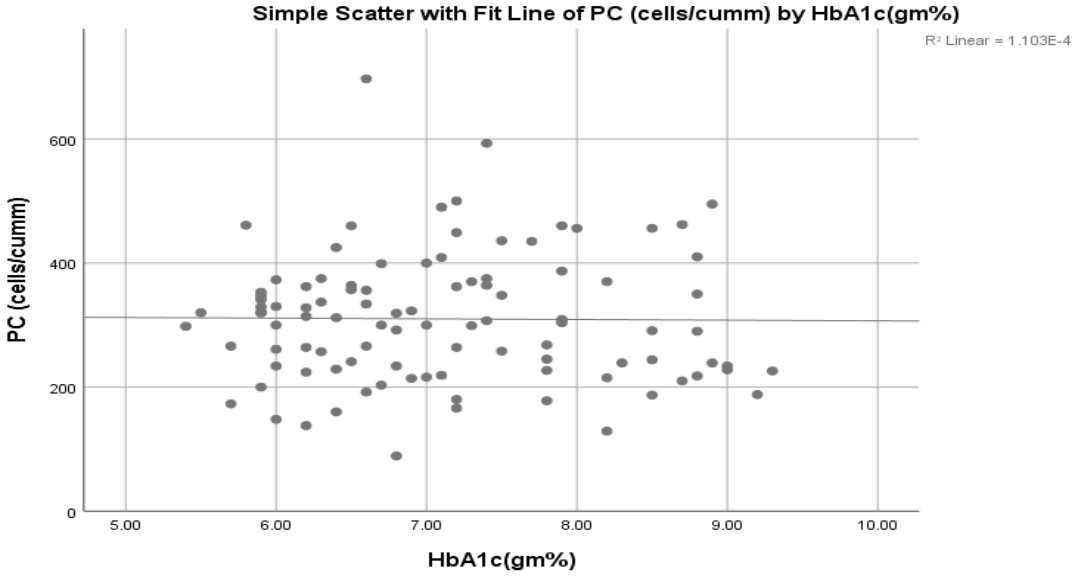

Figure 5- Correlation of HbA1C (gm%) with PC(cells/cumm)

Discussion

Diabetes mellitus is a chronic disease that causes increased morbidity and mortality due to its vascular complications. There is a need to develop risk factor modification to reduce the impact of complications. There is increased risk of thrombosis and atherogenesis in diabetic patients. Changes in hemostatic balance have been an important pathogenetic factor contributing to development of complications in DM. The present study was conducted to compare platelet parameters in type 2 diabetic patients and healthy controls, which can also be used as a good indicator of platelet activation and an independent predictor of impending vasculitis.

The present study was conducted on 100 cases during the year July 2017 to June 2018 in the Department of Pathology, R. N. T. Medical College and associated MB hospital, Udaipur, Rajasthan.

In present study age ranged from 36 to 89 years with diabetic complication was more prevalent in 5th decade followed by 6th and 4th decade. The mean age of patients in present study is 59.2±12.2. Similar findings were observed in study carried out by Akinsegun et al who found mean age of patients was 62.35±9.84 years[9].

In present study 50% of patients were male and 50% patients were females with male to female ratio in 1:1. Finding were in concordance with Hasan et al who found 55% males and 45% females[10].

In present study 31% had HbA1c level less than 6.5 and 69% cases had HbA1c level 6.5 or more than 6.5, while Sushma et al 97.2% cases had HbA1c level more than or equal to 6.5 and only 2.8% had HbA1c level < 6.5[11]. This can be attributed to selection of cases

Our study shows a statistically significant difference in the MPV level in diabetic patients with and without complications when compared to uncomplicated cases Dubey et al found that Mean platelet volume is 10.62±2.13 fl in diabetic group with vascular complications which is found to be raised in comparison to the group without vascular complications which is statistically significant with p value <0.0001[12].

In present study mean PCT in DM with complications is 0.31±0.09 and without complication is 0.29±0.10 and in non-diabetic cases is 0.26±0.09. The p-value between non-diabetic and diabetic with complication is 0.063 which is statistically insignificant. Similarly. A study by Mardia et al[13] revealed Mean PCT of 0.29 in diabetic without complication and mean PCT 0.43 in patients with complications (p value=0.007)

In present study a statistical significance in mean PDW level was observed in cases of diabetes. The p-value between non-diabetic and diabetic with complication was 0.0001 which is statistically significant. The observations were in concordance with Jindalet al[14]. These findings can be attributed to the accelerated production of platelets in patients with T2DM.

In present study mean PC in DM with complications is 319.9±104.8 and without complication is 301.8±141.8, the difference being statistically insignificant 0.563. The findings are quite similar to study by Mardia et al[13] who found platelet counts higher in the diabetic with complications.

Conclusion

Most of the patient with type II DM suffers from preventable vascular angiopathies and early diagnosis of progressive activation of coagulation can help manage these vascular diseases successfully. Therefore, MPV and PDW can be useful as prognostic marker of cardio-vascular complication in diabetics . Both MPV and PDW might be used as a simple and cost – effective laboratory test in the follow up of DM along with HbA1c and thereby help to reduce the morbidity and mortality.

Conflict of Interest: Nil Source of support: Nil

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